Review of Mukurtu Content Management System

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1. INTRODUCTION. The Mukurtu Content Management System (CMS) is an Internet-based platform designed to enable archiving of digital cultural resources. The platform is compatible with a range of media, but its functionality is optimized for print media, like images and documents. The platform is built to enable implementation of flexible, culturally-based access and use controls, or protocol. The fine-grained protocol controls in Mukurtu reflect an overall focus on culturally-compatible design targeted toward Indigenous community archive implementation. At least initially, individual language communities were expected to install and operate the Drupal 7-based, open source platform themselves. The rapid growth of cloud-based site hosting in the past three years has led Mukurtu to rethink its project scope and refocus its resources as a hosted service (p.c. March 20, 2014). Mukurtu will still make their CMS available for download and independent hosting, as initially planned, and the open source nature of the project can still benefit from collective programming and feature improvements. The new hosted service is called CoMunn[1] and is designed to target both individuals and communities interested in online management of personal or group media collections.

This review is mainly based on my experience using Mukurtu CMS within their hosted development server. Platform functionality on the development server does not provide full access to administrative customization, but most users will not notice any difference. Mukurtu has made the beta version of their CMS available to interested groups, prior to the first fully stable release version, which is expected in late 2014. Those using the beta version have largely done so using Mukurtu's development server, though there are several early partners who are already running their own installations. I have conducted this review of Mukurtu CMS in partnership with two Coast Salish communities interested in Internet-based language preservation and dissemination. I was also fortunate to interview Mukurtu Project Director and Washington State University Professor, Kim Christen, in early 2014.

Design features of Mukurtu CMS enable communities to control access to digital cultural resources like images, audio and video files while still adhering to cultural protocol governing dissemination. In many Indigenous communities, including the Coast Salish communities I work with, cultural protocol dictates appropriate sharing of cultural information such as songs, stories and names (Shepard in press; n.d.). Particularly in oral societies, knowledge was power and what you knew about place names, genealogy, resource rights, territory and spiritual powers were directly connected to status, wealth and influence (Suttles 1987; Miller 2007; Thom 2003). Many of these cultural traditions have continued relevance, even as language use and ideology change. In some communities protocol dictates that certain types of cultural information may only be appropriate for community elders, or only women, or only particular families. When these songs, stories and names become recorded, those people fluent in cultural protocol often lose ability to maintain appropriate use restrictions. I believe when platforms, and the archives they support, enable

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[1] CoMunn: http://www.comunn.net/mukurtu-mobile/

capacity to affirm cultural values like protocol, they facilitate processes of decolonization and Native self-determination (Viatori & Ushigua 2007; Christen 2012; Mawani 2012). According to Director Christen, "Mukurtu's heart and soul is protocol. Everything else radiates out from there" (p.c. March 20, 2014). Mukurtu CMS is designed around Indigenous community needs, so it is not a surprise that some of its design features are uniquely responsive to these populations.

2. THE PLATFORM. I primarily used Mukurtu CMS version 1.5 and to some extent Mukurtu Mobile version 1.0 between 2012-2014. The CMS is free for use and I recommend that interested groups begin testing once the 2.4 version becomes available in late 2014. I believe that the architecture of Mukurtu CMS exhibits design elements that can result in high levels of utilization by language communities, since some design features are directed toward increasing cultural compatibility of the platform. For example, Nathan (2010) finds that availability of protocol-based access controls in the Endangered Language Archive (ELAR)[2] sprovides language communities opportunity to articulate cultural values governing information dissemination. Increased control over cultural resources may result in greater use of an archive by language community members and preservation of content previously felt too sensitive for Internet-based archiving. The platform architecture of ELAR is built with the same Drupal 7 technology as Mukurtu CMS, however the Mukurtu platform significantly expands capacity for protocol control.

I find that capacity for dissemination and support of sovereignty are two salient objectives tribal communities have when considering the efficacy of a language archive (Shepard in press; n.d.). I believe that cultural resources, especially linguistic ones, are closely connected to identity, indigeneity, and political capacity for sovereignty (Sider 1993; Dombrowski 2004). If the language in question is endangered, the consequences of appropriate use and access are even greater (Dorian 2010). The Mukurtu platform is not specifically designed around pedagogical dissemination, but due to its open source architecture, additional features can be contributed to the platform. For example, the Pascal Sherman Indian School, has built an iPad application to connect language learners to content in the community's Mukurtu-based language archive (p.c. March 20, 2014). Students are able to see English and Salish word lists and view accompanying videos of elders speaking to enhance their learning. There is significant room to increase pedagogical dissemination capacity of language archives to increase educational efforts, in my opinion. In terms of sovereignty, I find that archives can support or infringe upon tribal sovereignty through the degree a language community can assert access and use controls over their intellectual property (Shepard in press; n.d.). Community-based archives are one response to language community interest in greater control of their resources.

Mukurtu is a product of a research relationship between Director Christen and the Warumungu Aboriginal community in Australia that began in 1995 (Christen 2008). By 2002, the Warumungu had identified thousands of resources in need of a comprehensive archive system that was capable of maintaining cultural protocol. Photographs represented the most significant type of media needing curation. Director Christen recounts, "I happened to be there and said 'I'm sure we can just buy some software.' This was 2002 and

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[2] ELAR: http://www.elar-archive.org/index.php

there really was nothing out there to meet their needs, so I got involved in the project to build this tool" (p.c. March 20, 2014). By 2007, Director Christen and her partners installed an archive in the Warumungu community and in 2010 the archive platform was made public as Mukurtu CMS. The initial platform design focused on meeting identified community needs like "variable user access, community-focused metadata and search categories, user-generated comments and tags, restricted content based on Warumungu protocols, and the ability to print, edit, and or remix content for their own use" (Christen 2008:21). The development team also recognized that ease of navigation and use was essential to ensure that community members with low levels of technological literacy could use the platform independently. According to Sun and Davison (2012),

> The project leaders recognized, from the outset, that archival work is value-laden and that information systems often have built-in assumptions about access and representation that can threaten the core goals of cultural heritage preservation work. Where communities' ability to represent themselves – via descriptions and images of artifacts, places, and people – become threatened, so do core human values of individual and collective sovereignty (8).

Development of Mukurtu has been a joint initiative of Director Christen and the Center for Digital Archeology[3], at the University of California Berkeley.

My experience with Mukurtu began in 2011 while I was looking for a language resource management tool to test with my tribal partners. Due to the cultural restrictions on knowledge sharing in the communities I work with, the site would need to enable protocol-based access restrictions. After an unsuccessful attempt to obtain funding and build such a platform myself, I found Mukurtu. I initially obtained free educational hosting on Dreamhost.com to install my instance of Mukurtu CMS. I was able to install the 0.7 version of Mukurtu in 2012 on my own, but quickly found that without a programmer or someone to help me with server maintenance, I was spending too much time with technical management. At the suggestion of the Mukurtu staff, they created a development server instance for my use. Mukurtu contracts with Pantheon[4] for their development server hosting and the new CoMunn project. The current version of Mukurtu is available for download via GitHub[5] and can be installed on a Drupal-compatible server or hosted service of your choice.

3. ACCESS. Access control in Mukurtu starts with the construction of community groups and their use parameters. Community is the largest category for controlling access in Mukurtu. Any combination of communities can be created on the site and their application is flexible. Depending on use, the community category could represent individual language groups if multiple languages are archived together. If the archive represents one language, you may only have one community. For my project, I created a community for each of the language groups I was partnering with, in addition to a few for testing. When setting up

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[3] Center for Digital Archeology: http://codifi.org/

[4] Pantheon is a large data management company specializing in hosting Drupal-based websites: https://www.getpantheon.com/

[5] GitHub is a website that enables download of program package files: https://github.com/

a community you must determine if resources attributed to that community are open to everyone or are restricted.

User-level permissions are the next way to control access. Users are linked to one or more communities and their access can be restricted to a particular group. Users can also have cultural protocol attached to their account for further control of access. Cultural protocol can be created to fit any community need, such as limiting access by gender, age, or family. When a user is linked to a cultural protocol, content with compatible protocol are available to them, those without are restricted. Individual content items in Mukurtu, like images and audio files, are termed "digital heritage." The protocol work quite effectively in my experience, but they should be well thought-out and tested. Changes to protocol settings can create cascading access changes throughout the archive.

The process of adding a piece of digital heritage brings the protocol choices into action (see Figure 1). There are two main protocol choices every time a piece of digital heritage is added. The first is determining what community the item will be attached to. In my project, I would upload an audio file and determine which of the two language communities to attribute the file to. If communities restrict access to only their members, then only a member of that community could contribute content. Administrators can add content to any community. Cultural protocol is the next choice when adding content. Here the user can select from any of the available protocol (e.g., women only) that have been created and apply one or more to the item. For example, if a song or story is only appropriate for elders in the community, then the user could designate this limitation in the cultural protocol menu. According to Christen (2012), "protocols are not rigid; they assume change, they accept negotiation, and they are inherently social – not given, neutral, or natural" (2885). All access settings, including protocol, can be altered over time to reflect changing beliefs or changes to the status of individuals. Mukurtu provides two options for attributing licensing to content. Neither licensing option limits access, but does inform users about the intended use of the material.

FIGURE 1. Mukurtu access and metadata fields

4. LICENSING. Content added to a Mukurtu site can have Creative Commons (CC)[6] licensing and Mukurtu's own Traditional Knowledge (TK)[7] licensing applied (see Figure 2). Applying CC and/or TK licenses details the intended use of the resource, such as limiting or allowing commercial use in the case of CC licensing, or TK classifications that describe use more specifically based on tribal community needs. TK is very new and CC, while it has been around since 2001, is still unknown to many. Neither system has legal authority behind it, but each label system prompts the person possessing a resource to think about the nature of their relationship to that resource and how they would like other people to utilize the material.
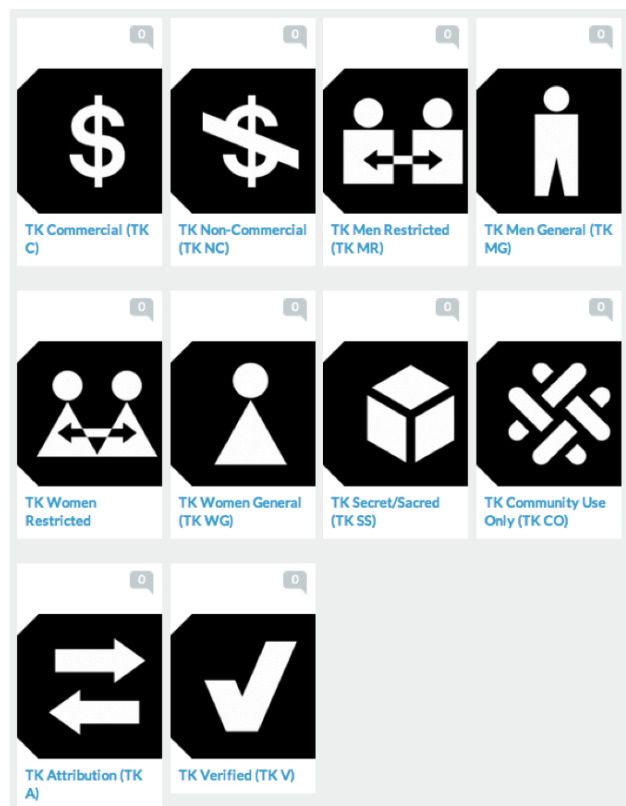

FIGURE 2. Mukurtu Traditional Knowledge (TK) Licensing

In the context of endangered language archiving and dissemination, the issue of restricting content is tempered by competing needs to make resources available to language learners, while also protecting intellectual property. I am an advocate for making language resources as accessible as is culturally appropriate for that community. Archive platforms that enable maintenance of cultural practices, like protocol, can contribute to cultural

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[6] Creative Commons licensing: http://us.creativecommons.org/

[7] Traditional Knowledge licensing: http://www.localcontexts.org/

sustainability and revitalization (Shepard in press; n.d.). I believe that when Indigenous communities publically declare approved uses of intellectual property and dissemination practices that are aligned with their cultural values, they are performing acts of self-determination (Dinwoodie 1998; Mawani 2012).

5. INTERFACE. The interface and functionality of Mukurtu CMS reflects the design needs of the community it was originally developed for. Content uploading, organization and display functions of the platform are best suited for print media, such as images and documents, not audio or video. In my experience, the CMS has great potential for innovative use in language preservation, but at least in the present version, the functionality limits its efficacy. It is important to note that the platform is not yet realized in the capacity its developers intend and I expect the forthcoming releases over the next year will improve its capabilities for management of language resources. In particular, development of Mukurtu Mobile version 2.5 is expected to bring important enhancements for language documentation work.

My trial of Mukurtu CMS mainly involved uploading audio, but also some Power-Point, PDF and text files. There is a 100MB file size-limit for any individual upload and a large variety of file types[8] are supported. I found it cumbersome that DOCX and PPTX formats are currently unsupported, though the older DOC and PPT formats are. I expect compatibility will improve in the near future and Director Christen acknowledges that the media module is not working as well as they expected and has caused trouble across the system (p.c. March 20, 2014). I found uploading was fast and simple for approved file types, but not all file types play back equally. For example, I uploaded a number of small WAV audio files and found their playback buffering was very slow and would not reliably start. Once I realized that my MP3 files were playing without a problem, I converted all the files to MP3 and did not have any more playback issues.

Once digital heritage items are uploaded they become part of the user's personal collection, tied to their account and linked to the community and protocol group(s) they are a part of. Files are accessed through the search screen or viewed as part of the community's digital heritage content page. The file display on the content page is again most appropriate for print media, as images are shown in thumbnail previews, and audio and all other file types receive a generic stock image (see Figure 3). These are modifiable features, but will require someone with Drupal expertise. Figure 4 is from a Mukurtu-based project that Director Christen directs in Eastern Washington State called the Plateau People's Web Portal[9] and gives an example of a more developed content page layout. The Plateau People's Web Portal is primarily a print media archive.

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[8] Supported file types: JPG, JPEG, GIF, PNG, TIF, TIFF, TXT, DOC. TEXT, XLS, PDF, PPT, PPS, ODT, ODS, ODP, MP3, MOV, M4V, MP4, OGG, WMV. WEBM. ICP, WAV
[9] Plateau Peoples' Web Portal: http://plateauportal.wsulibs.wsu.edu/html/ppp/index.php
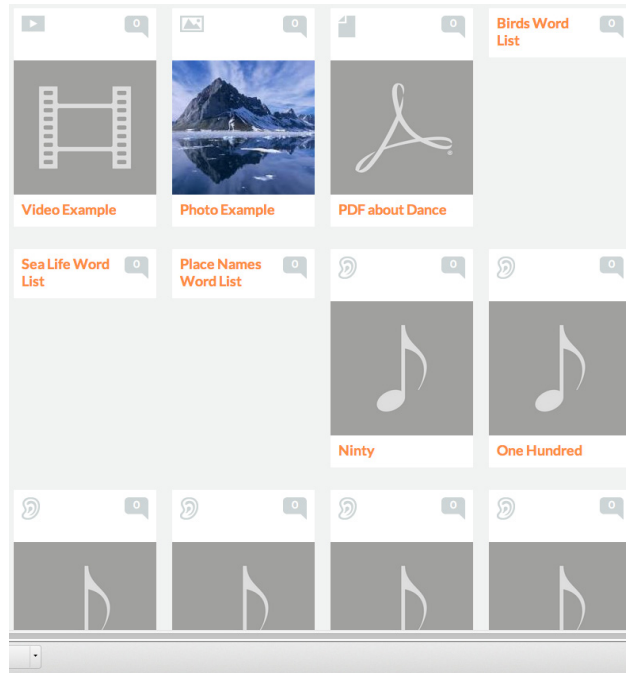
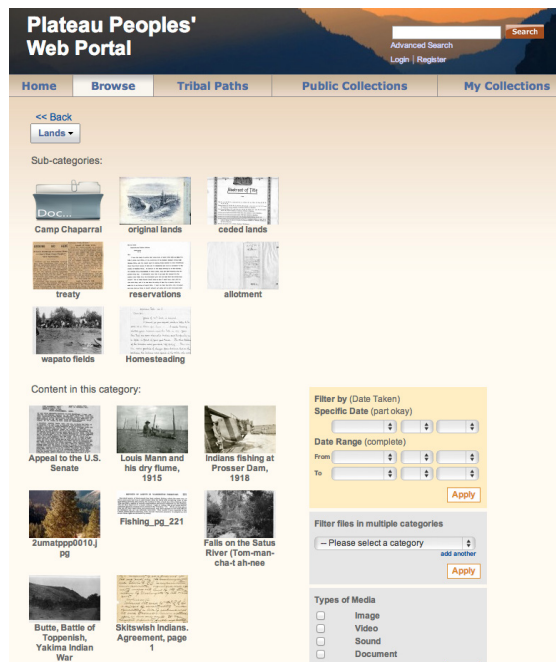FIGURE 3. Mukurtu digital heritage content display screen

FIGURE 4. Mukurtu-based Plateau Peoples' Web Portal content page display

Playback and viewing of most media works quite well and streams quickly. Images display once clicked and audio files play directly on screen via a simple media player. PDFs, documents, and PowerPoint-type files must first be downloaded, then opened. A nice feature is that digital heritage items can support multiple media files, which can promote pedagogical learning processes. In the simple example below, I have an audio file for the word 'dog' and an image of a dog in the right column (see Figure 5). I could also attach a video file, text file, and other audio files to enhance the main piece of media. One could also link a transcription to a recording, post multiple pronunciations (dialect, gendered, etc.) of a word, or connect multiple versions of a story or song. This feature invites the richness and indexicality of speech onto the archival page.
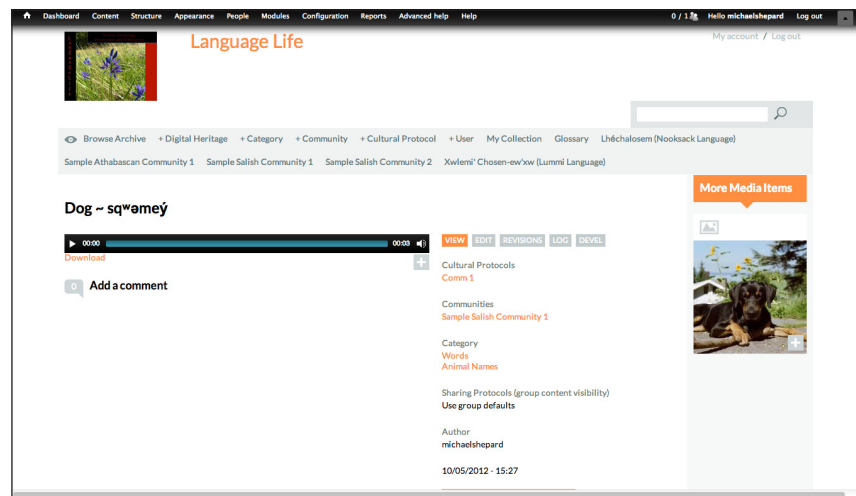

FIGURE 5. Mukurtu content display screen

Without assistance from a programmer or Drupal expert, I found my ability to effectively organize audio-based media a challenge. The basic content page display lacked some of the organizational capacity I wanted to make content easier to access and more conducive for language learning. Again, features are modifiable with expertise. The Plateau Peoples' Web Portal makes nice use of categories and searching refinement on the content page, employing use of the rich metadata labeling. Instead, I experimented with creating word lists and linking audio files to those words. This is a time consuming process, but provides a nice way to view a like grouping of terms and listen to the accompanying audio. I was also able to create a glossary where items were grouped alphabetically. The glossary helped with some organization, but for my users, grouping content by type had greater efficacy. The searching capabilities in Mukurtu CMS work well, but rely on quality metadata inputs.

6. METADATA. Ability to contribute rich metadata is a strength of Mukurtu CMS. The platform supports international metadata standards, such as Encoded Archival Description

(EAD),[10] Machine Readable Cataloging (MARC)[11] and Dublin Core,[12] as well as flexible rich text fields, such as 'Traditional Knowledge' and 'Cultural Narrative,' for narrative-based descriptions. Standard metadata fields including Date, Identifier, Language, and Contributor are all available. A mapping feature is available, which works especially well with content uploaded from a GPS-capable mobile device. All metadata fields are optional, with the exception of access protocol choices, and can easily be filled in at later dates when more time and resources are available.

7. BATCH UPLOADING. Digital heritage resources can be imported individually or in a batch, as can users, cultural protocol, communities, and categories. Once you become familiar with the process it can save you lots of time. Batch imports in any CMS must always be done very specifically and Mukurtu CMS is no exception. Uploading a large number of files is quite easy, but connecting those files to their metadata requires some finesse. Close attention to the structure of the CSV file and a 'cleansing ritual' of first uploading the CSV to Google Documents and then downloading it, proved a successful strategy. If working with a large collection, developing a solid process for batch uploads will be important. Batch creation of users, categories, and protocol are much simpler.

8. UPCOMING DEVELOPMENTS. In Director Christen's view, Mukurtu CMS is far from complete. Funding for upgrades and completion of their product development roadmap has, so far, been dependent on grant resources. While Mukurtu has been quite successful at obtaining grants, they realize the long-term unsustainability of being solely grant-funded. Director Christen envisions that the CoMunn project will develop a consistent revenue stream able to support continued operation of the CMS. Mukurtu is working from a product roadmap that will take them from the current 1.5 version up to version 2.4 by the end of 2014. A recent $499,186 grant from the Laura Bush 21st Century Librarians Program will help fund this work. Mukurtu expects to achieve a stable codebase in the 2.4 version that will realize the potential of open source architecture, where users can participate in development. This will enable contribution of custom-built modules or components to the platform.

A second $319,331 grant from the NEH Digital Humanities Implementation program will support development of Mukurtu Mobile from its current 1.0 version to 2.5. Director Christen sees Mukurtu Mobile development as integral to their growing support of language documentation. The 2.5 version will include full support of audio and video recording, along with the ability to perform transcriptions and attach protocol on the go. Director Christen expects a significant increase in utilization by linguists and language preservationists once the mobile application is upgraded. A quality mobile application is an important part of any strategy to encourage young people to interact with endangered language resources.

The CoMunn resource management service is fee-based and provides fully hosted digital heritage storage. CoMunn is managed by the Center for Digital Archaeology and

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[10] EAD: http://www.loc.gov/ead/

[11] MARC: http://www.loc.gov/marc/

[12] Dublin Core: http://dublincore.org/

hosting for a community starts around $3,500 a year for a 10-user license. Fully customized hosting plans are available and I expect most communities will need these to enable more users and flexibility. Director Christen sees the CoMunn product facilitating the evolution of Mukurtu as "primarily a tool built primarily around controlling access, to one that serves a growing need for preservation" (p.c. March 20, 2014). The Mukurtu CMS will continue to be available free for download and installation.

9. CONCLUSION. Mukurtu is being used around the world. Its platform flexibility creates opportunities for managing collections of a variety of media, though its application for language preservation still requires development. I expect planned product updates will deliver substantial improvements this year. The open-source architecture provides capacity for limitless new contributions. With sufficient funding, I am confident that the platform provides the structure of a language archive that facilitates community interests in language documentation and dissemination, along with control of intellectual property. Currently several Indigenous communities and organizations are using the platform. I expect to see many more in the future.

Primary focus	Digital cultural resource management platform
Pros	Open source, downloadable, protocol-based access controls, designed for Indigenous community use, quality metadata fields, mobile application
Cons	Lack of functionality for audio- and video-based resources, designed for print media resource management, still in development
Code base	Drupal 7
Open Source	Yes, available at https://github.com/
Reviewed Version	1.5
Documentation	http://support.mukurtu.org/
Download URL	http://www.mukurtu.org/#try

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