Preservation and Management of Aboriginal Cultural Heritage Resources in the Information Society: An Outline of the Solution through Emerging uses of ICTs

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The goal of this exploratory study is to identify the methods and resources that can help create an information system for cultural heritage resources of an indigenous community. As they live in secluded, self-contained groupings and are completely different in terms of culture and ethnicity from modern cultures, the aboriginal peoples, who were India's first residents, are the least developed in terms of economic development and social standing.The management of cultural heritage resources can best be accessed and experienced when they are in operational condition, as it requires consideration of the lives and living conditions of local communities. Throughout history, many indigenous cultures have either disappeared or have been marginalised to the point of extinction due to colonisation, ignorance of modern civilizations, etc. This paper describes the creation and design of a prototype digital indigenous or aboriginal cultural heritage archive, as libraries, archives, and museums are capable of preserving, disseminating, and reusing such indispensable resources. Only open source software and open standards are being used as technical equipment to carry out this study. This prototype comprises the native indigenous community cultural heritage resources of the Rabha tribal group of the Eastern part of India as a proof of concept and considers the necessity of integrating such a system with the traditional library retrieval system for complex information management needs.

Introduction

One of the oldest civilizations in the world, India has a long history that spans more than a thousand years and has affected its philosophy, literature, architecture, art, and music. It has also been influenced by the blending of cultures among Hindus, Muslims, Buddhists, Jains, Sikhs, and diverse tribes. Being a multilingual, multicultural, and multiethnic nation, India observes varied kind of mainstream as well as tribal festivals and rituals. As for examples, Indians celebrate Durga Puja, Kali puja (Diwali), Bhatridwitiya (Bhai Dooj),Eid al-Fitr, Eid al-Adha, Christmas, Good Friday as mainstream festivals, along side Dree, Baneshwar, Kailpoldu, Karama Puja, Sarhul, Thisam Phanit, Dandari Dance as tribal galas. It so happens that where Bengali Hindus celebrate Kali Puja, their counterparts in North India celebrate Deepavali, the festival of light to commemorate the homecoming of Shri Ramchandra after completing fourteen years of exile. At the same time, the Sikhs observe the emancipation festival of their sixth saviour, Hargobinda. The Jain peoples observed the day to mark the renunciation of Mahaveer. In the south of India, beyond the Vindya mountain, the commemoration of the destruction of Narkasur is observed, and in Nepal observe ‘tihar’, which is called minutes in Dosein, with the worship of Devi Laxmi. The radiance of the festival is present all over the land among all the sects, although with little difference. In India, the subcontinent can never be judged only by the aspect of Dipawali.

This identical festival with a pinch of variations has kept India tied together for ages. India and her culture are best described by their diversity; it is the tune that triumphs over all else. Thus, the stream of symmetry rails down and will roll down over the land of diversity. The vastness of India can never be defined with a limited view or reasoning.

Numerous tribal groups exist in various regions of India, including the Khasi, Naga, Garo, Santal, Mizo, Rabha, Ho, Bhil, Oraon, Munda, and Andamanese, among others. These groups have all been grouped together as a single entity in a schedule to Article 366 (25) of the Indian Constitution, known as the "Scheduled Tribes" (tribal.nic.in/ST/LatestListofScheduledtribes.pdf). Indigenous people have gained knowledge about medicinal and poisonous plants, making hunting weapons, the best time to sow weed for agriculture, using musical instruments, celebrating their rituals, and other topics through experience, learning, practise, and transmission from one generation to the next. Britz and Lor (2003) asserted it is typically suppressed, ignored, or neglected by the general public; where Sarkhel (2011, 2016) explained despite the fact that academics and research scholars are extremely interested in indigenous cultural heritage knowledge. 'When a knowledgeable or old person dies, a whole library disappears' (Manning, 2001), as oral histories are crucial for understanding civilizations and social customs around the world, where these can be preserved and conserved in libraries in a variety of ways, including music, stories, and personal experiences, etc. Many libraries have launched projects to protect indigenous cultural heritage information, As for examples, the New York Public Library maintains the Schomburg Center for Research in Black Culture (nypl.org/locations/schomburg), the World Heritage and Indigenous Peoples (whc.unesco.org/en/activities/496), the Smithsonian Center for Folklife and Cultural Heritage (folklife.si.edu), the Arctic Megapedia (arctic-megapedia.com), Sahapedia (sahapedia.org) and too many to say. Miriam (2012) argued that the Tribal Archives, Libraries, and Museums (TALMs) should take care cultural and ethical values into account while developing digital preservation plans for their indigenous collections because digitizing them is both a unique challenge and a practical process.

Niyogi (2021) argued for "The country has the highest number of Indigenous peoples in the world after Africa. As tribes uphold unique cultures, their preservation is vital at a time when a specific national cultural discourse is growing stronger […] there is a need to explore the tribal consciousness in the backdrop of climate change, development, and deforestation". An integrated, user-friendly, harmonised, advanced, unified, and traditional knowledge (TK) label based TALM retrieval system is constantly needed in our country since these indigenous cultural heritage resources are in grave risk of being lost for all time in the absence of well-suited open source software support, especially for indigenous communities, the complexity of domain-specific open metadata standards for cultural objects, and a lack of awareness and adequate maintenance, as well as the fragility of the medium they are kept in. Every year on August 9, the International Day of Indigenous Peoples is observed.

2. Objectives

In order to navigate, transmit, and transition indigenous knowledge smoothly amongst researchers, this study primarily displays the management of digital indigenous cultural heritage artefacts with their appropriate traditional knowledge (TK) labels and licences platforms. These may be listed as below:

- To explore the possibility of utilizing open-source digital asset management software for archiving indigenous community cultural resources and to identify the most effective open-source solution to achieve the stated goal;
- To design a sophisticated, harmonised, and traditional knowledge (TK) labels based digital asset management platform for indigenous community cultural heritage resources based on a specific cultural community with the help of the selected software.

3. Rabha tribes – indigenous cultural community

In India, tribes are referred to as "adivasis" which denotes that they are the original inhabitants of the nation and the progenitors of its indigenous or aboriginal peoples, who exhibit a special, varied, and distinctive culture. A rich, beautiful, varied, distinctive, and colourful indigenous socio-cultural heritage of the Rabha tribes includes rituals and customs, hand-woven clothes and jewellery, musical instruments, seasonal, agricultural, and religious festivals, as well as performances and other activities. Tribal cultures and their socio-religious practises have evolved as a result of modernization, westernisation, and to some extent acculturation, and are now in danger. The few remaining forests and ecological hot spots in our country are primarily protected by the Rabhas (together with other tribes as well). The Rabhas, who are the closely connected communities of Tibeto-Burmans, are mostly found in the three states of Assam, Meghalaya, and West Bengal in our country(Joseph, 2006; Sarkar, 2015). Among them, almost all the Rabhas in West Bengal lived in the Dooars (Alipurduar district), and they called themselves as Koch-Rabha (Joseph, 2006; Basumatari, 2010). The Rabha community, like other indigenous communities, has suffered greatly as a result of the deaths of many old, experienced, and knowledgeable members of this community, as their indigenous cultural traditions are primarily based on oral histories.

4. Review of literature, and overview of systems and services

The previous few decades have seen changes to information management procedures due to local issues. Therefore, new research and studies in archival management promote the redesign of record-keeping structures and contribute to the creation, testing, and application of techniques and tools for current indigenous cultural heritage archival policies and practises that meet present-day societal demands and expectations.

According to Pereira (1912), the word 'Rabha' or 'Rava' was first used in a Farsi book, namely, 'Baharistane Ghayebee' (1608–1624), written by Mirja Nathan Alauddin. According to Roy (2016), the Rabhas have a well-established culture, have a mother tongue that is a dialect known as 'Kochakrou', and have recently created their own script for the writing system. Several songs, folktales, poetry, diverse mythologies, idioms, proverbs, etc. are present in their literature. But their literacy rate is comparatively very low, and they did not place more priority on formal education. Mandal and Sengupta (2016) reported that Rabhas are very good handloom weavers. The Rabhas play a variety of native musical instruments, most of which are constructed

of bamboo (Mandal & Roy, 2013). There are mainly four types – a) tam-tam or 'dhol', b) gong or 'kansi', c) flute or 'banshi', and d) string musical instruments or 'badung dukpa'.

In the "3D-ICONS project" Discovery Program, which is co-funded by the European Union, Corns et al. (2015) conceptualised the difficulties in the creation of a public access digital portal comprising of 3D reconstructions of historical sites and historic structures. In his discussion on the benefits of locally produced cultural theatre, Costa (2019) emphasised the significance of the Budhan Theatre (an adivasi theatre troupe). As Hossain (2019) emphasized, the indigenous peoples of India play a crucial part in the creation of cultural heritage, and their innate traditional culture is regarded as a national asset. In order to conserve the indigenous cultural knowledge base, Kalita and Deca (2020) developed an ontology for traditional 'Rabha' dance.Holton (2012) discussed specially designed two digital archives for indigenous communities – the Association of Newfoundland and Labrador Archives (ANLA) (anla.nf.ca) in Newfoundland and Labrador, and the California Language Archive (CLA) (cla.berkeley.edu) for documentation and preservation of indigenous languages at the University of California, Berkeley. The collection of many kinds of anthropological artefacts from various ethnic groups in Thailand may be found at the Princess Maha Chakri Sirindhorn Anthropology Center's (SAC) Digital Archive (sac.or.th/portal).

Besides, a government organisation in Thailand called the National Electronics and Computer Technology Center (NECTEC) (navanurak.in.th) archives information in digital form primarily connected to the artistic and cultural artefacts of regional museums in this country. Last but not least, another excellent example of a digital cultural heritage archive (cimcc.info) was created by the California Indian Museum and Cultural Center (CIMCC), which uses Mukurtu as an archival management software with a variety of resources, including oral history, language, biographies, storytelling, etc.

5. Methodology

The methodology of this study is divided into three main sections – i) choosing the most effective traditional knowledge (TK) label based Digital Archival Management Software (DAMS); ii) implementation of that DAMS – Mukurtu; and iii) development of a digital archive of the Rabha community with the help of the implemented Mukurtu.

5.1. Choosing the most effective solution

An effective content management system (CMS) or asset management system is a web-based, multi-user software program that interacts with content that is kept in a repository and offers some level of automation for the duties necessary. For example, only open-source CMSs have been taken into consideration for this study, like Drupal Core (first released in May 2000 by Dries Buytaert; current version is 7.88), WordPress (first released in May 2003 by Mat Mullenweg and Mike Little; current version is 5.9), Joomla (first released in September 2005 by Mambo; current version is 4.1), Mukurtu CMS (first public version 1.5 released in 2012 by The Andrew W. Mellon Foundation with the Institute of Museum and Library Services; current version

is 3.0.1), Omeka (released in February 2008 by Roy Rosenzweig Center for History and New Media, current version is 3.0.1), etc. Table 1 shows a quick comparative analysis of these five well-known web-based DAMS solutions, but it does so based on some potential features that the tools may offer and which are necessary for the technological functionalities and architectural layout of this study. (Here, 1.0 = fully supported; 0.5 = partially supported; 0 = not available)

Table 1: Comparison among selected five popular DAMSs

Evaluation Criteria	Drupal Core	WordPress	Joomla	Mukurtu	Omeka
1. Flexibility of interface	1.0	1.0	1.0	1.0	1.0
2. Metadata support (domain-oriented)	0	0	0	1.0	0.5
3. Finding Aid available	0	0	0	1.0	0
4. Authority record support	0	0	0	1.0	1.0
5. OAI-PMH enable	0	0	0	0.5	1.0
6. TK labels provide	0	0	0	1.0	0
7. Advanced retrieval features	0.5	0.5	0.5	0.5	1.0
8. Backend software (as open-source)	1.0	0.5	1.0	1.0	1.0
9. Media format support	1.0	1.0	1.0	1.0	1.0
10. Scalability and interoperability support	0	0	0	0.5	1.0
Total score	**3.5**	**3.0**	**3.5**	**8.5**	**7.5**

According to this analysis, Mukurtu has secured the highest marks because it offers more precisely tailored features than the other tools of a similar nature, whereas Omeka is a close second to the first one in terms of scoring. A user-friendly and flexible interface (for both administrators and users), domain-oriented metadata for indigenous archival objects, appropriate finding aid support, compatibility with various traditional knowledge (TK) labels of indigenous communities, and a relational database and linked data management system (to make contextual relationships amongst items and agents) are some of Mukurtu's distinctive features. That is why Mukurtu has finally been chosen to develop the prototype of the indigenous community cultural heritage archive.

5.2. Features of Mukurtu

This open source (GNU-GPL)web-based digital archival management software, 'Mukurtu', is used to manage digital cultural heritage resources that may be downloaded from github (github.com/MukurtuCMS/mukurtucms). The word 'Mukurtu' or 'MOOK-oo-too' in the Warumungu or Warramunga language of Australia means 'dilly bag', which means – a receptacle for the protection of sacred objects that the elders

protected as part of their duties to look after their communities, family, lands, and ancestors (Christen, Merrill, & Wynne, 2017). Although this software's capabilities are mostly focused on images and documents, it is quite versatile and compatible with a variety of media formats.

"Mukurtu's heart and soul is protocol. Everything else radiates out from there" (Christen, 2012, 2015). For fine-grained management of access within the archive, Mukurtu offers customised cultural and sharing protocols which are used for proper sharing of knowledge about place names, resource rights, ancestry, territory, spiritual powers, and other indigenous community cultural information (such as songs, legends, folktales, etc.) (Suttles, 1987; Thom, 2003; Miller, 2007). One good example is the Plateau Peoples' Web Portal (plateauportal.libraries.wsu.edu) for managing the cultural protocols. Table 2 depicts some of the core qualities of Mukurtu are –

Table 2: Some salient features of Mukurtu

Parameter	Features
Interface	Mukurtu's admin interface is designed for uploading digital files (images, documents, audio-visual, etc.), organizing, and disseminating cultural heritage objects. It provides browsing by digital heritage as well as cultural community, browsing by geo-location, advanced search, simple search, etc.
Access	Certain communities may stand in for certain cultural groupings. The top categories in Mukurtu for restricting access begin with the creation of groups and the parameters that are applied to them. User-level permissions are the next level of control access, where people may be connected to communities but have their access limited to a particular group. In order to get relevant, unconstrained content (referred to as 'digital heritage') with compatible protocols, users may have distinct cultural protocols linked to their accounts, limiting access by gender, family, etc.
Licensing	Mukurtu uses two different types of licencing – i) own traditional knowledge (TK) 20 licencing for using 'digital heritage' more specifically and granularly based on the cultural, social, and linguistic needs of tribal communities that enables local-protocol driven access and dissemination of metadata and material determined by each community (Hughes, 2017); and ii) Creative Commons (CC) 6 licencing for limiting or allowing commercial use.

The Traditional Knowledge (TK) labels give indigenous communities a way to describe regional and local circumstances for recognising, clarifying, and sharing community-specific guidelines for using, exchanging, and disseminating traditional knowledge and data, and to add missing information and correct historical mistakes in the form of cultural protocols about digital cultural heritage materials in the public domain. These are used for tagging digital educational content only, without any copyright or legal matters. These

encourage the incorporation of regional norms for gaining access to and utilising cultural content that is disseminated digitally outside of local communities. Here, Mukurtu enables these traditional knowledge (TK) labels with cultural narratives for narrative-based descriptions. A total of twenty TK labels have been separated into three major groupings. Table 3depicts the detailed categorization of TK labels, and Figure 1displays the names along with icons of all TK labels.

Table 3: categorization and groupings of all TK labels

TK labels	Description	Components
Provenance	to identify the primary cultural authority for the material and recognise other interested groups	TK A, TK CL, TK F, TK MC, TK CV, TK CR
Protocol	to comprehend traditional protocols associated with the material and to draw significance from community protocols	TK V, TK NV, TK S, TK WG, TK MG, TK MR, TK WR, TK CS, TK SS
Permission	indicates generally approved activities by the communities	TK OC, TK NC, TK CO, TK O, TK CB

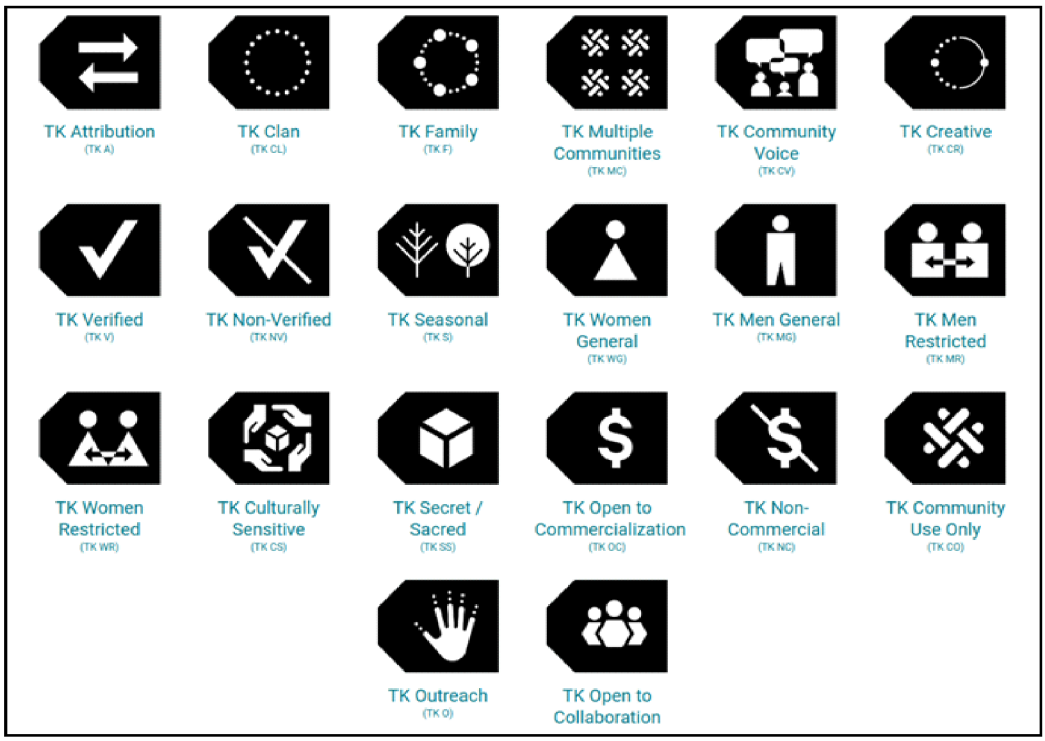

Figure 1: Names of twenty TK labels along with their icons (localcontexts.org)

5.3. Architecture of Mukurtu

Three core elements ("3C's") that have been used in Mukurtu are the 'Communities' ('the WHO', different tribal or aboriginal groups, specific families or clans, etc. may be taken as examples), the 'Cultural Protocols' ('the HOW', examples are tribal or clan affiliation, public access or community access only, etc. may be considered), and the 'Categories' ('the WHAT', paintings, architecture, artifacts, language, etc,) to identify required resources easily. If required, more than one community may be present at a Mukurtu site. The 'Cultural Protocols' are created within a community to provide more granular access and management of pertinent digital cultural community heritage materials to users. One community may be divided into different 'Cultural Protocols', which are mainly two types – open protocols (objects can be viewed by any user); and strict protocols (only related members can access). Finally, all community cultural heritage (digital) objects in Mukurtu must belong to 'Categories' that reflect the scope of objects through high-level descriptive terms. These "3C's" are the prerequisites for building any community record in Mukurtu. Figure 2 depicts the "3C's", where community is 'Rabha Community', theprotocol is 'People – Rabha Community', and the category is 'Rabha artifact'.

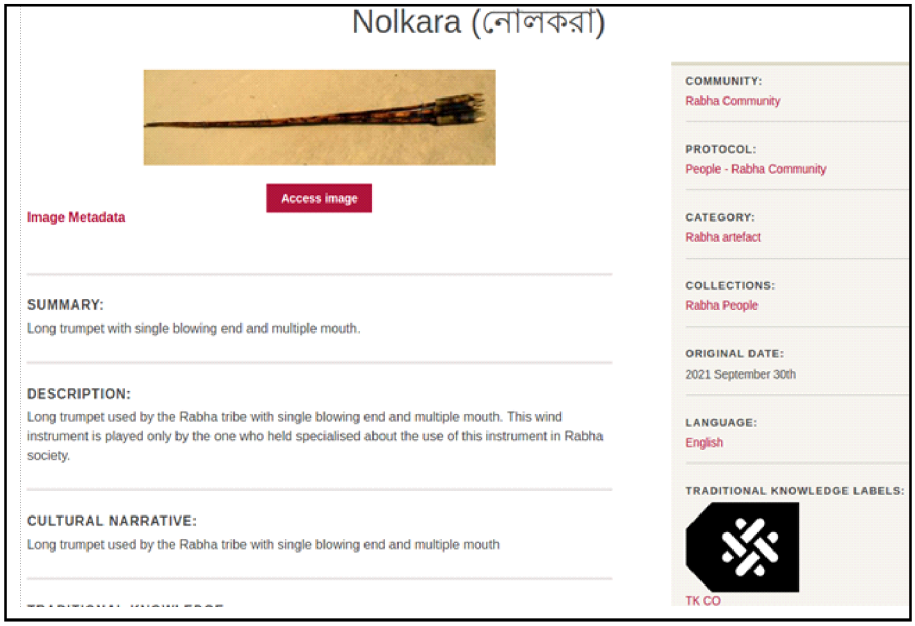

Figure 2: Details of the "3C's" of this indigenous cultural community archive

5.4. Content development of archival materials

This prototype of an indigenous community resource management system has been created using only open source software and open standards, and its platform is primarily based on the LAMP (Linux, Apache, MySQL, PHP) architecture —

Table 4: A brief details of basic technical equipment

Tool	Task
Ubuntu 20.04 LTS	Linux based operating system (for overall management)
Apache 2.4.41	as web server, supports PHP
MySQL 5.7.31	back-end Relational Database Management System (RDBMS)
PHP 7.4.18 with curl extension	as programming environment for different components
Mukurtu 3.0.1	used as digital assets management software
JQuery library 1.10	for different types of transition effects (pause-on-hover, etc.)
Leaflet Javascript library 0.7.7	used to build web based interactive map applications
Colorbox plugin 1.6.4	enlarge the media file size without leaving the given page

After successful installation and configuration of the basic technical equipment as listed in Table 4, the first logical step is to create the 'community', then to create the relevant 'cultural protocol' within the community, and thirdly, define the 'category'. But the most important task is to develop the content of 'digital heritage' items which are the actual digitised manifestation of the original indigenous community cultural heritage objects.

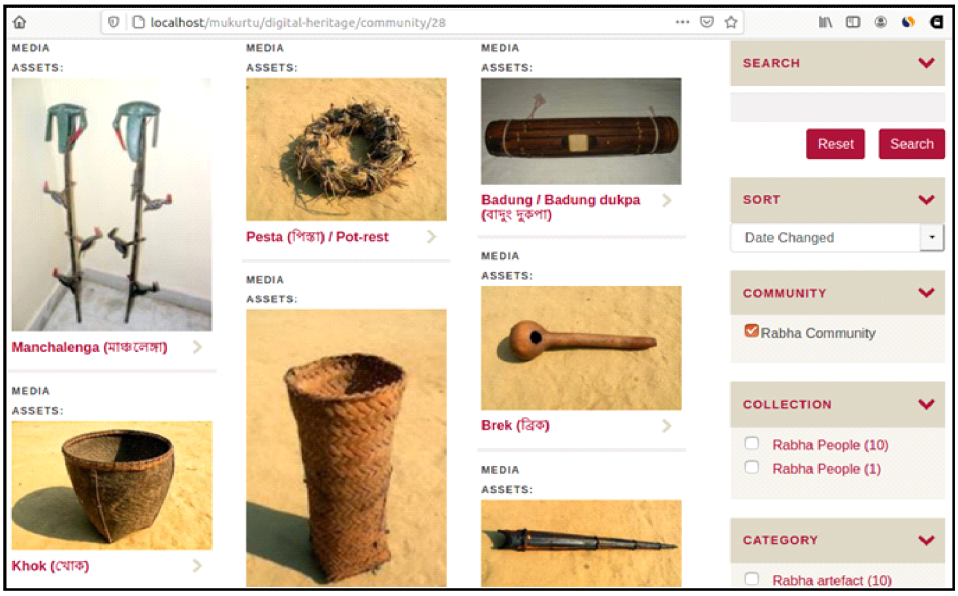

Figure 3: End user interface of Mukurtu (Rabha community)

The glimpse view of the data management workflow in Figure 3 displays the public user interface of this indigenous heritage archive in a grid view of Mukurtu. Users may retrieve their relevant resources by browsing the required communities, collections, categories, protocols, and media types that are listed in the right-hand column of the user interface.

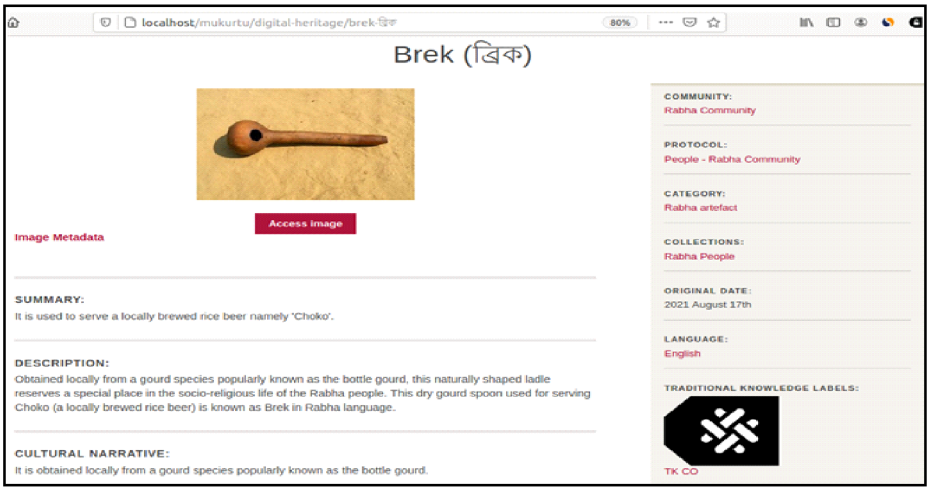

Figure 4: Content designations of a 'digital heritage' item

Furthermore, Figure 4 consists of the details of a 'digital heritage' item (#digital-heritage/brek) in Mukurtu. Like, the image and name of the cultural heritage item (brek), its metadata and description, cultural narrative, summary, etc. This interface also shows the distinguishing feature of Mukurtu, the TK levels (Ungsitipoonporn & Watyam, 2021).

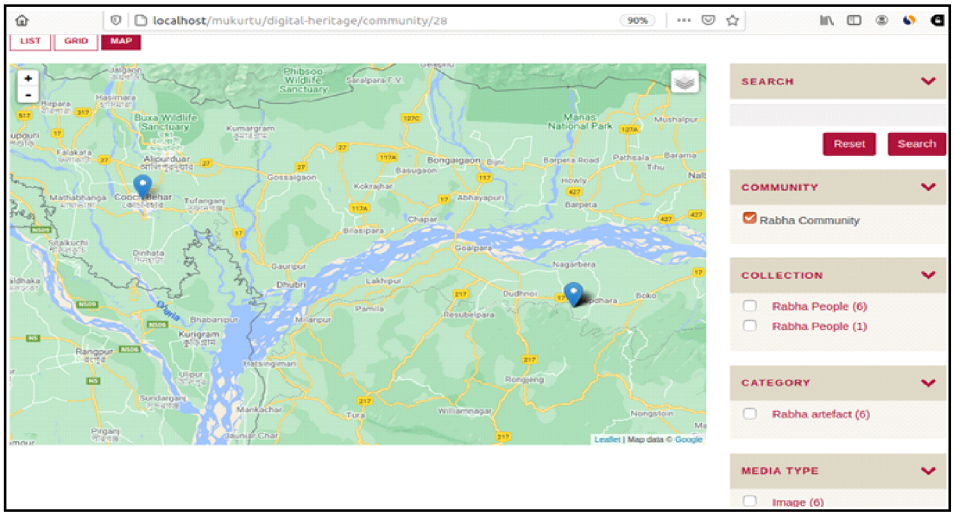

Figure 5: Geo-location based browsing interface

As discussed above, Figure 5shows the geo-location based browsing of the dwelling places of the Rabha community in Mukurtu.

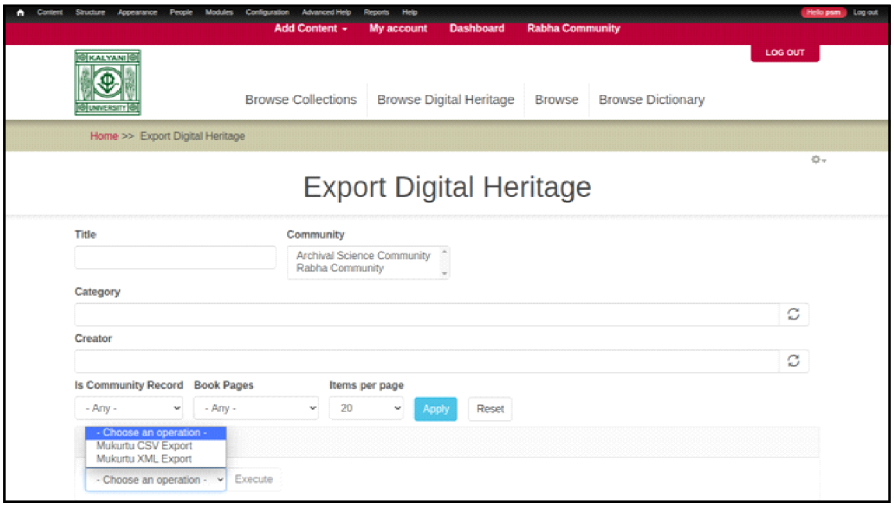

Figure 6: Community data export facility

6. Conclusion

A system like this for managing indigenous community cultural heritage resources will help those affected by past and current actions and policies as they work toward healing and reconciliation. One of the main goals of this study is to give indigenous people the chance to include their oral histories and other cultural heritage items into archives, thereby increasing access to previously inaccessible information. A very goodweb-portal on Tribal Art & Culture, namely, 'Janapada Sampada' (ignca.gov.in/divisionss/janapada-sampada/tribal-art-culture) is developed and maintained by The Indira Gandhi National Centre for the Arts (IGNCA) regarding this.This prototype of an indigenous community digital archive yields cultural resources of the Rabha tribes that have been implemented for ethnic community groups, academicians, and scholars, as well as all interested users with the help of Mukurtu CMS. The user interface of Mukurtu makes it very easy to search and browse for required resources through various search parameters, as well as the entire collection development workflow in the administrative interface is also simple enough. While Mukutu does not completely support OAI-PMH, administrators can export (Figure 6) the digital heritage objects in XML-structured Dublin Core (DC) or Metadata Object Description Schema (MODS) to harvest these objects in any open source resource discovery software (like, VuFind) to improve the search capabilities (Dutta & Mukhopadhyay, 2022).

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