

Building OER Curriculum-Alignment Networks Across States and Higher Education Libraries

Institute for the Study of Knowledge Management in Education (ISKME)

1. Statement of National Need

ISKME's OER work over the last decade, including our IMLS-funded initiatives, has revealed that a principal barrier to OER use by educators is the difficulty in finding the resources that they need. Existing OER platforms, including the Open Textbook Network, ISKME's own OER Commons, and a growing number of institutional OER repository projects (including the IMLS-funded Hyku project) provide access to high quality OER. However, these OER often do not include metadata on learning outcomes or alignment to local course requirements—making the task of identifying relevant OER time consuming and ineffective for the faculty end user. In response to this, ISKME has worked with Louisiana Library Network (LOUIS), Virtual Library of Virginia (VIVA), and OhioLINK Libraries over the past two years to provide OER repositories where their enlisted faculty and library staff work to align OER to their statewide course matrices. While the resources curated through this process helps to alleviate some of the burden for subsequent faculty in discovering OER, the consortia have cited the following challenges related to faculty use of the curated resources, and the sustainability of the model overall:

- The enlisted group of library staff and faculty reviewers are unable to sustain the current level of curatorial support for finding, aligning, and maintaining OER for their centralized OER repositories. Furthermore, in the long term, their limited library staff at the consortia-level will be unable to sustain the level of OER curation support and guidance they are providing across the state;
- The curated collections that result from the process do not enable faculty users to efficiently identify how well the OER aligns to local course requirements or to understand what adaptations are needed to meet those requirements. Faculty end users also lack social endorsement of material quality by way of peer feedback and reviews of the resources;
- While full, textbook-level OER resources are now more discoverable for faculty, identifying and sharing OER resources in smaller content chunks (such as lectures, slides, videos, and assessments) remains challenging due to lack of standards and coordination in metadata tagging strategies; and
- Overall, the three consortia are not able to grow their own collections by leveraging the work of their peers because their process lacks an efficient way to ingest OER being curated by each other and by external OER repositories.

Recognizing some of these challenges, national initiatives such as the OER Discovery Working Group facilitated by SPARC (the Scholarly Publishing and Academic Resources Coalition) and the Next Generation Repositories Project facilitated by COAR (Coalition of Open Access Repositories) are working to develop metadata and technical infrastructure to support the exchange of OER across repositories. Additionally, the Center for Applied Special Technologies (CAST) and the National Center on Accessible Educational Materials (AEM) are working, with support from ISKME, to build enhanced protocols and metadata for OER exchange—specifically focused on accessibility of content for students who need learning accommodations. At a regional level, the IMLS-funded Hyku project is working to support academic libraries across Indiana, Pennsylvania, New Jersey, West Virginia, and New York by building a shared technical infrastructure for exchanging digital collections. While the work of these initiatives informs design of underlying architectures for OER repositories, additional work is needed to map the curatorial requirements and process steps involved in identifying, evaluating, and maintaining OER collections from disparate repositories that meet the needs of local faculty end users.

Over the past six months, ISKME has begun to engage LOUIS, VIVA, and OhioLINK in a pilot to enable more

efficient and scalable cross-consortia sharing. The pilot work has entailed manual crosswalking of individual course names and numbers within the three separate VIVA, LOUIS, and OhioLink course catalogues, and by using an ISKME-developed course mapping tool, importing and transforming LOUIS and OhioLINK course names and numbers to their equivalent VIVA course names and numbers. While the pilot has shown promise, it relies heavily on the role of an intermediary like ISKME to identify and acquire collections from consortial repositories and to perform the initial crosswalking. It further continues to rely on enlisted library staff and faculty reviewers to manually validate the accuracy and relevance of the imported courses for their local context—in this case, to Virginia course requirements and learning standards. This task became especially challenging with regard to evaluation to validate alignment with accessibility standards, as neither faculty nor librarians in the initial pilot possessed the necessary expertise to perform this type of evaluation.

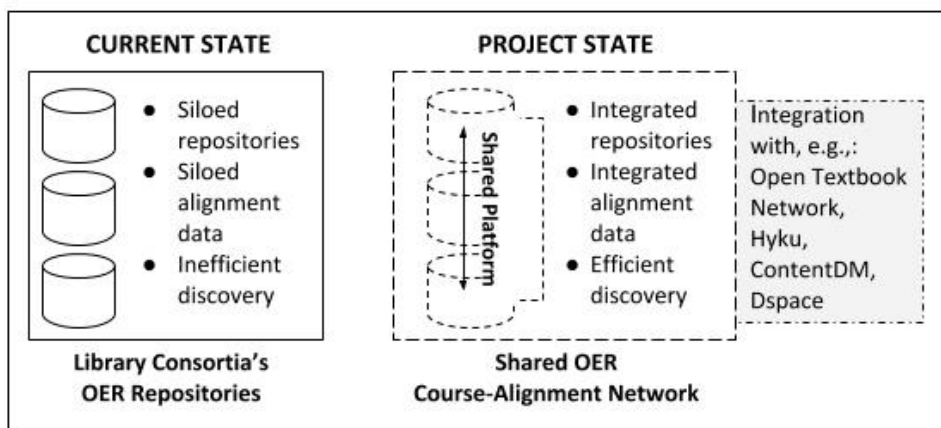
ISKME proposes that library consortia within and outside of the OER Commons repository infrastructure would benefit from the development of a sustainable course mapping process, with enhanced metadata, tools, workflows, and automated procedures for sharing and ingesting new content across consortia. We will work with OER Commons partners LOUIS, VIVA and OhioLINK to design and pilot test the OER alignment network service. We will further partner with three consortia outside of the OER Commons infrastructure—the Private Academic Library Network of Indiana (PALNI), the Pennsylvania Academic Library Consortium (PALCI), and the Digital Higher Education Consortium of Texas (DigiTex)—to ensure design input on how external OER repositories and learning management systems can best access and ingest course-aligned OER that is being exchanged within OER Commons. Together representing nearly 400 colleges and universities, these six consortia anticipate the following benefits of partnering on the development of the proposed solution:

- Growth of course-aligned collections as consortia ingest curated content from other states;
- Reduced time for library staff at the consortium and institution level in curating OER, freeing up time to support more faculty and to promote course transformations and OER publishing;
- Reduction in the siloed OER curation work currently being done by institutional library staff;
- Increased efficiency in translating evaluation data about resources from one state to another, and in making the evaluation data useful for faculty seeking to identify OER for local implementation; and
- Reduced time for faculty in identifying and adapting relevant OER.

2. Project Design

This project seeks to expand the amount of curriculum-aligned OER that faculty have access to, while decreasing the amount of time and resources needed for librarians to support curation and maintenance of OER collections. Working with six library consortia partners selected for their strong commitment to finding solutions to OER discoverability, the project will design and pilot a network service that makes it possible to exchange peer reviewed and curriculum-aligned OER across multiple institutional repositories. The network service will be comprised of a suite of API services on top of an interoperable metadata framework that can provide integration points with institutional repository

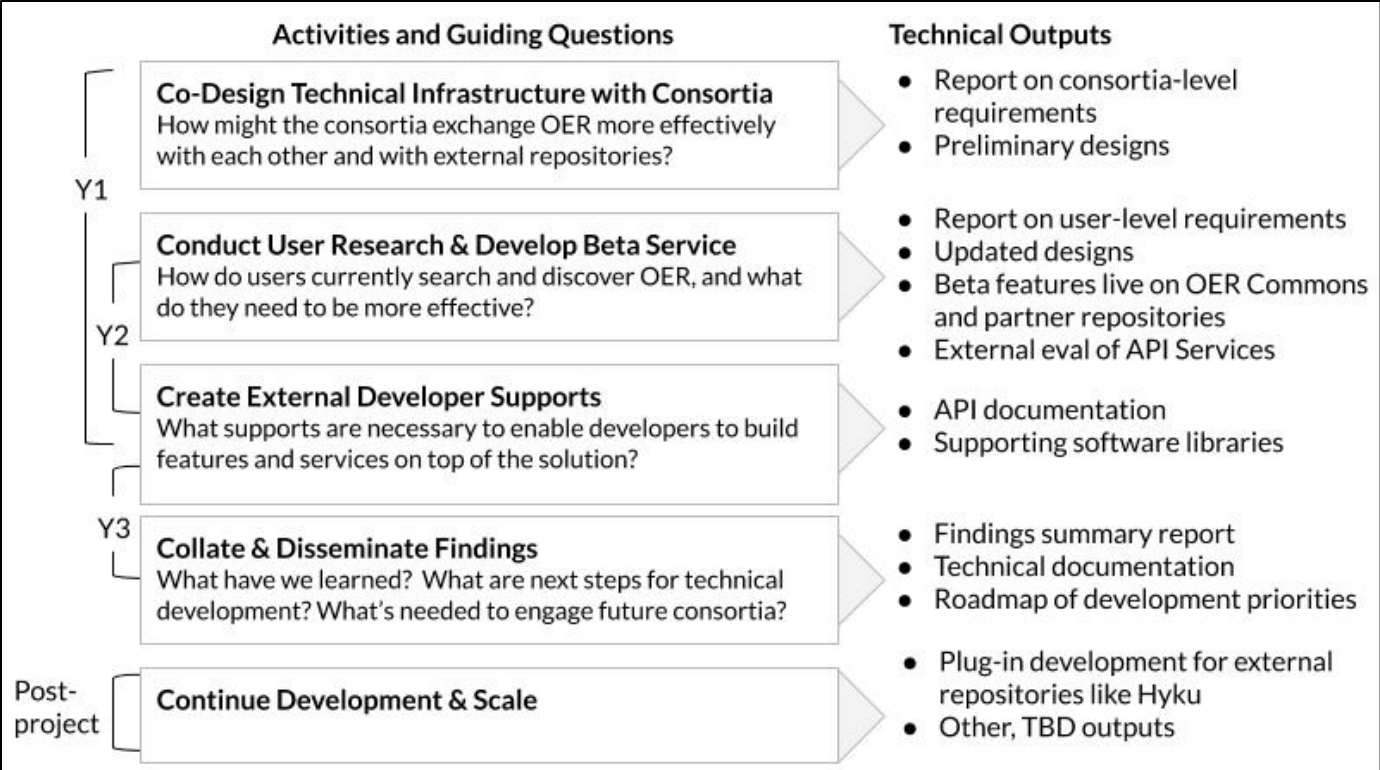
Figure 1. Consortia-level OER Discovery and Sharing: Current State and Project State



softwares such as Dspace, ContentDM, and the Hyku project. The service will be offered as a standard feature within OER Commons and our partner repositories, to enable cross-repository sharing at scale. We will also develop supporting user interaction (UI) components and software libraries, which will assist external platform developers in building on top of the network service.

The approach will entail gathering input from faculty and library staff across the six consortia to assess their decision making processes and metadata requirements when searching for and selecting OER. From analysis of this, technical and design requirements for the architecture and user experience will be finalized with consortia leads. This will be followed by a phase where network service features will be iteratively developed and tested with faculty and library staff end users. The final phase will entail real-world pilots with consortia participants followed by publication of research outcomes and release of API documentation, software libraries, and a roadmap detailing development needed to scale beyond the beta release. Future work (post-project) will focus on onboarding additional consortia partners and implementing interoperability enhancements. Figure 2 outlines the core project activities and outputs by year. A detailed outline of project activities is provided in a subsequent section.

Figure 2. Core Project Activities and Technical Outputs, by Year



Project Risks

Table 1. Identified project risks and related mitigation strategies

Potential Risk	Mitigation Strategy
OER is dynamic in nature; content is continuously published, often in an ad hoc manner and from multiple sources. As a result, older content becomes outdated or unavailable (link rot).	Prioritize the development of services and workflows that make it possible to subscribe to event notifications from disparate sources, which will alert repository managers when new content is available and old content is updated or deaccessioned across the network.

<p>Aggregating metadata and records across multiple repositories leads to a high degree of duplication and reduced usefulness of metadata because some pieces of information (i.e. information about local course alignments) may have high value in one context, and low value in another context.</p>	<p>Prioritize the development of machine learning assisted workflows for records deduplication and concept mapping across different metadata vocabularies. Example scenarios include:</p> <ul style="list-style-type: none"> ● <i>Concept mapping:</i> Network participant A uploads local vocabularies for course names and numbers, and a machine learning utility creates suggested mappings between these local vocabularies and all other course name and number vocabularies uploaded by all other network participants. ● <i>Deduplication:</i> Network participant A imports a collection from Network participant B. A machine learning utility recognizes that documents contained in network participant A’s existing collections match documents in the imported collection, and flags them as either suspected duplicates or versions.
<p>External OER repositories will need to consistently support the generation and storage of high quality local OER metadata.</p>	<p>Collaboratively develop requirements for the core schema based on work with the SPARC OER Discovery working group, which is an ongoing effort to agree upon and define a core set of OER metadata fields across multiple institutions who are using multiple types of institutional repository softwares, specifically for the purpose of cross repository interoperability.</p>
<p>Integrating into existing external OER repository platforms (those not built on OER Commons) may be a challenge because development teams would need funding and staffing support to implement API integration with the network.</p>	<p>Develop specification and scoping documents that describe requirements for integration with Hyku as an initial test case, within the scope of this project. Building on these learnings, develop a strategic plan for onboarding additional platforms, including plans to pursue sources of funding either through additional grants, or through other strategic partnership channels.</p>

Detail of Project Activities

Core project activities are outlined below, and include:

1. Convene Project Co-Design Partners
2. Design and Develop Technical Infrastructure
3. Conduct User Research and Develop User Interaction Designs
4. Create External Developer Documentation and Supports
5. Collate and Disseminate Research Results
6. Monitor Project and Evaluate Success

1. Convene Project Co-Design Partners (Y1-Y3)

The project will leverage a partnership model providing multiple levels of participation and input from six consortia that have committed to serve as co-design partners on the project. Three of the consortia—LOUIS, OhioLink, and VIVA—are currently ISKME clients, with repositories built on top of the OER Commons platform. PALNI and PALCI are partnering on the proposed ISKME project to enable more efficient ingestion

of external collections into their own OER library as part of their Hyku project. DigiTex hopes to meet its new strategic goals to enhance access to high quality, course-aligned OER for its 50 community college districts across the state.¹ Together, these consortia represent 367 institutions, of which 103 are community colleges. The individuals committed to working as co-design partners include:

- Louisiana Library Network (LOUIS), Teri Gallaway, Executive Director & Associate Commissioner and Emily Frank, Affordable Learning LOUISiana Program Coordinator
- Virtual Library of Virginia (VIVA), Anne Osterman, Director and Sophie Rondeau, Assessment & E-Resources Program Analyst
- OhioLINK Libraries, Anna Bendo, Director of Affordable Learning Initiatives
- Private Academic Library Network of Indiana (PALNI), Amanda Hurford, Scholarly Communications Director
- Pennsylvania Academic Library Consortium (PALCI), Gretchen Gueguen, Digital Projects and Communications Manager
- Digital Higher Education Consortium of Texas (DigiTex), Judith Sebesta, Executive Director and Ursula Pike, Associate Director

The scope of their participation is listed in table 2 below; their participation spans five core activities:

1. *User Research & Design (Y1)*—All six partners will support recruitment of faculty and library staff across their campuses who will participate in User Research. All six will also provide input on designs through a two day co-design workshop and through review of technical deliverables.
2. *Beta Testing (Y2)*— All six partners will additionally support the recruitment of faculty and library staff across their campuses to participate in Beta Testing of the network service.
3. *Pilot Project (Y3)*—LOUIS, OhioLINK and VIVA will participate in the design and implementation of cross-repository sharing projects by engaging library staff and faculty in OER curation activities.
4. *External Integration Evaluation (Y3)*—PALNI and PALCI will serve as external evaluators for the design of API services and software libraries. They will also contribute to the creation of developer documentation and the project’s strategic plan for onboarding additional repository partners.
5. *Dissemination (Y1-Y3)*—All six consortia will disseminate project progress and results through their professional networks and social media.

Table 2. List of Committed Co-Design Partners and Scope of Participation

Consortium	User Research & Design	Beta Testing	Pilot Project	External Integration Evaluation	Dissemination
LOUIS	●	●	●		●
VIVA	●	●	●		●
OhioLINK	●	●	●		●
PALNI	●	●		●	●
PALCI	●	●		●	●
DigiTex	●	●			●

¹ ISKME’s research team and DigiTex, alongside the Texas Higher Education Coordinating Board (THECB), are partners on a bi-annual study to assess use and impact of OER across Texas. DigiTex supports its 50 community college districts in sharing e-learning resources aligned to its state’s course matrices. In ISKME’s pre-proposal to IMLS, Texas Digital Library (TDL) was listed as the Texas partner; however, TDL, with THECB, are in the process of determining the infrastructure for their impending OER library, and we can anticipate the addition of TDL input later in the project, once their OER library plans are solidified.

2. Design and Develop Technical Infrastructure (Y1-Y3)

The technical infrastructure will include the following four components, which will be developed in conjunction with changing specifications resulting from user research, and based on co-design partner feedback over 3 years: 1) *Database architecture design and prototyping* to ensure that the metadata and storage needs for each partner are met; 2) *API endpoint design* to be used as the logic layer for the application and to enable external platform developers to access and utilize the key features of the service; 3) *Operational infrastructure solutions* that are cloud-managed to minimize time and money spent on operational overhead; and 4) an *User interaction layer* that is flexible enough to allow efficient design iterations based on feedback.

ISKME will also research, test, and train machine learning techniques to address our consortia partners' need for the automation of: 1) *OER resource deduplication and version identification*, which will help to flag duplicate records or records that represent two distinct versions of a piece of content; and 2) *Many to many metadata vocabulary mapping* to help suggest mappings between metadata such as course alignments and course topics ingested from external repositories.

3. Conduct User Research and Design UI Components (Y1-Y3)

User research will be conducted in three phases, broken out by year:

- Year 1 will focus on a survey and interviews with faculty and librarian end users as well as the consortia co-design leads to gather needs and requirements for the network service. Examples of research questions guiding Year 1 user research include: What are the tasks and decision making processes faculty and library staff use when selecting, evaluating and assembling OER?; what extensions to existing metadata are needed to accommodate their decision making, including accessibility metadata?; and, which tasks require automation and how do we efficiently combine automation with human input? After wireframes for user interaction features are developed based on the identified requirements, ISKME will facilitate a two day co-design meeting with consortia leads and their library staff to finalize the requirements and gather input on the initial designs. The remainder of Year 1 will focus on additional user research to validate the wireframes and develop prototypes.
- Year 2 research will focus on iterative beta testing and development (with library staff and faculty) of the live network service components that have been built into the VIVA, OhioLINK, and LOUIS repositories and OER Commons.
- Year 3 will focus on the development of individual pilot projects with VIVA, OhioLINK, and LOUIS, where they will implement cross-repository OER collection sharing and evaluation, without the involvement of ISKME as an intermediary. PALNI and PALCI will evaluate usage of the API services for implementing OER collection sharing within Hyku. Feedback from these pilot activities will inform final designs as well as the project's future roadmap priorities.

Table 3. Summary of User Research

Research Method & Purpose	Participants	Timing
Survey to assess curatorial practices, use of OER as part of curation, level of expertise with OER, and curation challenges and needs—to inform selection of participants for subsequent user interviews and testing.	50 faculty, 50 library staff across all six partner consortia	Oct-Nov 2020
Interviews to assess tasks, challenges and decision making processes used when selecting OER, what extensions to existing metadata are needed to accommodate decision	30 faculty, 30 library staff across all six partner consortia	Dec 2020-March 2021

making, and which tasks require automation.		
Wireframe and prototype testing to collect user feedback on designs as part of iterative refinement.	15 faculty, 15 library staff across all six partner consortia	Apr-July 2021
Beta testing to collect user feedback on live network components as part of iterative refinement.	15 faculty, 15 library staff across OhioLINK, LOUIS, and VIVA	Oct 2021-July 2022
Pilot testing to assess challenges and successes of using the network solution independently, without support from ISKME. The data will be used to inform final refinements to the solution and future development priorities.	1 consortium lead each from OhioLINK, LOUIS and VIVA, and at least 4 per consortium of their library staff and faculty curators	Dec 2022-May 2023

4. Create External Developer Documentation and Supports (Y2 -Y3)

In Year 2, ISKME will create API documentation and technical architecture design specifications to support external platform developers in building on top of the network service. We will iteratively update these documents based on findings from the user research and the PALNI and PALCI evaluation, and finalize them by the end of Year 3. The documentation will include:

- API documentation and technical architecture design specifications
- Supporting software libraries and user interaction and design artifacts
- Recorded webinar that demonstrates use of the network service within partner microsites
- Development roadmap detailing priorities for future development

5. Collate and Disseminate Research Results (Y1-Y3)

Target audiences and dissemination channels are listed in table 4. Key outputs to be shared include:

- *A final report* outlining the faculty and library staff user research findings, the developed solution, the pilot test results, a roadmap of development priorities, and recommendations for growing the work;
- *Three blog posts* highlighting the what and why of cross consortia sharing and how to engage, and summarizing key findings and implications (precise angles for each blog post to be determined);
- *A journal article* addressing the research and pilot findings, and discussing the implications for OER interoperability, as well as for curriculum policy, and for teaching and learning; and
- *An Open Github Repository* containing the technical artifacts listed in activity 4, above.

Table 4. Target Audiences And Dissemination Channels For Project Results

Target Audience	Dissemination Channels
Practitioner end users including faculty, library staff and instructional designers	<ul style="list-style-type: none"> ● Consortia partner’s established listservs and websites ● OER Commons existing email list and social media network of over 160,000 registered users ● Targeted presentations at conferences, including OpenEd, the Association of Colleges and Research Libraries, and Code4Lib
Library consortia leads and OER decision makers from across the U.S.	<ul style="list-style-type: none"> ● ISKME’s established Slack channel and email list for its OER Commons’ partners, currently consisting 27 representatives from 14 different library consortia, OER initiatives, and state departments of education

	<ul style="list-style-type: none"> Targeted outreach to library consortia that have demonstrated interest in or plans around OER and courseware sharing across states. Examples include the Consortium of Academic Research Libraries in Indiana, and Texas Digital Library
Library or repository development teams interested in developing applications on top of the API services	<ul style="list-style-type: none"> GitHub with the development roadmap, API documentation and technical architecture design specifications, supporting software libraries and UI/design artifacts, and a recorded webinar demonstrating use
Researchers from the field of OER, library science, and the scholarship of teaching/learning	<ul style="list-style-type: none"> Formal publication of the project’s research findings in at least one high impact, peer-reviewed academic journal, such as <i>Information Systems Research</i> or <i>Journal of Web Librarianship</i>

In addition to the above, we will work with the six partner consortia to develop and implement a concrete plan for engaging future consortia and their stakeholders. Preliminary engagement strategies include: 1) Identifying and directly targeting decision makers for all higher education academic library consortia in the U.S., as well as digital course sharing initiatives such as the Western Interstate Commission for Higher Education’s Internet Course Exchange Initiative; 2) Targeting the 27 members of ISKME’s OER Commons community of practice—spanning library consortia and state department of education leaders—which meets twice per quarter to share strategies and challenges around OER development; and, 3) Continued dissemination and marketing of the API services to enable adoption and participation by library consortia and OER initiatives that are not part of OER Commons.

6. Monitor Project and Evaluate Success (Y1-Y3)

The project will formatively assess and validate project results by collecting feedback from faculty, library staff and consortia leaders on the technical development work as part of the user research, and continuously integrate that feedback into iterative refinement of the project solution. As outlined in table 5, the project will also evaluate success through summative surveys with participating stakeholders and with future, external stakeholders, and through collection of engagement data showing level of interest in and awareness of the service by the wider field.

Table 5. Project Success Indicators And Sources Of Data

Success Indicator	Measured by
Satisfaction with and usability of project results by participating consortia leads and the field at large	<ul style="list-style-type: none"> Feedback on the usability of the project’s technical designs (drafts) by the six consortia leads during in person co-design workshop (formative, Y1) Closing survey with the six consortia leads to assess perceived usability and satisfaction with the final solution (summative, Y3) Feedback by faculty and librarian user testers on the effectiveness of the solution in helping them to identify high quality, course-aligned resources (formative, Y2; summative, Y3)
Increase in the number of OER in VIVA, LOUIS, and OhioLINK’s aligned collections as content is	<ul style="list-style-type: none"> Count of project aligned resources, by type of resource, in Year 3 compared to baseline counts in each state collection (summative, Y3)

<p>ingested from their peers during the pilot</p>	
<p>Increased efficiency in exchanging OER across the three pilot repositories</p>	<ul style="list-style-type: none"> ● Average time spent by ISKME staff during the project pilot in preparing OER collections for export/import across repositories using the network, compared to baseline average time spent on these tasks (summative, Y3) ● Average time spent during the pilot by library staff and faculty in validating imported OER using the new network service, compared to baseline time spent (summative, Y3)
<p>Increased awareness and interest by future library consortia who are not partners with OER Commons in accessing OER through the service</p>	<ul style="list-style-type: none"> ● Count and names of external organizations expressing interest directly to ISKME or to participating consortia leads through phone, email, and in-person communications (summative, Y3) ● Number and role of participants attending ISKME conference and web-based presentations on project progress and results (Y2-Y3)

Sustainability

The network service, API, and API documentation will be maintained by ISKME and actively developed as a core mechanism through which ISKME's OER Commons clients build and maintain their OER collections. This means maintenance and development of the network service will be funded via income generated from ISKME's established OER service and product offerings. OER content and associated metadata will be collaboratively maintained by ISKME and our OER Commons clients.

Next Phase Work

Beyond expanding the work so that additional statewide consortia are able to participate, potential components of the next phase work, based on early input from the six co-design partners, include:

- Further integration of the service into existing tools for OER material management;
- Enhancing the ability of participating consortia to ingest content from varied and disparate sources;
- Development of solutions to ensure that content remains up to date as course requirements evolve;
- Development of community standards around curricular alignments and evaluative metadata; and
- Building features that facilitate collaboration among cohorts (sub-groups) of consortia.

Resources Needed to Carry Out Activities

ISKME Personnel: The project staff will comprise ISKME Founder and CEO **Lisa Petrides**, PhD, who will serve as Project Director, overseeing outputs as well as financial and human resources; **Amee Evans Godwin**, VP of Research and Development, who will Co-Direct the project and lead partnership and dissemination activities; **Cynthia James**, PhD, ISKME's Director of Research & Learning, will serve as research and evaluation lead, and will oversee the compilation of all written materials for the project; **Andrew Kutyrev**, ISKME's lead OER platform engineer, will serve as software and services architecture lead, overseeing the project's technical design specifications and solution development; **Michelle Brennan**, MIS, ISKME's library and information services manager, will serve as technical co-lead alongside Andrew, and will manage the coordination of all technical outputs; **Polina Grinbaum**, engineering manager at ISKME, will coordinate the design and development of the project's technical outputs; **Nick Lobaito**, ISKME's user experience researcher and designer, will support implementation of user research and pilot testing; **Chris Adcock**, ISKME's digital librarian, will support metadata creation, testing, and maintenance; and ISKME's contracted research associate **Anastasia Karaglani**, PhD, will support data collection and analysis activities, and serve as

project manager. The project's technical leads will oversee three additional developers and designers from ISKME's pool of technology consultants to support prototype development.

Partner Contributors: Library and institution-level collaborators serving as co-design partners include: **Teri Gallaway**, Executive Director & Associate Commissioner and **Emily Frank**, Affordable Learning LOUISiana Program Coordinator, Louisiana Library Network; **Anne Osterman**, Director and **Sophie Rondeau**, Assessment & E-Resources Program Analyst, Virtual Library of Virginia; **Anna Bendo**, Director of Affordable Learning Initiatives, OhioLINK Libraries; **Amanda Hurford**, Scholarly Communications Director, Private Academic Library Network of Indiana; **Gretchen Gueguen**, Digital Projects and Communications Manager, Pennsylvania Academic Library Consortium; and **Judith Sebesta**, Executive Director and **Ursula Pike**, Associate Director, Digital Higher Education Consortium of Texas. **Other Resources:** ISKME maintains a fully functional office and meeting space for permanent staff and contractors. ISKME will also provide online video conferencing and collaboration capabilities to facilitate synchronous and asynchronous meetings for the project. ISKME will provide the necessary administrative support including accounting, and grants and contracts management.

3. Diversity Plan

The diversity plan will ensure that:

- Overall, there is a mix of different institution types and sizes represented in the research and pilot;
- Historically Black Colleges and Universities from each consortium are represented in research and pilot;
- At least 50 percent of the project's research and pilot test participants are faculty and library staff from community colleges serving a high percentage of Pell Grant recipients;
- Research participants representing different gender and racial identities are included; and
- Research participants who have experience in meeting accessibility requirements for learners with cognitive and/or physical disabilities are included.

4. National Impact

The project's participating consortia—LOUIS, OhioLINK, VIVA, PALNI, PALCI and DigiTex—collectively span nine states and represent close to 400 colleges and over two million students. The project anticipates the following national impact for these consortia and their stakeholders, and for future consortia that we will engage in the network service:

- *Access to best practices in course evaluation*, as cross-state consortia iteratively contribute and learn from one another through the network.
- *Advancement of institution- and state-level affordability initiatives*, as participating systems are more effectively able to grow and make their OER collections discoverable, toward the goal of reducing the cost of education for learners.
- *Reduced time for their faculty in identifying high quality materials* that meet changing course requirements, which increases faculty time to focus on customization of content and on instruction.

ISKME will continue to address OER exchange across silos as a priority for our work on a national level by forging relationships to bring in OER initiatives outside of OER Commons into the network service. Further, by providing research-based insights on required metadata extensions and workflows to support OER exchange, the project will inform the work of researchers and initiatives that are exploring interoperability solutions and frameworks for OER, including the aforementioned metadata and technical infrastructure initiatives of the Center for Applied Special Technologies, SPARC's OER Discovery Working Group, and the Next Generation Repositories Project.

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Schedule of Completion

Activity 1: Convene Project Co-Design Partners

Activity 2: Design and Develop Technical Infrastructure

Activity 3: Conduct User Research and Develop User Interaction Designs

Activity 4: Create External Developer Documentation and Supports

Activity 5: Collate and Disseminate Research Results

Activity 6: Monitor Project and Evaluate Success

Note: Activity 5 notations below do not include the ongoing dissemination activities (email listservs, Slack channel sharing, etc.) listed in Table 3 of the Project Narrative. Conference presentations listed below are preliminary.

Year One: Aug. 1, 2020 - July 31, 2021

	Aug/Sept	Oct/Nov	Dec/Jan	Feb/Mar	Apr/May	June/July
Activity 1	Kick-off meeting			Co-design workshop		
Activity 2	Iterative machine learning R&D Iterative database and operation infrastructure R&D					
Activity 3	Design research recruitment instruments	Participant recruitment via user survey	User interviews		Wireframe and prototype testing	
Activity 4						
Activity 5					Open Ed presentation	Share blog post about user research findings + report
Activity 6					Analysis of workshop artifacts	

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Year Two: Aug. 1, 2021 - July 31, 2022

	Aug/Sept	Oct/Nov	Dec/Jan	Feb/Mar	Apr/May	June/July
Activity 1	Bimonthly web-based meetings and written feedback provided on project outputs and deliverables					
Activity 2	Iterative API development; Iterative user Interaction (UI) development					
Activity 3	Beta testing on staging					
Activity 4					Draft API documents	PALNI/PALCI API feedback
Activity 5				Code4Lib presentation; Open Ed Week presentation	Association of College and Research Libraries presentation	Share blog post
Activity 6					Awareness and engagement analysis	Analysis of beta testing feedback

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Year Three: Aug. 1, 2022 - July 31, 2023

	Aug/Sept	Oct/Nov	Dec/Jan	Feb/Mar	Apr/May	June/July
Activity 1	Bimonthly web-based meetings and written feedback provided on project outputs and deliverables					
Activity 2	Complete the technical infrastructure needed for pilot projects					
Activity 3			Pilot projects with OhioLINK, LOUIS, and VIVA			
Activity 4			Updated API docs available	Supporting software libraries available	PALNI/PALCI evaluation of software libraries	Final API docs, software libraries, and roadmap
Activity 5				1-2 conference presentations	Share summary report, technical documents, GitHub repository, recorded webinar, and blog post; 1-2 conference presentations	
Activity 6					Analysis of pilot feedback and outputs; Closing surveys with consortia leads; Awareness and engagement analysis	



DIGITAL PRODUCT FORM

INTRODUCTION

The Institute of Museum and Library Services (IMLS) is committed to expanding public access to digital products that are created using federal funds. This includes (1) digitized and born-digital content, resources, or assets; (2) software; and (3) research data (see below for more specific examples). Excluded are preliminary analyses, drafts of papers, plans for future research, peer-review assessments, and communications with colleagues.

The digital products you create with IMLS funding require effective stewardship to protect and enhance their value, and they should be freely and readily available for use and reuse by libraries, archives, museums, and the public. Because technology is dynamic and because we do not want to inhibit innovation, we do not want to prescribe set standards and practices that could become quickly outdated. Instead, we ask that you answer questions that address specific aspects of creating and managing digital products. Like all components of your IMLS application, your answers will be used by IMLS staff and by expert peer reviewers to evaluate your application, and they will be important in determining whether your project will be funded.

INSTRUCTIONS

If you propose to create digital products in the course of your IMLS-funded project, you must first provide answers to the questions in **SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS**. Then consider which of the following types of digital products you will create in your project, and complete each section of the form that is applicable.

SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS

Complete this section if your project will create digital content, resources, or assets. These include both digitized and born-digital products created by individuals, project teams, or through community gatherings during your project. Examples include, but are not limited to, still images, audio files, moving images, microfilm, object inventories, object catalogs, artworks, books, posters, curricula, field books, maps, notebooks, scientific labels, metadata schema, charts, tables, drawings, workflows, and teacher toolkits. Your project may involve making these materials available through public or access-controlled websites, kiosks, or live or recorded programs.

SECTION III: SOFTWARE

Complete this section if your project will create software, including any source code, algorithms, applications, and digital tools plus the accompanying documentation created by you during your project.

SECTION IV: RESEARCH DATA

Complete this section if your project will create research data, including recorded factual information and supporting documentation, commonly accepted as relevant to validating research findings and to supporting scholarly publications.

SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS

A.1 We expect applicants seeking federal funds for developing or creating digital products to release these files under open-source licenses to maximize access and promote reuse. What will be the intellectual property status of the digital products (i.e., digital content, resources, or assets; software; research data) you intend to create? What ownership rights will your organization assert over the files you intend to create, and what conditions will you impose on their access and use? Who will hold the copyright(s)? Explain and justify your licensing selections. Identify and explain the license under which you will release the files (e.g., a non-restrictive license such as BSD, GNU, MIT, Creative Commons licenses; RightsStatements.org statements). Explain and justify any prohibitive terms or conditions of use or access, and detail how you will notify potential users about relevant terms and conditions.

A.2 What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

A.3 If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS

A.1 Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and the format(s) you will use.

A.2 List the equipment, software, and supplies that you will use to create the digital content, resources, or assets, or the name of the service provider that will perform the work.

A.3 List all the digital file formats (e.g., XML, TIFF, MPEG, OBJ, DOC, PDF) you plan to use. If digitizing content, describe the quality standards (e.g., resolution, sampling rate, pixel dimensions) you will use for the files you will create.

Workflow and Asset Maintenance/Preservation

B.1 Describe your quality control plan. How will you monitor and evaluate your workflow and products?

B.2 Describe your plan for preserving and maintaining digital assets during and after the award period. Your plan should address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

Metadata

C.1 Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata or linked data. Specify which standards or data models you will use for the metadata structure (e.g., RDF, BIBFRAME, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

C.2 Explain your strategy for preserving and maintaining metadata created or collected during and after the award period of performance.

C.3 Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content, resources, or assets created during your project (e.g., an API [Application Programming Interface], contributions to a digital platform, or other ways you might enable batch queries and retrieval of metadata).

Access and Use

D.1 Describe how you will make the digital content, resources, or assets 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, delivery enabled by IIIF specifications).

D.2. Provide the name(s) and URL(s) (Universal Resource Locator), DOI (Digital Object Identifier), or other persistent identifier for any examples of previous digital content, resources, or assets your organization has created.

SECTION III: SOFTWARE

General Information

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

A.2 List other existing software that wholly or partially performs the same or similar functions, and explain how the software you intend to create is different, and justify why those differences are significant and necessary.

Technical Information

B.1 List the programming languages, platforms, frameworks, software, or other applications you will use to create your software and explain why you chose them.

B.2 Describe how the software you intend to create will extend or interoperate with relevant existing software.

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

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

B.5 Provide the name(s), URL(s), and/or code repository locations for examples of any previous software your organization has created.

Access and Use

C.1 Describe how you will make the software and source code available to the public and/or its intended users.

C.2 Identify where you will deposit the source code for the software you intend to develop:

Name of publicly accessible source code repository:

URL:

SECTION IV: RESEARCH DATA

As part of the federal government's commitment to increase access to federally funded research data, Section IV represents the Data Management Plan (DMP) for research proposals and should reflect data management, dissemination, and preservation best practices in the applicant's area of research appropriate to the data that the project will generate.

A.1 Identify the type(s) of data you plan to collect or generate, and the purpose or intended use(s) to which you expect them to be put. Describe the method(s) you will use, the proposed scope and scale, and the approximate dates or intervals at which you will collect or generate data.

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

A.3 Will you collect any sensitive information? This may include personally identifiable information (PII), confidential information (e.g., trade secrets), or proprietary information. If so, detail the specific steps you will take to protect the information while you prepare it for public release (e.g., anonymizing individual identifiers, data aggregation). If the data will not be released publicly, explain why the data cannot be shared due to the protection of privacy, confidentiality, security, intellectual property, and other rights or requirements.

A.4 What technical (hardware and/or software) requirements or dependencies would be necessary for understanding retrieving, displaying, processing, or otherwise reusing the data?

A.5 What documentation (e.g., consent agreements, data documentation, codebooks, metadata, and analytical and procedural information) will you capture or create along with the data? Where will the documentation be stored and in what format(s)? How will you permanently associate and manage the documentation with the data it describes to enable future reuse?

A.6 What is your plan for managing, disseminating, and preserving data after the completion of the award-funded project?

A.7 Identify where you will deposit the data:

Name of repository:

URL:

A.8 When and how frequently will you review this data management plan? How will the implementation be monitored?