Abstract

As part of the IMLS national digital platform funding priority, the Center for Digital Scholarship and Curation at Washington State University (WSU), along with our partners seek to advance Mukurtu CMS: a free and open source content management system and community archive built in partnership with indigenous communities to manage and share digital cultural heritage based in local cultural systems. Leading the development of the Mukurtu CMS platform over the last five years at the WSU Libraries and working with Tribal archives, libraries, and museums (TALMS) nationally, we recognize the profound need to ensure Murkurtu's sustainability and expand its current features to meet the needs of Mukurtu's diverse community of users. With institutional partners at the University of Hawaii's Department of Linguistics, the Alaska Native Language Archives, the University of Oregon Libraries, the University of Wisconsin's SLIS program, the Wisconsin Library Services and Yale University's Beinecke Rare Book & Manuscript Library, we will establish four **regional Mukurtu Hubs** that will contribute to the development and deployment of Mukurtu CMS. The Hubs will contribute to core development needs and provide training and support to regional TALMS—the **Spokes**. The Hubs and Spokes will work in together with the Mukurtu teams' community software development model used in previous phases of development to ensure that Mukurtu CMS remains a grassroots effort, with design, functions, and features driven by local needs. By building capacity through these **regional Mukurtu Hubs and Spokes,** we will create a **sustainable national platform** built directly from community needs that uniquely addresses the ethical curation of, and access to, cultural content.

In the 2012 Association of Tribal Archives, Libraries, and Museums report, *Sustaining Indigenous Cultures,* 90% of tribal survey respondents note that, "their archive restricted access to at least some materials." Further, these tribal archivists and librarians suggested that digital systems could help "to segregate records by sensitivity level to both improve access and protect materials." Mukurtu CMS is an answer to this need. By providing fine-grained cultural protocol based sharing and access parameters, adaptable and expandable metadata fields specifically designed for traditional knowledge, and multiple "community records" for individual items, Mukurtu CMS provides a platform that promotes the sharing and management of cultural content in ethical and culturally responsive ways. The work in this next phase of development will ensure the extension and sustainability of the platform. The proposed project has four main goals:

- *Produce a Mukurtu 3.0 release* with updated features and functions based on input from Mukurtu Hubs and Spokes, fully managed and maintained at WSU at the Center for Digital Scholarship and Curation with a core development team;
- *Create regional Mukurtu Hubs* to act as regional centers for Mukurtu CMS development and deployment each with up to 5 spokes—Tribal archives, libraries or museums—to define Mukurtu development needs and promote Mukurtu implementation;
- *Provide sustainable workflow models* for collaborative and ethical curation and content sharing between Native and non-Native repositories freely available online at mukurtu.org and through outreach activities; and
- *Expand Mukurtu's adoption* through local installations and a one-click hosted installation through Reclaim Hosting and pricing packages to meet the needs of underrepresented Tribal communities and to ensure platform sustainability and to encourage use by universities and other non-indigenous institutions.

The work plan will follow a cyclical, iterative, and transparent approach to development through community engagement and open documentation. Extending the work to date supports the objectives of creating a national digital platform that promotes tools for diverse sets of communities. This phase of work will equip local, tribal, and community archives, libraries and museums with culturally relevant tools, workflows, and models to manage and share materials in technologically and culturally sustainable ways.

Mukurtu Hubs and Spokes: A Sustainable National Platform for Community Digital Archiving

I. Project Overview
Building on the success of a previous National Leadership Grant, we are applying as part of the National Digital Platform to advance Mukurtu CMS: a free and open source content management system and community archive built in partnership with indigenous communities to manage and share digital cultural heritage based in local cultural systems. Leading the development of the Mukurtu CMS platform over the last five years at the Washington State University (WSU) Libraries and working with Tribal archives, libraries, and museums (TALMS) nationally, we recognize the profound need to ensure Murkurtu's sustainability and expand its current features to meet the needs of Mukurtu's diverse community of users. With institutional partners at the University of Hawaii's Department of Linguistics, the Alaska Native Language Archives, the University of Oregon Libraries, the University of Wisconsin's SLIS program, the Wisconsin Library Services, and Yale University's Beinecke Rare Book & Manuscript Library, we propose to establish four **regional Mukurtu Hubs** that will contribute to the development and deployment of Mukurtu CMS. The Hubs will provide training and support to regional TALMS—the **Spokes**. The Hubs and Spokes will work in together with the Mukurtu teams' community software development model used in previous phases of development to ensure that Mukurtu CMS remains a grassroots effort, with design, functions and features driven by local needs. By building capacity through these **regional Mukurtu Hubs and Spokes,** we will create a **sustainable national platform** built directly from community needs that uniquely addresses the ethical curation of, and access to, cultural content. With previous IMLS support we built the software and defined core functional needs, this second proposal will ensure the extension and sustainability of the platform.

II. Statement of Need
This proposal grows from national conversations around digital tool building, sustainability, and the technological needs of diverse users, particularly the cultural values and social needs of underrepresented communities. Specifically, the continued development of Mukurtu CMS, and the Hubs and Spokes model, are aimed at meeting the needs of Indigenous communities globally and Tribal archives, libraries and museums across the United States and Canada in particular. In the 2012 Association of Tribal Archives, Libraries, and Museums report, *Sustaining Indigenous Cultures,* 90% of tribal survey respondents note that, "their archive restricted access to at least some materials." Further, these tribal archivists and librarians suggested that digital systems could help "to segregate records by sensitivity level to both improve access and protect materials." Mukurtu CMS is an answer to this need. By providing fine-grained cultural protocol based sharing and access parameters, adaptable and expandable metadata fields specifically designed for traditional and tribal knowledge, and multiple "community records" for individual items, Mukurtu CMS provides Indigenous communities and collecting institutions with a system that promotes the sharing and management of cultural content in ethical and culturally responsive ways. Far from being a tool for only Indigenous communities' needs, Mukurtu CMS provides content management, archiving, and display capabilities that promote building partnerships and sharing content responsibly while enriching records through expanded sets of local metadata, linguistic diversity, and traditional knowledge. Other CMS options on the market, such as Omeka and CONTENTdm do not allow for the culturally nuanced management and sharing of digital content and do not meet the needs of TALMs (See Appendix B: CMS Comparison Chart and support letters from Omeka and DPLA).

Needs Assessments
Over the last five years, during our Mukurtu workshops and online seminars we have collected formal surveys defining the needs of Mukurtu users. This information supplemented by informal conversations with stakeholders led to the identification of technical needs and also the development of new models of shared curation. This shared curation includes the vetting of content for cultural sensitivities, support for of Native languages, and the inclusion of historical context into diverse collections. The main needs we have encountered during our collaborations may be described as follows:

- Non-Indigenous collecting institutions want to share their collections with Indigenous communities and the public, and they know they have some content that is culturally sensitive (sacred objects, images of the deceased, maps which disclose archaeological sites, etc.), but they do not have a way to share the content online while respecting these cultural differences, nor do they know the best channels to contact community representatives for vetting of the materials.

- Indigenous collecting institutions wish to make their own collections available to their communities online, but need a way to define access based on local, internal protocols. For example, we collaborated with the Pokagon Band of the Potawatomi who have a collection of songs that should only be listed to after the first snow falls. Having the option to define access based on cultural and social values for certain categories of collections, allows Native communities the flexibility to make their collections viewable, searchable, and open for narration by tribal members and others while maintaining core cultural values.
- Indigenous institutions know that non-Indigenous collecting institutions hold materials pertaining to their tribe and they would like to add their own metadata to those collections online through their own CMS. Without a system that can facilitate easily moving not just content, but also, metadata, between databases, tribes have limited access to these institutional collections for their own use, reuse and community access.

Most of our work with Mukurtu development, implementation, and training has revolved around creating individual installations of Mukurtu to meet these specific needs. During our first development phase (2011-2014) the uptake of Mukurtu CMS by Indigenous communities globally outpaced our expectations. Our online Mukurtu community engagement program now has over **500 members with more than 200 installations, demos, and test sites** of Mukurtu CMS. We have also partnered with national, regional, and local non-Native institutions to use Mukurtu to return digital collections back to TALMs and increase the ethical access to their collections. During this first development and deployment phase, with a small staff and budget, we dramatically improved the software, developed a Mobile application, and collected documentation of the profound need of TALMs to have a technological and culturally responsive platform for digital heritage stewardship. These needs are not met by other tools or platforms.

Work to Date
Phase One: Mukurtu Alpha
Mukurtu CMS started as a grassroots project to manage, circulate, and narrate the Warumungu Aboriginal community's digital materials using their own cultural protocols. In 2002, after years of collaboration with the Warumungu Aboriginal community in Central Australia, the Principal Investigator on this project, Dr. Kimberly Christen Withey, accompanied a group of community members to the National Archives in Darwin. Looking through the images and documents there was both tension and relief. The tension centered on the violation of cultural protocols observed by Warumungu people in the distribution, circulation, and reproduction of their cultural materials and knowledge. For example, images of the deceased were displayed with no warnings; pictures of sacred sites lacked any connection to the ancestors who care for those places; ritual objects were disconnected from their provenance. In addition to this archival material, the Warumungu community received thousands of photos from former missionaries, schoolteachers, and researchers. These digitally returned objects posed a challenge because they could be reproduced endlessly, accessed more easily, and distributed without consent or consultation. Community members who viewed the photos on the Cultural Center's computer knew what individuals and families should view them, what should be restricted, and if they could be reproduced. The cultural protocols did not need to be spoken, but everyone knew when they were violated. What the Warumungu community wanted, was a platform whose functionality respected their dynamic social and cultural systems, relationships, and cultural protocols. After evaluating the commercial off-the-shelf content management

systems, we discovered a set of unmet needs including: cultural protocol driven metadata fields, differential user access based on cultural and social relationships, and functionality to include layered narratives at the item level. We were not the only ones to come to this conclusion. Based on feedback from Native communities in the U.S., the National Museum of the American Indian (NMAI) at the Smithsonian Institution conducted a survey of commercial off-the-shelf content management systems and came to the same conclusion.[1] In 2007, after two and half years of community consultation, development, and design work we launched the Mukurtu Wumpurrarni-kari archive as a stand-alone, browser-based, community protocol driven archive, updatable to community needs over time (Appendix A pages 2-3).

Phase Two: Mukurtu Beta and the Plateau Peoples' Web Portal
As the Mukurtu Wumpurrarni-kari Archive was in use, Withey, and the Washington State University Libraries, formed a partnership with six tribes in the Plateau region to extend the alpha version of Mukurtu to test its capabilities to deal with formal library collections (with existing metadata), an online system, and multiple tribes across several states sharing common histories, but also unique tribal values, languages, and collections. To test the concept of a multi-tribal version of Mukurtu, the WSU team developed a prototype of the Plateau Peoples' Web Portal (Appendix A page 4). The Portal allows members of the Plateau tribes to curate their cultural materials held in WSU's collections and at our partner institutions at the National Anthropological Archives (NAA), the National Museum of the American Indian (NMAI) at the Smithsonian Institution, and the Northwest Museum of Art and Culture (MAC) in Spokane Washington. The Portal expanded the functionality of the original Mukurtu platform creating an online, multi-tribal digital archive with more administrative features, extended access management parameters, and differential metadata requirements across fields and between Native communities and the collecting institutions that hold archival material related to them. The Portal includes functionality that allows for multiple voices through community records, layered context, and diverse forms of metadata at the item and collection level. In the Portal, each collecting institution provides metadata for the content that they contribute to the Portal. Tribal administrators enter expanded metadata derived from their communities called "Tribal Knowledge" and add updated catalog information under the "Tribal Catalog Record," (Appendix A pages 4-8). This system protects the integrity of institutional metadata while simultaneously adding to the record through the layering of tribal metadata in one space. In this way, the Portal provides the framework for a new mode of archival preservation and classification that recognizes the usefulness of integrating multiple sets of standards and information systems.[2] (see support letters from the Smithsonian's National Anthropological Archives and the Library of Congress)

Phase Three: Mukurtu 1.0-2.0.3
As the Plateau Peoples' Web Portal developed and we created the beta version of Mukurtu with support from a NEH Digital Start Up Grant, Withey presented the system's capabilities to many groups: indigenous communities, archivists, librarians, and museum scholars. It became clear that there was a similar set of archival and content management needs that linked communities. For example, the Squamish nation in Canada wanted an archive whose protocols could accommodate their intricate clan and family system; in New Zealand the Maori needed a system that could deal with extensive iwi (kin-based social networks), and in Kenya the Maasai sought a system that would allow them to differentiate materials meant for commercial purposes from those meant only for internal circulation; and LGBT archives wanted to protect the privacy of their donors while also providing access to sensitive materials to smaller groups. In every case these communities requested flexible cultural protocols to drive the

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[1] J. Hunter, B. Koopman, J. Sledge. (March 2003) "*Software Tools for Indigenous Knowledge Management*," Museums and the Web 2003, Charlotte, NC.
[2] In 2012, the Portal was awarded the "Guardians of Culture, Memory, and Lifeways Outstanding Project Award", by the Association of Tribal Archives, Libraries, and Museums as an "inspiring model of how university repositories can successfully collaborate with tribal communities to curate and enhance collections with tribal voices and histories. http://www.atalm.org/sites/default/files/awards_media_release.pdf

distribution, circulation, and reproduction of their cultural heritage, customizable templates, adaptable user-access levels to meet the diverse needs of their complex social networks, and clear intellectual property management tools to make informed decisions about the circulation of their own materials.

An IMLS National Leadership Advancing Digital Resources Grant in 2011 allowed us to fine-tune the NEH-funded beta version of the platform to produce a stable upgradeable tool that would be available to more communities. Leveraging Drupal 7 as Mukurtu's base allowed our development team to focus on specific features and functions and areas of emphasis that set Mukurtu apart from other CMS options. Mukurtu is the only CMS that provides: 1) cultural protocol-driven access parameters based on local knowledge systems providing granular levels of access and control of content and metadata 2) pathways for sharing content and metadata between multiple community groups 3) flexible and clear licensing and labeling parameters for content, and 4) selected metadata transfer between collecting institutions and Indigenous communities using Mukurtu's "roundtrip" feature. Selective sharing and vetting in features like Roundtrip balance the cultural needs of communities with the desire to share content more publicly. The Roundtrip feature allows content and metadata to move "in and out" of Mukurtu CMS and other content management systems (with ContentDM at WSU, EMU at the Smithsonian and Museum Plus at the MAC) at a granular level—so communities can choose to share all metadata associated with items or collections, or they can define which fields to not include. For example, in the Portal roundtrip with the NAA tribal communities share much of their metadata but not all the traditional knowledge of specific places –like location coordinates and sacred knowledge. This feature makes sharing a process that includes cultural vetting and values. In 2012, we launched our 1.0 version of Mukurtu CMS in Sydney, Australia (Appendix A pages 9-13) and over the course of the next twelve months grew Mukurtu users to over 200+ and held ten community workshops for training and continued user feedback and testing (Appendix A page 14-15)

During 2014 using our community software development model, Mukurtu CMS reached a 2.0 release and underwent a theming facelift, a complete code update, and the addition of new features including customization of the front page, community pages, and the addition of customizable Traditional Knowledge (TK) Labels (Appendix A pages 16-20). Built directly from community needs and input, the TK Labels are a prime example of a feature designed around specific cultural and historical needs. Because Indigenous communities do not legally own much of their patrimony they cannot use traditional or Creative Commons licenses. Over two iterations of Mukurtu development, we created the TK Labels to provide context to public domain works circulating to the general public (www.localcontexts.org/). Items or collections within Mukurtu CMS can have TK Labels including: seasonal (for materials that should only be accessible during certain seasons), sacred (for materials that are culturally sensitive or attribution (so source communities can be named in addition to other creators of works—Appendix A pages 21-23).

What we found through the process of open source development is that while the standard open source model provides an avenue for growing a development community, Mukurtu users do not have the resources, infrastructure, and programming skills to contribute to Mukurtu's development in the same way as other open source platforms. Recognizing that these differences are based on limited resources, and an underrepresented set of users, the proposed Hubs and Spokes model addresses this by maintaining the technical foundation of Mukurtu at WSU and leveraging the Hubs to provide additional support and outreach and the Spokes to provide community needs for updates and refinements to the platform. As part of this proposal, the Hubs will work directly with the Spokes using WSU's assessment workflow to document feature and functionality needs through user testing and on-going training modules. In addition, in 2015 the WSU team received a planning grant from the Andrew W. Mellon Foundation to hold three planning workshops bringing together Native and non-Native stakeholders from repositories across the country. The planning meetings—already underway—will document a set of best practices and technical needs for expanding the sharing capabilities within Mukurtu CMS to facilitate sharing content and metadata between institutions and sharing vetted content with aggregators such as the Digital Public Library of America. Building on Mukurtu's existing framework, this phase of testing and needs assessments will extend Mukurtu's ethical, shared, vetting standards so that the integrity of Native content will be maintained through the aggregation process. Instead of content being pulled into

aggregators without a community cultural vetting process, the "Mukurtu Shared" workflow model proposed as part of the Mellon planning grant is designed to promote trust at all levels of content management and sharing. Extending the notion of security past technical checks, the Mukurtu Shared workflow inserts "cultural checks" into the aggregation process. The Digital Public Library of America (DPLA) are participants in the planning grant and we are in conversation with them about future possibilities of Mukurtu users being able to push select content to DPLA. Together we have discussed the technical needs to define a process to provide selected, vetted materials through Mukurtu CMS into the DPLA, much like our roundtrip feature has provided to other repositories (see DPLA letter of support).

III. Impact: Performance Goals and Benefits

Mukurtu CMS is a disruptive technology in the best sense of the phrase. Wedging its way into library school curricula, university library research models, national archives' access protocols, and tribal archives, libraries, and museum's daily archival practices, Mukurtu is at the center of a new ethical and collaborative model for carrying out the hard work of digital management and curation. It is clear that while Indigenous communities seek a digital platform to meet their distinctive cultural, historic, and linguistic needs: managing content through differential access, promoting levels of vetting for content, providing expanded metadata fields for diverse community input, and facilitating sharing between content holders and source communities. What is apparent after three development phases of Mukurtu CMS is that this set of needs and activities relates to a range of archives, repositories, universities and local communities. While Mukurtu CMS began as the answer to a set of Indigenous community needs, it has tapped into national and international conversations concerning digital privacy, sharing, and an ethics of access. Mukurtu accommodates a diverse set of users with varied levels of technical needs and support, but a common desire to curate, manage, and share their collections in meaningful ways embedding local knowledge, language, and cultural values. Refining a set of workflows and models for the adoption of Mukurtu CMS will impact digital content management across libraries and archives by increasing opportunities for standardized formats for sharing cultural materials through vetting processes that include communities of origin. The four key themes identified in the 2015 IMLS In Focus Report on the National Digital Platform: enhance and build interoperable tools and services, be inclusive, initiate radical collaborations and shift to continuous professional learning are met through the extension of Mukurtu CMS. The work in this proposal will:

- *Extend the core framework of Mukurtu's codebase to a 3.0 release* based on input from the Hubs and Spokes though guided user testing and community workshops;
- *Engage with diverse sets of communities* at local levels integrating their needs to the core of the platform. This engagement will result from planning meetings, community and user testing workshops and outreach by the WSU team at conferences and Tribal communities
- *Foster collaborations between communities and collecting institutions* by using Mukurtu to share and enhance records and, more significantly, through our workflow models that encourage relationships of respect and trust between collecting institutions and source communities, and;
- *Extend the Hubs and Spokes model* to communities and professionals in all types of institutions— from the smallest TALMs to the largest national repositories. Using our preexisting contacts as well as building from the Mellon-funded planning grant we will be able to reach communities throughout the US and internationally connecting local communities to collections at national and regional repositories giving them a meaningful and sustainable model to share and mange collections collaboratively.

We propose the Hubs and Spokes model for the further development of Mukurtu CMS, building its implementation and sustainability with a set of core partners to continue to grow the platform's impact on the ethical curation, sharing and management of cultural heritage materials. Each partner institution will become a Mukurtu Hub, acting as the central point of connection between the Mukurtu development team at WSU and the regional tribal Spokes. In this proposal, the Hubs and Spokes will work closely together to contribute key platform feature and function requirements to the Mukurtu development team. Their

impact will be measured by the needs assessments they create during their community and user testing workshops. By engaging directly with our Mukurtu community base and spreading our engagement regionally, we will expand the depth of Mukurtu's capabilities and provide an extensive network for the implementation of Mukurtu. One of the constant pieces of feedback we get from Mukurtu users –through our workshops and in our virtual training sessions—is to provide contacts at other institutions using Mukurtu. Fostering a community of users increases the impact of Mukurtu on the core needs of managing cultural heritage materials. These regional Hubs will be able to meet the unique needs of their regional Spokes while also extending the community of users beyond what the WSU team can do on its own by providing a built in network of users to share ideas, training, insights and experiences. Similarly, by growing our options for cloud hosting to include the one-click install and shared hosting options from Reclaim Hosting, we continue to provide services for our Mukurtu users who do not have the technical infrastructure and or human resources to implement and maintain the software on their own servers.

IV. Project Design and Evaluation
The proposed project has four main goals:
- *Produce a Mukurtu 3.0 release* with updated features and functions based on input from Mukurtu Hubs and Spokes, fully managed and maintained at WSU at the Center for Digital Scholarship and Curation with a core development team;
- *Create four regional Mukurtu Hubs* to act as regional centers for Mukurtu CMS development and deployment each with up to 5 spokes—Tribal archives, libraries or museums—to define Mukurtu development needs and promote Mukurtu implementation;
- *Provide sustainable workflow models* for collaborative and ethical curation and content sharing between Native and non-Native repositories freely available online at mukurtu.org and through outreach activities; and
- *Expand Mukurtu's adoption* through local installations and a one-click hosted installation through Reclaim Hosting and pricing packages to meet the needs of underrepresented Tribal communities and to ensure platform sustainability and to encourage use by universities and other non-indigenous institutions.

These goals extend the work to date creating Mukurtu CMS and support the objectives of creating a national digital platform that promotes tools for diverse sets of communities. By expanding Mukurtu CMS through regional Hubs and Spokes and promoting an expansive community development model, we will equip local, tribal, and community archives, libraries and museums with culturally relevant tools, workflows, and models to manage and share materials in technologically and culturally sustainable ways.

The work plan will follow a cyclical, iterative, and transparent approach to development through community engagement and open documentation. Each of the Mukurtu Hubs will engage in three rounds of Mukurtu CMS platform development and testing with their Spokes in years one and two of the grant. Outcomes of these engagements will include detailed "user-stories" that will then be delivered to the Mukurtu development team for integration into Mukurtu CMS. The Mukurtu Hubs will:
- Facilitate user-testing at their institutions with Tribal "Spokes";
- Create detailed sets of "user stories" following WSU templates for Mukurtu engineers;
- Work directly with the Mukurtu development team and their Spokes to refine specific functionality and features for Mukurtu 3.0; and
- Document testing, feature needs and functional analysis for open development.

This iterative process builds on our method to date and adds in the Hubs and Spokes for a more in-depth approach to the "community centered software development" model our team has used successfully to date. For this phase **each Mukurtu Hub will be responsible for contributing to a core feature to Mukurtu CMS** and extending Mukurtu's reach by up to five Spokes.

Years one and two of the grant will be divided into thirds with user-testing with the Spokes on-site at each Hub, the creation of needs requirements by the Hubs in partnership with the WSU team, followed by software development, and finally deployment and implementation of the new features to the Hubs and

Spokes. As a core activity the user/community testing at each Hub with their related Spokes will be uniform. Testing will include "cognitive walkthroughs" where individuals are asked to walk-through a series of tasks (adding content, vetting materials, etc.) with specific desired outcomes. These walk-throughs will identify areas for updates in both functionality and theming (for example, is the interface intuitive?, are there steps in the process that could be made simpler?, etc). For the addition of new features and functions, community users will engage with Hub representatives in a series of focus group tasks creating needs scenarios and concept models followed by group work leading to "affinity voting" to define and refine specific functional needs. The Mukurtu team has used these methods successfully to date in community planning meetings and will continue to refine them through individual surveys and evaluations following each development sprint (Appendix B, Mukurtu Features and Release History).

The WSU Mukurtu team, when appropriate, will also conduct targeted remote usability testing and prototyping sessions that will include testing of wireframes of proposed functionality and navigation as a part of phase one and phase two using the Loop 11 contracted service for online usability testing. Where desired functionality currently exists in Mukurtu CMS, we will test using a live instance of Mukurtu with the Loop11 service for data collection. Where functionality does not yet exist in Mukurtu CMS, we will build interactive wireframes using Loop11 and balsamiq—a function of Loop11 that allows for testing interactive wireframes prior to writing one line of code.[3]

Year three will focus on documentation and deployment of a 3.0 release of Mukurtu CMS and outreach to potential new Hubs and Spokes. Using the requirements defined and refined through the community testing in phases one and two, the Mukurtu team, along with contractors, Kanopi Studios, will undertake three development sprints at regular intervals with regular "pauses" for feedback and refinement. For each functional or theme requirement the technical specifications document will:

- Identify existing Drupal/Mukurtu module(s) that will be extended and/or modified to accomplish an identified functional or theming requirement
- Estimate development hours to deliver each functional or theming requirement
- If no Drupal/Mukurtu module exists for functional requirement assess the development hours necessary for adding identified functional or theming requirement and review the relative sustainability of maintaining new module moving forward.
- The MoSCoW (Must have/ Should have /Could have /Would be nice to have) level attributed to the technical requirement will also be applied to the corresponding technical specification.

The software will be maintained and managed by WSU with updates to GitHub at each "point" release (2.0.4 onward) through the development cycle. The Mukurtu team and project partners will use several metrics to gauge the success of the project at intervals throughout the project:

- The overall growth in the Mukurtu community as measured by the number of Spokes, adopters of local installations, community email list members, member contributions through Mukurtu support channels, and Git Hub pull requests;
- The documentation of new feature and function requests and successive integration into the platform through point releases;
- The number of new Spokes that work directly with Mukurtu Hubs either in person or virtually as a means to adopt Mukurtu CMS; and
- The number of inquiries by potential users about local or hosted options for adoption.

Throughout the project the Mukurtu team will employ a set of evaluation methods aimed at assessing the work to date, refining outputs, and achieving the projects overall goals. Evaluation methods include:

- Formal Surveys: Participants from each set of Spokes will respond to formal surveys assessing the benefits and utility of the community development engagements. Visitors to the Mukurtu.org website and members of the Mukurtu premiere list will be asked to assess Mukurtu's core features and functions and vote on new features. The Mukurtu Support site has a direct feedback loop: all

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[3] Balsamiq. (n.d.). Retrieved July 13, 2015, from https://balsamiq.com/ and Online Usability Testing. Powerful. Simple. (n.d.). Retrieved July 13, 2015, from http://www.loop11.com/

tutorials, educational resources, and FAQs allow users to provide comments and suggestions. In addition, we will use our online survey tool to follow up with workshop participants at regular intervals throughout testing and implementation.

- Development Assessments: The Hubs will provide structured evaluations and feedback to the WSU team through formal development assessments during each quarter of engagement, testing, development and implementation. User testing will include evaluative materials at each stage. This evaluation and assessment will directly impact the new features and functions planned for Mukurtu 3.x releases. Assessments will be formatted to each set of project activities.
- Hubs and Spokes Advisory Board: An important part of the evaluation process will be the input of the project's advisors. Advisors represent tribal archives, librarians and museum specialists, and experts in digitization and preservation and representatives from national repositories. The advisory board will provide evaluation of the on-going development work and assessments of the Hubs and Spokes model and will provide input on future Hubs.

V. Diversity Plan
Our project aims directly at the needs of tribal archivists, museum specialists and librarians who are often marginalized and underserved by large-scale national projects and professional organizations that do not recognize their sovereign status, unique historical role and collections, limited resources and infrastructure, and educational and training needs. In order to continue to serve this population, our work plan includes: designing Mukurtu's core updates around stated community needs, engaging with a diverse set of TALMs throughout the US through our regional Hubs, and extending our previous relationships with national repositories to create more partnership opportunities.

VI. Project Resources: Personnel, Time, Budget
This proposed project effort will draw on the following roles from WSU, the partner Hub institutions, Spokes and subcontractors. This mix of staffing provides an array of expertise and spreads out specific work tasks amongst several institutions ensuring buy-in and complimentary set of skills and resources across development, deployment, and training tasks.

Personnel (Grant funded and externally funded)
1. **Project Director**: Dr. Kimberly Christen Withey, Mukurtu Project Director (PI), will dedicate 17% of her time (in-kind) to oversee the Mukurtu Hubs and Spokes communication and workshops, provide management of the Mukurtu team and subcontractors, provide communication between stakeholders, define goals for each set of project wide meetings, work with all team members and collaborators to maintain project goals.
2. **Project Technical Manager**: Alex Merrill, Head of Systems, WSU, co-PI, will dedicate 20% of his time (in-kind) to serve as the main point of contact for the Hubs during their user testing meetings and for the creation of the technical and functional specifications. Merrill will work with Mukurtu CMS developers at WSU and Kanopi Studios to ensure development goals are met.
3. **Mukurtu Project Trainer and UX Lead**: Michael Wynne, Digital Applications Librarian, WSU will provide direction and support for integration of Mukurtu CMS, workflows, UX models, assessment materials, on-site and virtual trainings for Mukurtu Hubs.
4. **Mukurtu CMS Developer**: Steve Taylor, Informational Technology Specialist WSU, will dedicate 15% of his time (in-kind) work with Merrill and Wynne to create the technical and functional specifications documents, provide technical support during the user testing sessions, aid in aggregating user testing feedback and provide his expertise for the interoperability of Mukurtu CMS with other platforms, apps and software services for platform documentation during an implementation phase.
5. **Project Institutional Support Manager:** Trevor Bond, co-Director of the CDSC at WSU, and co-PI, will dedicate 20% of his time (in-kind) to oversee on campus meetings, work with the advisory board, and provide outreach to archivists and librarians from non-Native repositories.

6. **Hub Managers:** Each Mukurtu regional Hub will have a manager who coordinates with their Spokes, maintains communication with the WSU team, and manages on site workshops, user testing and community meetings.
7. **Hub Team Leaders**: Work directly with the Hub Managers, provide daily support to Spokes, interfaces directly with WSU Project Trainer during testing sprints, aggregates user feedback and needs documents and provides updates to project partners.

Timeline of Activities
Over the proposed grant cycle the project will involve development, testing and implementation, divided into three phases with **three sets of iterative activities** 1) Community engagement, Hubs and Spokes feature assessment and testing, feedback and prioritization, including outreach to future Hubs and Spokes 2) feature and function software development, testing, refinement and 3) delivery and implementation, training, documentation, and code release.

Project Kick off: May –August 2016
- Hubs hire team leaders
- WSU Mukurtu team sets up Hubs with Reclaim Hosting Mukurtu sites
- WSU Mukurtu team puts project communication system in place
- First all project meeting at WSU and follow up virtual training for Hubs
- Roll out of Reclaim Hosting installation feature to the public

Project Implementation Phase One: September 2016 – June 2017
Community Engagements and Testing
- Hubs and Spokes: 3 community engagement/user testing meetings at each Hub engaging 2-3 Tribal spokes
- Hubs and Spokes and WSU team: Assessments and community feedback aggregation
- Hubs: Production of user stories for development of new features

Mukurtu CMS Development Phase One:
- WSU and Kanopi Studios: Feature and Function development
- Hubs and Spokes: Community testing and refinement of needs
- WSU: Deployment to Mukurtu codebase and release on GitHub

Mukurtu Delivery and Implementation
- WSU: Mukurtu Support site updated: new tutorials, outreach, communication, assessments
- WSU: Mukurtu workshops, advisory board meetings, evaluations

Project Implementation Phase Two: July 2017 – April 2018
Community Engagements and Testing
- Hubs and Spokes: 3 community engagement/user testing meetings at each Hub engaging 2-3 Tribal spokes
- Hubs and Spokes and WSU team: Refinement of phase one features as necessary
- Hubs: Production of user stories for development of new or extended features
- WSU: outreach to potential new Hubs

Mukurtu CMS Development Phase Two
- WSU and Kanopi Studios: Feature and Function development
- Hubs and Spokes and WSU team: Community testing and refinement of needs
- WSU: Deployment to Mukurtu codebase and release on GitHub

Mukurtu Delivery and Implementation
- WSU: Mukurtu Support site updated: new tutorials, outreach, communication, assessments
- WSU: Mukurtu workshops, advisory board meetings, evaluations
- Mukurtu team project wide meeting
- WSU: workshop for potential new Hubs/Spokes

Final Project Implementation Phase and Documentation May 2018- April 2019
<u>Mukurtu Hubs and Spokes final meetings</u>
- WSU: Mukurtu Hubs deployment of Mukurtu 3.0 to Spokes
- WSU and Hubs: training updates to Spokes and community of users
- WSU: meeting with potential new Hubs/Spokes for after grant period

<u>Mukurtu documentation updates</u>
- Hubs and Spokes: final needs assessments
- WSU: GitHub final release, Mukurtu 3.0
- WSU: Mukurtu Support website training modules completed

<u>Mukurtu Community engagement</u>
- WSU: Evaluations and assessments delivered on Mukurtu.org
- WSU: Mukurtu support materials finalized, delivered on Mukurtu Support page
- Mukurtu Hubs and Spokes: future plans, new regions, outreach models updated

VII. Communications Plan

Our communication plan links directly back to our targeted audience defined in our Statement of Need. The Mukurtu team will maintain the Mukurtu CMS monthly newsletter, the Mukurtu.org website and the Mukurtu Support website—all channels for effectively engaging with the Mukurtu community and relevant stakeholders. We will update the Mukurtu.org website to provide a community forum site where Mukurtu users, developers, and Mukurtu team members can interact, answer questions and facilitate expansion of the tool through practical use-based queries and suggestions. We will maintain our open platform on GitHub to ensure transparency in development and encourage engagement with the development community. Our newly formed Mukurtu Hubs will provide a second tier of outreach and communication through their planned activities and engagement with the Spokes in their regions. We will use our existing Mukurtu and Sustainable Heritage Network registries as well as our relationship with ATALM to provide outreach to TALMs beyond the regional Hubs we have in place for this round of project work. We will continue to have Mukurtu workshops at annual ATALM conference and make all sessions freely available online. We will continue our monthly Mukurtu Office Hours—online, virtual sessions that alternate between planned "how to" tutorials and open sessions for sharing.

VIII. Sustainability

Over the past decade, sustainability in software engineering has come to include the ideas of modifiability, reusability and usability of software *throughout the product development lifecycle*. The sustainability of a software project like Mukurtu CMS centers on three closely coupled areas: 1) the technological sustainability of the software codebase, 2) dedicated organizational support, 3) community support and training. The sustainability of Mukurtu CMS is both technical and community-oriented. The completed Drupal integration and open source codebase ensure interoperability and accessibility of the Mukurtu platform and the organizational home of Mukurtu at WSU ensures its continued community-focused development and deployment. In order to maintain the platform's integrity and ensure its timely updates, Mukurtu will be supported organizationally by the Center for Digital Scholarship and Curation (CDSC) at WSU. Established in 2014, the CDSC has dedicated space, personnel, and funds to maintain Mukurtu CMS. After the grant period WSU will commit to permanent funding for a dedicated developer and will continue with digital stewardship training through the Sustainable Heritage Network, providing both virtual and hands on educational resources to TALMs. In addition, by providing two hosting options—one full service, zero-subscription model through the Center for Digital Archaeology and a forthcoming one-click installation of Mukurtu CMS by Reclaim Hosting—Mukurtu users have a choice of hosting options that meet their financial and security needs while enriching the sustainability of the platform through reliable, updatable hosting. Uniting this community development model with regional Hubs, an expanded sharing model, and a commitment to maintain the software at WSU provides a sustainable model for the Mukurtu platform after the grant period.

Schedule of Completion

October 1,2016 – September 30, 2019

The work of this grant will be divided into four phases. The first phase, encompassing months 1-4, will be the project kick-off. The Hubs will hire and/or identify their team leaders. The WSU Mukurtu team will configure Murkurtu sites through Reclaim hosting for the Hubs, establish a project communication system, and in partnership with Reclaim hosting, roll out a one-click install feature for Mukurtu to the public. The project kick-off phase will be capped by an all project team meeting at WSU Pullman with virtual training follow-ups as needed.

Once the personnel and technology are in place and training has been completed the project will move into the first of two implementation phases. Project implementation phase one, months 5-14, will have three distinct activities:

1.) Community engagement, testing, and needs refinement,
2.) Mukurtu CMS development,
3.) Mukurtu delivery and implementation.

The Hubs and Spokes will conduct three community engagement and testing sessions at each Hub. The WSU Mukurtu team will work with the Hubs to aggregate the results of the user testing session and aid in the production of use stories that will lead to new or refined Mukurtu features. Phase one work will include an iterative development sprint involving both Kanopi Studios and WSU developers. During this phase, the Hubs and Spokes will review and test completed development work. The WSU Team will post Mukurtu code updates on GitHub. Concurrently, the WSU Mukurtu team will update support documentation pertaining to the latest release of Mukurtu CMS, publicize new features through Mukurtu Workshops, hold a Mukurtu advisory board meeting, report on first year evaluations and conduct outreach to potential additional Hubs.

The second project implementation phase, months 15-24, will build upon the previously completed work. We will also undertake the following activities:

1.) Initial outreach to new Hubs identified in Phase One
2.) Review the features delivered in Phase One for potential refinement
3.) Hold a project wide team meeting
4.) Conduct a Mukurtu workshop for potential new Hubs/Spokes

Concurrent with the activities listed above, we will continue with community engagement and testing, Mukurtu CMS development, and Mukurtu delivery and implementation activities. The third project implementation phase, months 25-36, will include:

1.) Final meetings with the Hubs, Spokes and the WSU project team.
2.) Update Mukurtu documentation and complete Mukurtu training modules
3.) Conduct evaluations and final needs assessments from Hubs,
4.) Release Mukurtu 3.0 to GitHub
5.) Engage new potential Hubs through outreach meetings and training workshops.

Schedule of completion: Mukurtu Hubs and Spokes

Actors: Activity	Project Kick-off				Project Impl: Phase One										Project Impl: Phase Two										Final Project Impl Phase and Doumentation											
	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Hubs: hire/identify team leaders	█	█	█	█																																
WSU: Prepares Mukurtu sites and communications channel	█	█	█	█																																
All: Project meeting and follow-up trainings		█										█	█										█													
WSU: Announces Reclaim hosting feature			█																																	
Hubs: community engagement/user testing meetings					█	█	█	█	█	█	█	█	█	█		█	█	█	█	█	█	█	█													
Hubs: Complete user stories for development						█	█		█		█	█				█		█		█	█	█														
ALL: Assessment and community feedback aggregation						█		█		█		█				█		█		█		█														
WSU: Feature development sprints							█		█		█		█				█		█		█		█													
Hubs: Community Testing and needs refinement							█		█		█		█				█		█		█		█													
WSU: Release of codebase to GitHub master branch														█										█												3.0 █
WSU: Mukurtu support site updated								█				█				█				█						█		█								
WSU: Mukurtu workshops, advisory board meeting, evaluations														█										█												
WSU: Outreach to potential new Hubs															█	█	█	█	█	█	█	█	█	█												
WSU: Workshop for potential new Hubs/Spokes																						█	█	█	█											
All: Training updates to Spokes and community																										█	█			█	█			█		
WSU:Deploy 3.0 to Hubs and Spokes																												█	█	█	█	█	█			
WSU: Meet with potential new Hubs/Spokes																									█	█	█	█								
WSU: Mukurtu support materials and documention updated																																	█	█	█	█
Hubs: Final needs assessment																									█	█	█	█	█							
WSU: Final project assessments conducted																														█	█	█	█	█	█	█
Hubs: Future plans, new regions and updating of outreach models										█	█	█	█	█																					█	█

DIGITAL STEWARDSHIP SUPPLEMENTARY INFORMATION FORM

Introduction:
IMLS is committed to expanding public access to IMLS-funded research, data and other digital products: the assets you create with IMLS funding require careful stewardship to protect and enhance their value. They should be freely and readily available for use and re-use by libraries, archives, museums and the public. Applying these principles to the development of digital products is not straightforward; because technology is dynamic and because we do not want to inhibit innovation, IMLS does not want to prescribe set standards and best practices that would certainly become quickly outdated. Instead, IMLS defines the outcomes your projects should achieve in a series of questions; your answers are used by IMLS staff and by expert peer reviewers to evaluate your proposal; and they will play a critical role in determining whether your grant will be funded. Together, your answers will comprise the basis for a work plan for your project, as they will address all the major components of the development process.

Instructions:
If you propose to create any type of digital product as part of your proposal, you must complete this form. IMLS defines digital products very broadly. If you are developing anything through the use of information technology – e.g., digital collections, web resources, metadata, software, data– you should assume that you need to complete this form.

Please indicate which of the following digital products you will create or collect during your project.
Check all that apply:

Every proposal creating a digital product should complete …	Part I
If your project will create or collect …	**Then you should complete …**
☐ Digital content	Part II
☐ New software tools or applications	Part III
☐ A digital research dataset	Part IV

PART I.

A. <u>Copyright and Intellectual Property Rights</u>

We expect applicants to make federally funded work products widely available and usable through strategies such as publishing in open-access journals, depositing works in institutional or discipline-based repositories, and using non-restrictive licenses such as a Creative Commons license.

A.1 What will be the copyright or intellectual property status of the content you intend to create? Will you assign a Creative Commons license to the content? If so, which license will it be? http://us.creativecommons.org/

A.2 What ownership rights will your organization assert over the new digital content, and what conditions will you impose on access and use? Explain any terms of access and conditions of use, why they are justifiable, and how you will notify potential users of the digital resources.

A.3 Will you create any content or products which may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities? If so, please describe the issues and how you plan to address them.

Part II: Projects Creating Digital Content

A. Creating New Digital Content

A.1 Describe the digital content you will create and the quantities of each type and format you will use.

A.2 List the equipment and software that you will use to create the content or the name of the service provider who will perform the work.

A.3 List all the digital file formats (e.g., XML, TIFF, MPEG) you plan to create, along with the relevant information on the appropriate quality standards (e.g., resolution, sampling rate, pixel dimensions).

B. Digital Workflow and Asset Maintenance/Preservation

B.1 Describe your quality control plan (i.e., how you will monitor and evaluate your workflow and products).

B.2 Describe your plan for preserving and maintaining digital assets during and after the grant period (e.g., storage systems, shared repositories, technical documentation, migration planning, commitment of organizational funding for these purposes). Please note: Storage and publication after the end of the grant period may be an allowable cost.

C. Metadata

C.1 Describe how you will produce metadata (e.g., technical, descriptive, administrative, preservation). Specify which standards you will use for the metadata structure (e.g., MARC, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

C.2 Explain your strategy for preserving and maintaining metadata created and/or collected during your project and after the grant period.

C.3 Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content created during your project (e.g., an Advanced Programming Interface, contributions to the DPLA or other support to allow batch queries and retrieval of metadata).

D. Access and Use

D.1 Describe how you will make the digital content available to the public. Include details such as the delivery strategy (e.g., openly available online, available to specified audiences) and underlying hardware/software platforms and infrastructure (e.g., specific digital repository software or leased services, accessibility via standard web browsers, requirements for special software tools in order to use the content).

D.2 Provide URL(s) for any examples of previous digital collections or content your organization has created.

Part III. Projects Creating New Software Tools or Applications

A. **General Information**

A.1 Describe the software tool or electronic system you intend to create, including a summary of the major functions it will perform and the intended primary audience(s) the system or tool will serve.

A.2 List other existing digital tools that wholly or partially perform the same functions, and explain how the tool or system you will create is different.

B. Technical Information

B.1 List the programming languages, platforms, software, or other applications you will use to create your new digital content.

B.2 Describe how the intended software or system will extend or interoperate with other existing software applications or systems.

B.3 Describe any underlying additional software or system dependencies necessary to run the new software or system you will create.

B.4 Describe the processes you will use for development documentation and for maintaining and updating technical documentation for users of the software or system.

B.5 Provide URL(s) for examples of any previous software tools or systems your organization has created.

C. <u>Access and Use</u>

C.1 We expect applicants seeking federal funds for software or system development to develop and release these products as open source software. What ownership rights will your organization assert over the new software or system, and what conditions will you impose on the access and use of this product? Explain any terms of access and conditions of use, why these terms or conditions are justifiable, and how you will notify potential users of the software or system.

C.2 Describe how you will make the software or system available to the public and/or its intended users.

Part IV. Projects Creating Research Data

1. Summarize the intended purpose of the research, the type of data to be collected or generated, the method for collection or generation, the approximate dates or frequency when the data will be generated or collected, and the intended use of the data collected.

2. Does the proposed research activity require approval by any internal review panel or institutional review board (IRB)? If so, has the proposed research activity already been approved? If not, what is your plan for securing approval?

3. Will you collect any personally identifiable information (PII) about individuals or proprietary information about organizations? If so, detail the specific steps you will take to protect such information while you prepare the research data files for public release (e.g. data anonymization, suppression of personally identifiable information, synthetic data).

4. If you will collect additional documentation such as consent agreements along with the data, describe plans for preserving the documentation and ensuring that its relationship to the collected data is maintained.

5. What will you use to collect or generate the data? Provide details about any technical requirements or dependencies that would be necessary for understanding, retrieving, displaying, or processing the dataset(s).

6. What documentation will you capture or create along with the dataset(s)? What standards or schema will you use? Where will the documentation be stored, and in what format(s)? How will you permanently associate and manage the documentation with the dataset(s) it describes?

7. What is the plan for archiving, managing, and disseminating data after the completion of research activity?

8. Identify where you will be publicly depositing dataset(s):

Name of repository: _____

URL: _____

9. When and how frequently will you review this data management plan? How will the implementation be monitored?

Original Preliminary Proposal

Preliminary Project Proposal
Mukurtu Hubs and Spokes: A Sustainable National Platform for Community Digital Archiving

Building on the success of a previous National Leadership Grant, we are applying as part of the National Digital Platform to advance Mukurtu CMS: a free and open source content management system and community archive built in partnership with indigenous communities to manage and share digital cultural heritage. Leading the development of the Mukurtu CMS platform over the last five years at the Washington State University (WSU) Libraries and working with Tribal archives, libraries, and museums (TALMS) nationally, we recognize the profound need to ensure Murkurtu's sustainability and expand its current features to meet the needs of Mukurtu's diverse community of users. With confirmed partners at the University of Hawaii, Department of Linguistics, the University of Oregon Libraries, the University of Wisconsin's SLIS program, the University of British Columbia's Museum of Anthropology, and Yale University's Beinecke Rare Book & Manuscript Library, we propose to establish five **regional Mukurtu Hubs** that will contribute to the development and deployment of Mukurtu CMS to tribal archives, libraries, and museums during the grant period and afterward will provide training and support to these and other regional TALMS—the **Spokes**. By building capacity through these **regional Mukurtu Hubs,** we will create a **sustainable national platform** built directly from community needs that uniquely addresses the ethical curation of, and access to, cultural content.

This proposal grows from national conversations around digital tool building, sustainability, and the technological needs of diverse communities. At an IMLS forum in 2014, Tom Scheinfeldt, suggested that: "Innovation can't just mean new, it has to be somehow useful and implemented, especially by others...A model without someone implementing the model is not really a model at all, and that's especially true in the digital tools realm." Scheinfeldt's critique is apt. An emphasis on innovation in technology must be accompanied by a clear definition of usability, the need to spur adoption and engagement and the long-term necessity for technological platforms to be maintained, extended, and updated in an iterative fashion. Similarly, the 2015 IMLS Focus Report on the National Digital Platform reaffirmed the need to put users at the center of platform building and engage meaningfully with diverse communities nationally—especially those who have been underserved and underrepresented. This proposal addresses those needs.

With our first National Leadership Grant, we built the Mukurtu platform to a 2.0 release as open source software fully documented on GitHub. We found through this process that while the standard open source model provides an avenue for growing a development community, Mukurtu users do not have the resources, infrastructure, and programming skills to contribute to Mukurtu's development in the same way as other open source platforms. Recognizing that these differences are based on limited resources, and an underrepresented set of users, the Hubs and Spokes model we propose addresses this by maintaining the technical foundation of the Mukurtu platform at WSU and leveraging the Hubs to provide support and outreach. As part of this proposal, the Hubs will work directly with regional TALMs (the Spokes) using WSU's assessment workflow to document feature and functionality needs through user testing and on-going training modules. Uniting this community development model with regional Hubs and a commitment to sustain the software at WSU provides a sustainable model for the Mukurtu platform after the grant period.

During our first development phase (2011-2014) the uptake of Mukurtu CMS by indigenous communities globally outpaced our expectations. Our online Mukurtu community engagement program now has over **500** members with more than **200** installations, demos, and test sites of Mukurtu CMS. We have also partnered with national, regional, and local non-native institutions to use Mukurtu CMS to return digital collections back to TALMs and increase the ethical access to their collections. During this first development and deployment phase, with a small staff and budget, we grew exponentially and documented the profound need of TALMs to have a technological and culturally responsive platform for digital heritage stewardship. The first phase of work built the platform and defined core needs, this second phase will ensure the extension and sustainability of the platform.

Performance Goals and Outcomes

The work plan will follow a cyclical approach to development through community engagement. Each of the Mukurtu Hubs will engage in three rounds of Mukurtu CMS platform development and testing by: 1) facilitating user-testing at their institutions, 2) creating a detailed sets of "user stories," for Mukurtu engineers and 3) working directly with Mukurtu engineers to define and refine specific functionality and features for Mukurtu 3.0. Years one and two of the grant cycle will be divided into thirds with user-testing on-site at the Hubs, creation of needs requirements by the Hubs in partnership with the WSU team, followed by software development and finally deployment of the new features to the Hubs and Spokes. Year three will focus on documentation and deployment of a 3.0 release of Mukurtu CMS. The software will continue to be maintained and managed by WSU after the release. This iterative process builds on our method to date and adds in the Hubs for a more in-depth approach to the "community centered software development" model used successfully to bring Mukurtu to its current 2.0 version. The outcome will be well defined "user stories" that allow Mukurtu software engineers and designers to target development. For this phase **each Mukurtu Hub will be responsible for contributing to the completion of a core feature to Mukurtu CMS** and extending Mukurtu's reach by up to five Spokes.

Our work plan and outcomes are aimed at producing a **sustainable platform and model** for digital stewardship of cultural materials. At the completion of the grant our regional Hubs will have the skill sets, technological base, and networks to facilitate the on-going use of Mukurtu. To ensure the sustainability of the Mukurtu digital platform we have two related outcomes: 1) growing platform adoption through local installations and our cloud-hosted .net service and 2) structuring the software management at WSU. First, Mukurtu.net—a cloud hosted service with a unique "zero-subscription" model—offers TALMs a one time fee based on their needs and projected growth. This model caters to TALMs who cannot commit to yearly subscription fees. Secondly, to maintain the platform's integrity and ensure its timely updates, Mukurtu will be supported organizationally by the Center for Digital Scholarship and Curation (CDSC) at WSU. Established in 2014, the CDSC has dedicated space, personnel, and funds to maintain Mukurtu CMS. After the grant period WSU will commit to permanent funding for a dedicated developer and will continue with digital stewardship training through our Sustainable Heritage Network—providing both virtual and hands on educational resources to TALMs.

Potential Impact

Mukurtu CMS is a disruptive technology in the best sense of the phrase. Wedging its way into library school curricula, university library research models, national archives' access protocols, and TALMs, Mukurtu is at the center of a new ethical and collaborative model for carrying out the hard work of digital preservation, management, and curation. As Mukurtu's Project Director for the last eight years, I have seen how this "tool" has created both a platform for managing digital heritage across divergent communities and a space for collaborations between national repositories and TALMs. In this next phase the impact of Mukurtu Hubs and Spokes will be measured through 1) the creation and extension of Mukurtu's existing features based on Hub inputs, 2) a Mukurtu 3.0 release fully managed and maintained at WSU Libraries, 3) five regional hubs providing services to TALMs as the spokes and 4) a robust .net service to provide a reliable service model. In this way, the software will be sustainable, and importantly, Mukurtu's community of users will also be nurtured through on-going regional support.

Estimated Budget

This project has three main budget categories: 1) platform development and engineering at WSU, 2) dedicated staff positions at each regional Hub for testing and outreach, and 3) travel and Hub meetings. The budget includes the partners as sub-awardees with WSU as the fiscal agent. With our five national partners, the total budget we estimate requesting is $650,000, roughly 2/3 of the total will go to support the hubs and the remainder to WSU for development and deployment. Washington State University and our Mukurtu Hubs will provide a one to one in-kind cost share.