

RESEARCH PAPER

Legal and Ethical Issues around Incorporating Traditional Knowledge in Polar Data Infrastructures

Teresa Scassa¹ and Fraser Taylor²¹ Faculty of Law, University of Ottawa, Ottawa, Canada² Geomatics and Cartographic Research Centre, Carleton University, Ottawa, CanadaCorresponding author: Teresa Scassa (tscassa@uottawa.ca)

Human knowledge of the polar region is a unique blend of Western scientific knowledge and local and indigenous knowledge. It is increasingly recognized that to exclude Traditional Knowledge from repositories of polar data would both limit the value of such repositories and perpetuate colonial legacies of exclusion and exploitation. However, the inclusion of Traditional Knowledge within repositories that are conceived and designed for Western scientific knowledge raises its own unique challenges. There is increasing acceptance of the need to make these two knowledge systems interoperable but in addition to the technical challenge there are legal and ethical issues involved. These relate to ‘ownership’ or custodianship of the knowledge; obtaining appropriate consent to gather, use and incorporate this knowledge; being sensitive to potentially different norms regarding access to and sharing of some types of knowledge; and appropriate acknowledgement for data contributors. In some cases, respectful incorporation of Traditional Knowledge may challenge standard conceptions regarding the sharing of data, including through open data licensing. These issues have not been fully addressed in the existing literature on legal interoperability which does not adequately deal with Traditional Knowledge.

In this paper we identify legal and ethical norms regarding the use of Traditional Knowledge and explore their application in the particular context of polar data. Drawing upon our earlier work on cybercartography and Traditional Knowledge we identify the elements required in the development of a framework for the inclusion of Traditional Knowledge within data infrastructures.

Keywords: Traditional Knowledge; Intellectual Property Law; Copyright; Ethics; Data Management

Introduction

In the summer of 2014 one of Sir John Franklin’s two lost ships – the *Erebus* – was found by a team of scientists funded by the Canadian government and in command of a vessel loaded with sophisticated technology to aid in the exploration. The discovery received global media attention and ended over a century of speculation as to the location of the wreck. In the late summer of 2016 another discovery was made – the wreck of the *HMS Terror*, the second of the two Franklin ships – was found by explorers in a Nunavut bay.

While the quest for the lost Franklin ships must have seemed like the proverbial search for needles in a haystack, Inuit knowledge handed down through generations as part of an oral tradition supported the finding of the ships near their ultimate locations (CBC News, 2014; Davison, 2016) (**Figure 1**). Scientists were aware of these accounts, and used them to shape the parameters of their search. Parks Canada (2016) has recognized that the “essential role played by Inuit in the search for *HMS Erebus* and *HMS Terror* underscores the importance of Inuit knowledge that led to these amazing discoveries”. It has also been stated that the discovery ‘validated’ the Inuit Traditional Knowledge (Allen 2014).

The finding of the *Erebus* and the *Terror* is just one illustration of a point of intersection between science and technology-based Western knowledge of the Polar Regions and the Traditional Knowledge (TK) of the

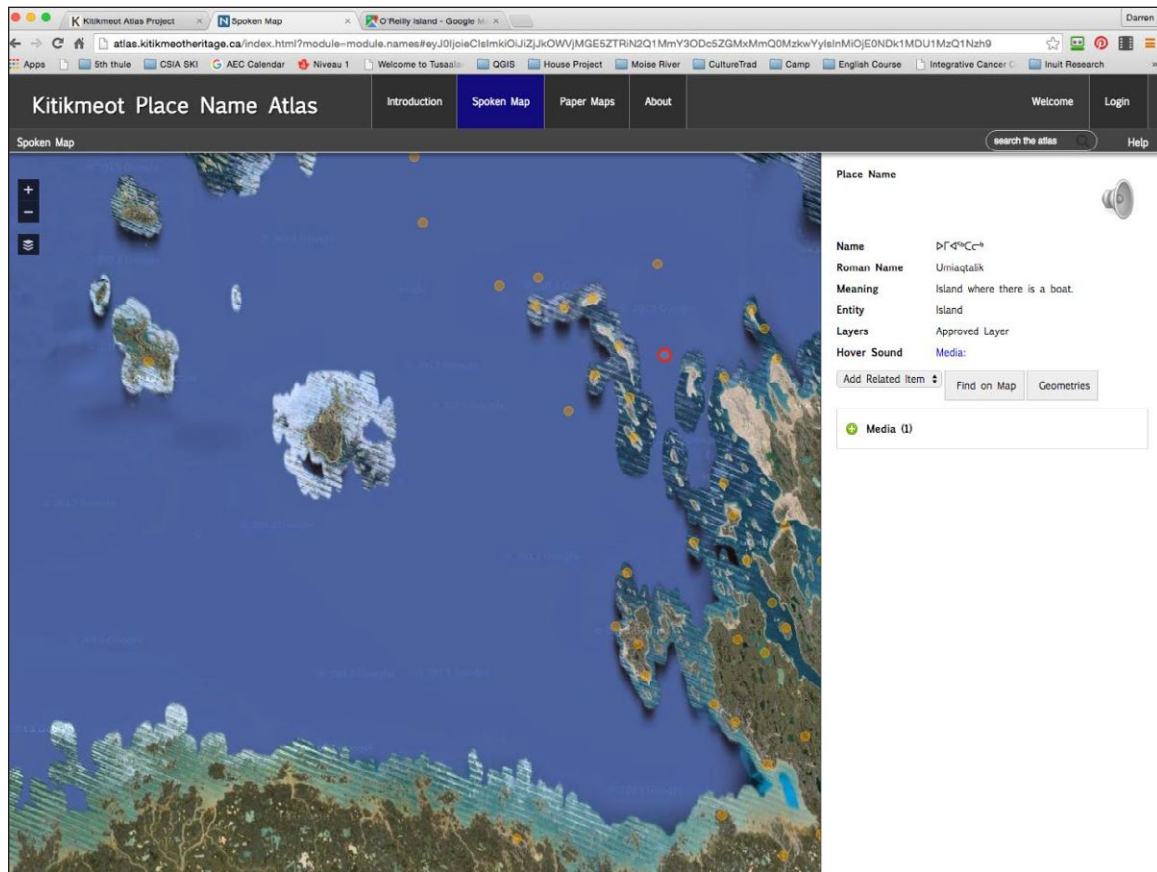


Figure 1: Kitikmeot Place Names Atlas (<http://www.kitikmeotheritage.ca/research-cultural-programs/kitikmeot-atlas-project/>) featuring 'the island where there is a boat'. Reproduced with permission of the Kitikmeot Heritage Society and the Geomatics and Cartographic Research Centre of Carleton University.

people indigenous to these regions. There are many other points of intersection; Northern peoples hold detailed knowledge of climate, geography, flora and fauna, as well as many other northern phenomena. It is fair to say that what is known about the polar region is a unique blend of Western scientific knowledge and local and indigenous knowledge. As the international community moves towards the development of repositories of polar data, it is increasingly important to incorporate TK into these repositories, and to do so in ways that are respectful of the form, substance and norms that operate within these knowledge systems.

This paper begins by defining TK and by explaining why its inclusion in polar data repositories is important. We next consider how Western knowledge frameworks and normative infrastructures shape the processing, collecting and sharing of information. We explain how these knowledge frameworks pose challenges for the incorporation of TK into data repositories. While the digital nature of such repositories presents opportunities, it also poses its own particular challenges. Existing approaches to the issues of "legal interoperability" do not deal adequately with TK. Using the Canadian Polar Data Network as an illustration, we then lay out some ideas for developing an inclusive and respectful approach to incorporating Traditional Knowledge. We identify tools and strategies that can be used in reaching this objective.

Defining Traditional Knowledge

The term 'Traditional Knowledge' refers to the knowledge developed within a particular category of knowledge systems. Traditional Knowledge or TK is generated by different peoples, groups and communities around the world (Dutfield 2001). In general terms, TK systems reflect 'a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment'. (Berkes 1993: 3)

Traditional Knowledge is the product of a knowledge system, and as such must be understood not simply in terms of discrete pieces of knowledge, but rather in terms of the ways in which such knowledge is created, interpreted and disseminated (Barsh 1999; Dutfield 2001; Scassa, Lauriault & Taylor 2014). Canada's

Royal Commission on Aboriginal Peoples (1996 at 33) described distinctive characteristics of the Aboriginal knowledge system in these terms:

[Aboriginal tradition is not] usually human-centred in the same way as the western scientific tradition, for it does not assume that human beings are anything more than one – and not necessarily the most important – element of the natural order of the universe. Moreover, the Aboriginal historical tradition is an oral one, involving legends, stories and accounts handed down through the generations in oral form. It is less focused on establishing objective truth and assumes that the teller of the story is so much a part of the event being described that it would be arrogant to presume to classify or categorize the event exactly or for all time.

Oguamanam (2011: 46) offers a broad and inclusive description of TK that emphasizes not only the diversity of content which comprises TK, but also its integration within distinctive knowledge systems. He describes TK as:

an aspect of ecological management and environmental stewardship, sustainable development, economic empowerment, self-determination, human rights, property rights, culture, arts, craft, music, songs, dance and diverse creative repertoire; religion, lifestyle and innumerable aspects of social processes that undergird a people's overall worldview.

Traditional Knowledge has been the subject of attention in international law, and is addressed in a number of international law instruments. For example, the UN *Convention on Biological Diversity* (2012) recognizes the diversity of TK, which includes: 'stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds'. Article 3 of the World Intellectual Property Organization's revised objectives and principles on the protection of TK specifically acknowledge 'the dynamic and evolving nature of TK and the nature of TK systems as frameworks of ongoing innovation' (WIPO 2005).

Traditional Knowledge is diverse and multi-faceted. It is knowledge that is developed and sustained within knowledge systems that may be profoundly different from the Western knowledge system in terms of methodologies for the creation and validation of such information as well as the modes of recording, transmitting, sharing and using such knowledge (Howell & Ripley 2009). The challenges to including TK in polar data repositories therefore go beyond simply indexing and cataloguing this information. Approaches to TK in knowledge repositories must be careful not to erase the 'cultural logics' (Christen 2012: 2875) of that information. These 'cultural logics' may include principles of obligation and reciprocity with respect to the sharing of knowledge (Christen 2012). In this regard, the digital nature of the information stored in such repositories adds particular dimensions (Anderson 2010; Christen 2012; Nicholas 2014). As Coombe and Aylwin (2014: 202) note, it is essential to be aware of "the power relations at work in digital environments that enable old inequities to be perpetuated in new ways".

The Canadian Polar Data Network

The challenges of including TK in polar data repositories are perhaps best illustrated by using a concrete example. We have chosen the Canadian Polar Data Network (CPDN) as an example of a polar data repository, and one that is sensitive to the challenges presented by the incorporation of TK. The Canadian Polar Data Network is a network of organizations with the common purpose of providing access to Canadian scientific polar data. Our particular focus is on the framework in place for contributing data to the repository and for accessing and using such data. Established by a network of institutions and government departments, the goal of the CPDN is to provide for the 'preservation of and access to multi-sector, multi-discipline polar data' (CPDN Principles). The CPDN hosts 'data resulting from or related to Canadian research and monitoring activities'. (Canadian Polar Data Network, 2012) To achieve its goals the CPDN provides not only the physical infrastructure needed to host the data but also additional infrastructure in the form of standards for interoperability and meta data, as well as best practices for life-cycle management and data sharing. The data catalogues are publicly accessible, subject to agreement with the terms of use for the site. The CPDN also addresses intellectual property (IP) issues, and has an express objective 'to protect sensitive data and traditional knowledge'. (CPDN Principles)

Because the CPDN hosts data from diverse sources, it requires those who contribute data to the repository to enter into a Data Deposit Agreement (CPDN 2012) that addresses the terms and conditions of any deposit.

It is worth noting that while the agreement is intended to define the terms of the relationship between contributor and host, there is room for negotiation to vary any key terms. This flexibility is an important feature of the agreement.

A key element of the Data Deposit Agreement (2012) is the management of IP rights. The Agreement expressly states that it ‘honours all applicable IP rights inherent to the original data’. No transfer of rights is required in exchange for the CPDN services. Instead of a transfer of rights, the depositor provides a non-exclusive license to the CPDN to preserve the deposited data and to make it available under certain terms and conditions.

The default position for the dissemination of any data hosted by the CPDN is open access. This means that unless otherwise specified, the data and research materials will be made available under an open license with minimal restrictions. A depositor may stipulate different terms and conditions for dissemination of its data; in such cases, the depositor must provide an alternate license agreement. Any such license agreement must comply with the Operating Principles of the CPDN. The Data Deposit Agreement (2012) contains an Appendix with examples of acceptable alternate license terms. Acceptable variations to the default open license terms include imposing restrictions on the users to whom data will be disseminated (for example, limiting dissemination to a particular community of users such as, for example, university students); imposing restrictions on permitted uses (for example, limiting use only to instructional purposes); and imposing special conditions on use (such as limitations on secondary uses, restrictions on linking data, and so on). As will be seen in the discussion below, it is this flexibility with respect to variations in license terms that carves out space for the development of TK-specific licensing within the CPDN.

Including Traditional Knowledge in Repositories of Polar Data

The inclusion of TK in repositories of polar data is supported on two broad bases. The first is that Northern peoples are custodians of a rich trove of knowledge that is specific to the polar region, that is complex (integrating scientific, social and cultural knowledge), and that is of both historical and contemporary relevance. To exclude this knowledge and to focus instead on Western scientific knowledge would be to ignore a crucial information resource. Excluding TK from repositories of polar data would also perpetuate colonial legacies of oppression through an implicit judgment that such knowledge is either unimportant or of inferior quality.

The inclusion of TK within polar data repositories can be achieved in two broad ways, which are not mutually exclusive. Traditional Knowledge can be extracted and incorporated into the frames of Western scientific knowledge or it can be included using methodologies that attempt to reproduce both its form and its substance. The former category, which reflects long-standing practice, may involve the gathering of TK by researchers using interviews; the results of these interviews may be analyzed and explored in scholarly publications using accepted theoretical and methodological approaches. In many instances the research questions are framed by researchers from outside the TK community and may be shaped or influenced by priorities that are external to these communities. Using these approaches, TK becomes embedded within the Western knowledge system. It is an object of analysis and can be reduced to data. In our view this approach has many shortcomings as it rarely effectively captures the essential elements of TK, especially the underlying ontology as will be discussed later in this paper.

In the second category, information may also be recorded using a variety of techniques, but the recordings are themselves the knowledge output. One example of this approach is the production of community driven cybercartographic atlases such as the cybercartographic Atlas of Arctic Bay (<http://gcr.Carleton.ca>; Taylor et al. 2014). These Atlases are produced using the Nunaliit Cybercartographic Atlas Framework (Hayes et al. 2014). Nunaliit means “community” in Inuktitut and is a document-oriented framework built on Couch DB. It is designed for ease of use by non-experts and the community of Arctic Bay used it to help create the Atlas. The Atlas content is driven by the community and in the case of Arctic Bay includes some unusual features such as a rap video entitled “Don’t Call Me Eskimo” performed by the youth of the community whose music and lyrics capture many of the social and economic issues facing the community. The Atlases are multimedia and story-telling is central to their structure and content, making them ideal platforms for Inuit Traditional Knowledge, especially as they use sound and video. The word ‘Atlas’ is a metaphor for all kinds of qualitative and quantitative information linked by location. The Atlases are designed with Northern conditions in mind, such as limited bandwidth, and are facilitated through the building of a distributed data network with servers in each community. In addition to the Arctic Bay Atlas a number of community-based atlases have been produced including the Inuit Siku Sea Ice Atlas (Ljubicic et al. 2014), the Kititmeot Place Names Atlas

(Keith et al. 2014), the Views From the North Atlas (Payne et al.), the Gwich'in Atlas (Aporta et al. 2014), and a number of others are in production (<http://gcr.ca/atlas>). In many instances the communities provide the financial resources required to produce the atlases, which is very much a “bottom up” process. These Atlases capture the TK in both form and substance. Further, the decisions as to what information to gather, from whom and for what purposes is part of a process that is either entirely directed by the TK community or developed in close consultation with them. The community “owns” the data in the atlases. In addition to effectively portraying TK, some of the atlases, such as the Sea Ice Atlas for example, (<http://sikatlas.ca>) also incorporate Western scientific knowledge, and combine this with TK of sea ice in innovative ways. The atlases are not currently included in the Polar Data Catalogue repository as they cannot be adequately ingested.

The challenges to the incorporation of TK of the first kind have long been the domain of ethics review boards, as the gathering of TK has typically involved interviews with human subjects. In 2010 the Canadian Tri-Council of granting agencies released a revised ethics policy that specifically gave more explicit attention to research involving indigenous communities. (TCPS 2 2010) Considerable input into this document was contributed by Inuit and First Nations communities (Felt & Natcher 2011; Nickels & Knotsch 2011). Other initiatives, such as the Guide for Researchers prepared by the Inuit Tapiriit Kanatami and the Nunavut Research Institute (2007) and the First Nations-led Ownership, Control, Access and Possession (OCAP) (National Aboriginal Health Organization 2007) have sought to provide a normative framework that goes beyond the particular human subject to address community-based issues and research relationships. Protocols of this kind play an important role in relationship-building (Anderson 2010; Bannister 2009; Felt & Natcher 2011; Lyons 2011). With respect to the incorporation of TK of the second kind, these same challenges are combined with issues of how to incorporate the knowledge in ways that preserve its integrity, acknowledge its different epistemological framework, provide appropriate attribution, and respect community norms with respect to sharing and communication. They must also do so within the context of a digital repository – something that may require its own particular considerations (Nicholas 2014).

Knowledge Frameworks and Normative Infrastructure

The inclusion of TK within repositories that are conceived and designed for Western scientific knowledge raises unique challenges. Knowledge systems operate on assumptions and principles that are often implicit to those who participate within that system (Anderson 2010). Knowledge and information frameworks shape how information is gathered, categorized, evaluated, verified, recorded and used (Coombe 1997).

A key element of contemporary knowledge frameworks relates to concepts of ‘ownership’ – particularly of IP. This is evident, for example, in the Data Deposit Agreement of the CPDN, discussed earlier, which “honours all applicable intellectual property rights inherent to the original data” (Data Deposit Agreement 2012). Attention to IP rights is important since these rights shape what uses can be made of the works to which they pertain. For example, the approach taken in the Data Deposit Agreement, which leaves IP rights with the depositor but requires the depositor to provide the CPDN with a non-exclusive licence over the material, is consistent with the goals of preserving data and of making them widely available. At the same time, it respects the rights of the “owners” of the data. Yet the approach is one shaped by the Western IP framework from which the Agreement emerges. As will be discussed below, this framework is one that does not adequately account for TK.

In Western systems of thought, ownership is associated with property – whether tangible or intangible – and is often said to be composed of a ‘bundle of rights’ that permits the owner to exercise a certain degree of control over the property (Ziff 2010:2). Control over expressions of knowledge is generally achieved through IP systems and the ownership of IP rights has become a key factor in the ability to commercialize research output, to publish it, and to receive acknowledgement as the author or inventor of particular knowledge outputs (Scassa & Chung 2015). Of course, Western legal systems do not permit the ownership of knowledge *per se*; IP regimes protect concrete expressions or applications of knowledge. Facts and ideas are considered to be part of the public domain; what can be ‘owned’ are original expressions of knowledge, or output in the form of inventions (Scassa & Chung 2015; Vaver 2011; WIPO 2010).

Although facts themselves are not capable of ownership on an individual level, the concept of ‘ownership’ is still used in relation to data. This is perhaps because original *compilations* of data can be protected under copyright, and such compilations are also eligible for protection in European countries under a database right (Vaver 2011). In addition, data that is kept confidential may be protected as ‘confidential information’.

These ownership rights associated with collections of data superimpose a Western property law paradigm on much of the field of information management.

The Western IP paradigm has some key features that may be at odds with traditional systems of knowledge. Some of the points of conflict may be quite fundamental (Seeger 1997; Young-Ing 2008). For example, applying a private property model in the context of knowledge and cultural expression reflects a very particular world view. Intellectual property laws also have explicitly economic dimensions that facilitate the commercialization of IP.

The controversy over a UK fashion designer's copying of the design of an Inuit Shaman's jacket illustrates the challenges that can arise for the protection of TK and cultural property within a Western IP regime. Although the example deals with a cultural artefact rather than TK, many of the issues raised are relevant in both contexts (Anderson 2010). According to the great-granddaughter of the Shaman, the design for the jacket came to her great-grandfather in a dream. The jacket was photographed for a book titled *Northern Voices: Inuit Writing in English* and was also displayed in the film *The Journals of Knud Rasmussen* (Zerehi 2015). Although these earlier uses were authorized, they placed the jacket and its design into public view. The artistic design of the jacket was in all likelihood a work in which copyright would have been found to subsist. However, copyright protection would have expired 50 years after the death of its creator. Copyright law would make no allowance for the sacred nature of the design as communicated through a dream. Nor would it recognize communal claims to rights or interest in the design (Howell & Ripley 2009; Young-Ing 2008). In Western IP terms, the design would be in the public domain, and its reuse would not violate copyright or any other IP laws.

One of the issues raised by the example of the Shaman's jacket is the tendency to locate IP rights with specific individual authors (Young-Ing 2008). The notion of the individual author laboring on his or her own to create works is considered to be part of the Western romantic ideal of authorship. It is also closely linked to particular philosophical justifications for the protection of IP. John Locke's labour theory justified IP rights as a form of reward or recompense for the diligent labour of the author in creating the work (Craig 2002). In continental Europe, Kant and Hegel are seen as the sources of the 'personhood' justification of IP law. According to this theory, works are an expression of an author's personality, such that the protection of works through IP law are important to human flourishing (Radin 1993). These justificatory theories of IP rely upon and place the author in a central position. Of course, on a more pragmatic note, it should not be forgotten that the identification of specific authors/owners of works, including compilations of data also facilitates the commercial (and other) exploitation of these works by locating rights to control and exploit these works with a readily ascertainable owner and/or author. The law also creates a hierarchical and economics-oriented framework for understanding the location of rights in employment (work-for-hire) relationships (with the employer holding rights in works created by employees by default) (Scassa & Chung, 2015).

The link between the individual author and the protected work in copyright law is also important in setting the term of protection for the work. Thus, again to use the example of the Inuit Shaman's jacket, the term of protection available under copyright law would be tied to the life of the author of the work plus an additional 50 years in Canada. The term of protection allows the author to profit from the exploitation of their work during their lifetime and allows their heirs to also profit for a limited period of time. It does not address or accommodate the situation of works that cannot be attributed to specific authors, nor does it address works that have sacred or spiritual meaning (Howell & Ripley 2009; Young-Ing 2008).

While Western notions of IP can be used to protect the creative output of indigenous artists and authors (for example by providing copyright protection for literary, artistic, musical or dramatic works authored by those individuals), it is not well adapted to protect TK. This may be because, for example, it is generally not possible to identify a particular author or authors. In fact, it is often the case that 'protection' takes on a different meaning in the context of TK. While protection may have a commercial dimension – that is, the right to benefit from the intellectual/creative output of a community – there may be other goals as well (Bell & Shier 2011). For example, rather than seeking to protect TK to enable its commercial exploitation, the objective might be to protect TK from appropriation and exploitation by others, or from inappropriate and unacceptable uses. Such uses might include sharing sacred information with individuals outside the circle of those permitted access to the knowledge, or they might include using TK about plant or animal resources in ways that lead to exploitation of these resources without the community's input or consent.

Of particular concern to some communities is an inappropriate portrayal of community activities by outside observers.

Because principles of copyright authorship may determine the author of a work to be the one who reduced it to a protected form of expression (such as a book or a film), copyright principles might also facilitate the appropriation of TK by giving exclusive rights over works that incorporate the TK to those from outside the indigenous community (Anderson 2010; Bell & Schier 2011; Seeger 1997). An example of this might be a researcher acquiring copyright in a compilation of songs or stories that have been shared with her by an indigenous community.

Another feature of Western IP systems that poses a challenge in the context of TK is copyright's fixation requirement (Howell & Ripley 2009). In copyright law, it is the author's expression that attracts IP protection, and typically that expression must be 'fixed' in some material form in order for rights to be recognized. The element of fixation relates to the perspective that it is fixation that completes the act of authorship (a work that has yet to be 'fixed' is more akin to an unprotectable idea). It also serves an evidentiary purpose. Thus fixation makes it possible to measure one work against another to assess whether there has been any infringement. In such a system, oral expression does not rise to the level of a 'work' unless it too has been fixed (for example, in an audio or video recording or in a written transcription). Interestingly enough, in the cases of fixations of oral works, it is the person who performs the act of fixation who is typically recognized as the rights holder (Bell & Schier 2011). These principles may work well in societies that privilege written records and documentation; they are ill-suited to oral societies. In fact, they make it easier to appropriate TK within oral societies by according rights to those whose efforts result in the fixation of any expression. The researcher who videotapes sacred dances, or who records and transcribes stories or oral history will acquire IP rights in the 'works' that result for the recording and transcription (Anderson 2010; Bell & Schier 2011).

Copyright law also draws a distinction between 'facts' and 'ideas' (which are in the public domain – making them the property of no one and free for common use) and 'works' (which are expressions of facts and ideas by human authors). It is the author who takes facts or ideas and renders them concrete in some form of expression, thus giving rise to IP rights. This notion does not translate well in the context of TK, as the knowledge is treated as lacking status as 'property' until it is captured and fixed in some way. From an IP point of view, oral knowledge is simply that – and it lies in the public domain. Recorded knowledge is expressed within a proprietary work. As noted above, it is the person who captures or expresses this knowledge that is most likely to be the rights holder within Western IP frameworks (CIPPIC 2016).

The public domain is also considered to be a key feature of IP regimes. That which is either not protectable by IP laws (ideas, facts, discoveries, and so on) as well as that which is no longer protected by IP law because its term of protection has expired, is said to be in the public domain. The existence of an expansive public domain is seen as a virtue since public domain materials can be used by anyone as a resource to draw upon in the creation of new works or innovations (Hyde 2010). However, the public domain can pose real challenges for the protection of TK, precisely because 'facts', 'ideas' and unfixed (oral) expression are considered to be part of this public domain (Anderson 2010, CIPPIC 2016). Furthermore, materials originally protected by copyright law and in which the term of protection has expired fall into the public domain. Thus, in the example of the Inuit Shaman's jacket, the design is one which would have been protected by copyright law, but 50 years after the death of its author it would fall into the public domain – notwithstanding the fact that the design might have enduring sacred properties within Inuit culture. Coombe and Aylwin (2014: 204) observe that 'the assumption that there is or should be a singular or unitary public domain of cultural material does not acknowledge the interests of ethnic minorities and Indigenous peoples and their distinctive heritage'.

The WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (2010: 2) has observed that 'the "public domain" operates to exclude TK and TCEs [traditional cultural expressions] from protection and can be used to justify their misappropriation'. The Committee notes that while TK and TCEs are often shared within communities and thus may appear to be public domain material, the sharing is carried out in accordance with communal norms that may impose restrictions and conditions. They observe (at 2) that: 'Some knowledge is considered secret, sacred, and an inalienable part of indigenous cultural heritage from time immemorial to time unending'. In the digital context, the concept of the public domain becomes even more problematic, largely because digitized works – or TK itself – once digitized can be so easily and widely copied and disseminated. Christen (2012: 2877) offers a critique of conceptions of the public domain that are rooted in individualist American discourses, and

argues for a need to understand 'the ethics of information circulation, both within the digital realm and in a post-colonial world order where we cannot so neatly carve out the digital from the political and the historical'.

An Inclusive Data Repository

Intellectual property law – particularly copyright law – shapes relationships between individuals, institutions and governments in the development, structuring and use of information repositories (Bell & Schier 2011; Scassa & Chung 2015). It is almost inevitable then that the assumptions and attitudes towards knowledge and its expression that inform IP law also inform, often in implicit ways, how knowledge repositories are structured and operated. If TK is to be incorporated within these repositories, implicit assumptions must be made explicit, and must be examined and adjusted to create an environment that is respectful and inclusive not just of the knowledge, but of the cultures that produce, care for, and rely upon this knowledge.

For knowledge repositories seeking, for example, to create databases of scientific studies, compilations of data, journal articles and so on, the author/ownership model described above offers a certain convenience, as the inclusion of content can be achieved by clearing the necessary rights with the copyright owner. The growing movement towards open access publishing (where published articles are licensed under terms that place few if any restrictions on their reuse) and open science, where public access to data sets compiled through publicly funded research is also required, can also facilitate the process of clearing rights to content within the repository. Even where there are proprietary restrictions on certain uses of materials, these can be ascertained through communications with the rights-holder, facilitating the management of access. The IP regime provides not only a set of default rules regarding ownership and control of works; it also provides a framework that supports the licensing and management of those rights. The challenges for repositories seeking to incorporate TK are first, to ensure that the default IP rules do not inadvertently 'expropriate' TK and second, to develop a framework to support the licensing of works that incorporate TK that is consistent with the expectations and aspirations of the communities which have contributed it.

A license is essentially a type of contractual agreement. The term 'license' is used when the terms of the contract relate to access to and/or use of some form of tangible or intangible property. Licenses are frequently used in relation to IP rights; the license sets out the terms and conditions under which access to and/or use of certain IP is provided. The license is enforceable as a contract; however, it is given extra weight by the underlying IP rights since failure to comply with license terms can also result in a violation of the IP rights. The CPDN already uses licenses with respect to both contributions of data to the CPDN and uses of these materials by other researchers and the public. Licenses do not work in the same way for material that is considered to be in the public domain. Because so-called public domain materials are not protected by IP rights, the 'license' is merely a contract; there is no other underlying legal regime that provides rights to control how the materials are used or by whom.

The very nature of internet-based access to content has led to the ubiquity of licenses governing public access to and use of online digital content. Because of the potential for uncertainty and variability of license terms to operate as a barrier to the easy dissemination and reuse of much content, template open licenses have become an important resource to aid in providing straightforward, accessible and interoperable licensing terms. Perhaps the most common suite of open licenses is that produced by Creative Commons. This suite offers licenses that range from ones with virtually no restrictions on reuse to ones that place restrictions such as requirements of attribution or limits on commercial re-use. Other open license templates have been developed for data (Open Database Licence v1.0) as well as for government data (Canada Open Government Licence v2.0, UK Open Government Licence v.2). These licenses are for use in relation to copyright protected materials, or, in the case to the ODL, materials that are protected either by copyright or by a database right (in the EU).

The movement towards open licensing of copyright protected works such as software, journal articles, books, and compilations of data is premised upon laudable goals to liberate such materials from many if not most of the restrictions inherent in copyright law so as to facilitate its reuse and broad dissemination. In this sense, open licensing creates a quasi-public domain. The licensed works are still protected by copyright, and copyright law may be invoked both as a justification for licensing and as a means to enforce license terms such as those requiring attribution or those barring commercial re-use of the materials. However, subject to the relatively few restrictions imposed in open licenses, the licensed works may be freely reused and disseminated. Governments have embraced open licensing as means of supporting their open data and open government agendas, and granting agencies are increasingly insisting upon the open dissemination

of research results (Government of Canada 2015). While these developments support broad public access to data and research materials, and relatively few restrictions on reuse, conventional open licensing may also pose challenges for the ethical reuse of TK (Coombe & Aylwin 2014; Christen 2012) particularly because it tends to be premised on free and unrestricted use.

However, licensing still offers opportunities to address the protection of TK in data repositories. What is required is some underlying proprietary right or interest that can backstop the licence terms. The concept of a 'TK Commons' is beginning to emerge (Coombe & Aylwin 2014; WIPO 2010), and it positions TK not as public domain material, but rather as communally-owned materials, the access to which can be governed by particular terms and conditions which are based upon customary legal principles. Within such a commons, licensing would be the means by which those terms and conditions are expressed. A number of projects which explore the licensing of TK and of indigenous cultural artefacts are already in the process of development. One example is the Mukurtu content management system for digital archives (Christen 2012) which offers, among other things, template TK licences. Christen (2012: 2883) explains that projects such as Mukurtu offer both the 'technological framework and the ideological structure' for managing indigenous cultural material. She observes that the development of Mukurtu 'emphasized the underlying sociality of information and its reliance on, and embeddedness within, ethical systems of relation and action in which people negotiate the creation, reproduction and distribution of knowledge based on multiple and interrelated factors and situations'. (Christen 2012: 2887)

Similar to the kinds of terms and conditions seen in Creative Commons or other types of open licenses, TK licenses might preclude commercial reuse, or require a particular form of attribution. Unlike Creative Commons type licenses, TK licenses would be shaped by the centrality of social relations and obligations as part of the customary law governing TK (Nicholas 2014). TK licenses might restrict use to particular groups or categories of users (determined by customary law), or might permit only certain types of reuse. In this respect, they may be quite different in character from conventional IP licenses such as Creative Commons, most notably because they might reflect principles of indigenous customary law that do not map neatly onto Western legal concepts (Coombe 1997; Coombe & Aylwin 2014; Nicholas 2014).

To again return to the example of the Shaman's jacket, it may be that the reproduction of the design in photographs or in film for particular purposes and with permission is not a problem. There may be a wide range of other contexts in which the copying of the design is considered acceptable. It is the commercial use, without consultation or consent that is at the core of the problem in this case. Licensing provides a framework within which notice to claims can be provided and terms and conditions for access or reuse can be set. While a Creative Commons licence would be premised upon the subsistence of an underlying copyright (which would not be the case with the design on the Shaman's jacket which had fallen into the public domain), a TK licence would be premised upon a proprietary claim based upon indigenous legal principles.

As noted earlier, TK may be collected by researchers from outside the particular indigenous community and incorporated into Western style reports, studies, publications, or compilations of data. Alternatively, it may be collected and recorded with the participation of the knowledge-holding communities, in formats that are more consistent with oral knowledge, and may be presented, stored and controlled according to the norms of that community. In either case licensing may be relevant. In the first case, it may be used by TK communities to establish the terms and conditions on which their knowledge is shared with researchers, and those terms and conditions may be prescribed as a mandatory part of any license associated with the downstream use or dissemination of the research outputs. In the second case, licensing may be part of the terms and conditions for access to and use of the data, information or other content that is part of the digital or other resource.

The CPDN currently sets open licensing as its default, but allows for alternative license agreements. The framework is sufficiently flexible so as to allow for the use of a license that incorporates terms and conditions specifically relating to TK (CIPPIC 2016). What is needed is some form of template license or suite of licenses that can be used in relation to TK. In the next section of this paper we sketch out how such a license might evolve and what it might look like.

The TK License

As Young-Ing (2008: 63) argues, 'Indigenous jurisprudence and law (Customary Law) should protect Indigenous knowledge'. A TK license would not only reflect principles of Indigenous information law, these principles would provide a normative foundation for the terms and conditions. Although there may be issues regarding the enforceability of such licences, including the courts' willingness to give effect to the

underlying norms, this does not mean that there is no value in articulating these norms. Further, the growing recognition of the importance of TK may help create a legal environment that is favourable to the interpretation and enforcement of such terms. And, as Young-Ing (2008) notes, the assertion of Indigenous customary principles can lead to consensual conciliation.

Any attempt to develop TK licensing in the context of polar data repositories should take into account the likely need for two distinct categories of license. The first would be a license as between TK holders and researchers that would govern the collection and use of TK. Such licenses would need to be developed in close collaboration with Inuit communities in the North. Much work has already been done in different contexts regarding the norms and principles that should govern the collection of TK from indigenous communities. These have been expressed in the form of research protocols of a kind which Anderson (2010) describes as part of the 'toolkit' needed to address the protection and licensing of TK. The principles of ownership, control, access and possession (OCAP), for example, have been articulated so as to provide guidance in this process (NAHO 2007). In Nunavut, the *Scientists Act* specifically provides for a review of all research projects to ensure, among other things, that the NRI's principles guiding research in Northern communities are complied with (ITK & NRI 2006). These principles for ethical collection and reuse of TK offer a good departure point for shaping the terms and conditions under which the sharing of TK will take place (Bannister 2009; Bell & Schier 2011; Felt & Natcher 2011; Lysons 2011). Template licenses might offer a menu of limitations on the use of TK from which the limitations appropriate to the particular context may be chosen. These might include limitations on who can access the information, the purposes for which it may be used, circumstances in which fresh consent to use must be obtained, from whom consent is to be obtained, and so on (CIPPIC 2016).

The second category of license would be an end-user license, similar in kind (though not in content) to a Creative Commons license. The end user license governs how downstream users of content made publicly available are entitled to access and use the work. Creative Commons licenses apply in relation to copyright protected works. As noted above, there is an underlying property right and non-compliance with the terms of the license will result in infringement of that right. A TK license is on less solid legal footing. The lack of formal protection for TK as intangible property means that the license is simply a contract between parties. While failure to comply with the terms may amount to a breach of contract it is not also at the same time a violation of IP rights. Nicholas (2014) argues that the legal basis of such licenses is in indigenous customary law, although the extent to which courts will recognize these principles is still uncertain (Bell & Schier 2011). Nevertheless, such licenses still have some legal and normative force. They are a vehicle through which notice can be given of interests in TK, and they are a means of identifying expectations regarding how that TK is to be used (CIPPIC 2016).

As with the license between researchers and TK sources, a template TK end-user license would need to be developed in collaboration with TK communities. Because of the variable nature of TK and the complexity of the customary laws that may shape access to and use of it, rather than a suite of licenses with varying degrees of permitted uses, it might be more appropriate to develop a menu of potential terms or restrictions that TK holders can opt to include or exclude from the license (CIPPIC 2016). In a recent report on TK licensing, the Canadian Internet Policy and Public Interest Clinic (CIPPIC) (2016) suggests that terms might include requirements of attribution (as well as form of attribution), requirements to seek consent before reuse (along with information about where consent requests should be directed), or restrictions on reuse to certain contexts (educational use or non-commercial use, for example). In addition, as the CPDN Appendix on Alternate Dissemination Licence Agreements makes clear, there may be circumstances in which the end-user license might be restricted only to certain categories of users.

Conclusion

We have argued that polar data repositories should seek to incorporate Inuit TK and to do so in a way that is respectful of customary laws and norms that govern the use and dissemination of this information. The CPDN has adopted a structure that is flexible enough to incorporate information on non-standard license terms. This opens the possibility to address the use of TK through licensing practices that are specifically developed for TK. Because of the broad range of TK and the potential complexity of the customary laws that may govern its use and dissemination, template licenses – with the possibility to select from menus of terms and conditions – may offer a solution that is sufficiently flexible for the licensing of TK. It is also a solution that reduces the legal complexity, making such approaches more user-friendly.

While template licensing for TK may offer a solution in principle, bringing this approach into practice will require a great deal of additional work. In particular, TK holders will need to be involved in the development

of the menu of terms and conditions and in shaping the normative framework for the licenses. The particular realities of the digital environment, combined with the challenges of digital capacity and digital literacy in Northern communities will also need to be addressed (Christen 2012). While much work is required, there are already resources to draw upon, from research protocols developed in consultation with Inuit and First Nations communities, to terms of use for digital atlases developed in conjunction with Inuit and Northern communities. An ultimate aim is to enable Northern communities to create and house their own atlases and progress has been made in this respect. This would help ensure that the TK included in such atlases was under the control of the communities concerned. Initiatives, such as Mukurtu, although developed for other purposes and in different indigenous contexts, still offer valuable lessons on how to bring such projects to fruition.

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Competing Interests

The authors have no competing interests to declare.

Author Information

Teresa Scassa is the Canada Research Chair in Information Law at the University of Ottawa, where she is also a professor at the Faculty of Law. She is the author or co-author of several books, including *Canadian Trademark Law* (2d edition, LexisNexis 2015), *Canadian Intellectual Property Law* (Emond 2013), and *Electronic Commerce and Internet Law in Canada*, (CCH Canadian Ltd. 2012). She is a member of the Geomatics and Cartographic Research Centre at Carleton University, and has written widely in the areas of intellectual property law, law and technology, and privacy. In particular, she has written about the intersection of law and digital cartography, volunteered geographic information, and citizen science.

Dr. Fraser Taylor is Chancellors Distinguished Research Professor of International Affairs, Geography and Environmental Studies at Carleton University. He has been involved in geospatial information management for many years. He organized and chaired the initial session at IPY GeoNorth North in Yellowknife in 2007 which led to the establishment of the Arctic Spatial Data Infrastructure and chaired the External Advisory Committee to this initiative. From 2002 to 2013 he chaired the International Steering Committee for Global Mapping. He is a member of the UN Expert group on Global Geospatial Information Management and is a member of the Open Geospatial Consortium (OGC) Global Advisory Council, the Global Earth Observation System or Systems (GEOSS) Data Sharing Working Group and the CODATA Working Group on Data at Risk. He has a special interest in Traditional Knowledge especially in the Arctic and has created a number of cybercartographic atlases in cooperation with northern communities and organizations. His latest book is *Developments in the Theory and Practice of Cybercartography: Applications and Indigenous Mapping* (Elsevier 2014). This won the Prose Award by the Association of American Publishers, 2015.

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