Establishing a GIS-Mapping Exchange for Public Libraries
Program: National Leadership Project Grant; Project Category: Lifelong Learning

Portland State University (PSU) -- in partnership with the Environmental Systems Research Institute (ESRI), the international leader in GIS technology products; ChickTech, a national organization serving tens of thousands of girls and women every year through tech programs and events; Multnomah County Library (MCL; Portland, OR); Civic Switchboard, an IMLS supported effort that aims to develop the capacity of academic and public libraries in civic data ecosystems; and Carnegie Library (Pittsburgh, PA) -- requests $249,951 to develop the capacity of public libraries to efficiently and effectively use and improve their use of geographic information systems (GIS) technology. More specifically, we aim to establish, facilitate and evaluate both an innovative training program and a collaborative networking platform such that libraries can work alongside map makers and geospatial data providers, as well as other relevant partners, in order to increase capacity and better serve patrons. This project builds upon the work that this team conducted via a 2019-20 IMLS Planning Grant, where we created a web-based, open platform 'toolkit,' entitled *GIS-Mapping Exchange for Public Libraries*. We believe the proposed next phase will not only allow library staff to visualize, question, analyze, and interpret data to understand relationships, patterns, and trends, but it will also transform how libraries serve their communities.

A. Statement of National Need
Geospatial data is around us every day -- whether monitoring the weather or navigating a new neighborhood using Google Maps. Any data identifying a position or place on the earth is considered geospatial data. More specifically, Geographic Information Systems (GIS) is a framework for gathering, managing, analyzing, and displaying (i.e., mapping) data. Rooted in the science of geography, GIS integrates many types of data. The use and awareness of GIS is steadily increasing and with this growth comes an opportunity to profile the power of geography's spatial perspective -- and to establish greater awareness of mapping and geography in general. Our vision for this project is to democratize the power of data and GIS by building GIS capacity, literacy, and accessibility into the public library system.

Public libraries are contending with funding shortfalls across the nation, yet they remain one of our most trusted institutions and patrons rely on libraries for trustworthy information, data, and technology. Public libraries are also embedded in locality and community, serving as "civic connectors,"[1] an important bulwark against various forces eroding social cohesion, and public libraries are often one of last civic institutions still trusted by minority and underserved groups (as was clearly demonstrated during the recent 2020 Census outreach).[2] And, as state education funding continues to decline nationwide,[3] public libraries are even more important.

Becoming literate in GIS and an active provider of GIS information and services is considered an important long-term strategic investment by many libraries. GIS services allow public libraries to manage spatial data better on behalf of diverse constituencies and presents opportunities to rethink current practices, such as cataloging and access to information during a time of transition, experimentation, and transformation. Library staff can also facilitate public engagement in knowledge creation, whether by using existing open geospatial data supplied by civic agencies or by gathering original community-centered data. This facilitation is becoming ever more

important as wide-reaching research questions with an inherent geographic component (e.g., Covid-19) stretch the capabilities and funding limitations of traditional academic research institutions.[4] Analysis of geospatial data and maps is an accessible and powerful way to determine, and potentially strengthen, community trust and cohesion.[5] Public libraries with GIS competency provide a particularly powerful tool for the support of Arts-enhanced STEM education programs (i.e., STEAM).

Public libraries nationwide, along with the patrons they serve, face an ever-tightening base of resources; while the Covid-19 pandemic has exacerbated this, in reality many individuals, public libraries, and other civic institutions were already finding it difficult to secure needed funding for day-to-day expenses, let alone acquisition of specialized software such as GIS and associated web-based platforms. Research conducted in partnership with working libraries during our prior planning grant established the need for a nationwide library-based community GIS project as a way to enhance public library relevance in a rapidly changing world, as well as making it clear that the public has a need and desire to learn and apply these skills and technologies if they are offered.

This project compliments and builds upon the excellent work being done by the *Civic Switchboard* project, as well as a growing community geography culture and praxis. What *Civic Switchboard* has succeeded in doing for local open data access and understanding, our project intends to refine into a geospatial and mapping focused toolkit, training program and networking platform. While we will in many cases use similar organizing and data analysis techniques, our project seeks to specifically empower communities—centered around local public libraries—to use the power of maps to answer questions of particular local relevance and need. Our project seeks to decenter the power of geographic analysis from large, well-funded government and private entities, and put it as directly as possible into the hands of a knowledgeable public library community partnership.

B. Project Design
Public libraries are primed to make important contributions toward helping citizens discover geospatial information as well as build data literacy and technical skills. A critical first step, however, is ensuring library professionals are comfortable in their own abilities and knowledge. GIS literacy also requires teamwork in the library, networking with other librarians and partnerships with outside entities. By working alongside data producers, especially in local, regional and state government agencies, librarians can often obtain data free of charge. One benefit to the agencies providing the data is that they can then refer users to the library instead of burdening themselves with answering queries.

The primary objective of our recently-funded planning grant was to develop an internal training framework to provide public library staff with knowledge and skills to help them better understand and utilize geospatial services. The training materials can also be used to deliver educational sessions to patrons. As library staff learn how to use geospatial data, they can utilize it to improve and expand upon internal processes, discover important patterns regarding patron usage and potential service locations, and more. In this planning phase, we collaborated with Multnomah County Library and the Carnegie Library of Pittsburgh to create a workshop toolkit and to pilot the workshop program. More specifically, we conducted two, 4-hour pilot workshops

for public library staff. The project team and MCL librarians co-led the workshop. Activities included: Welcome/Icebreaker, Presentation, Metadata Activity, Practice Reference Interview, Guided Web-Map Lab, and Final Discussion/Survey. We also began to develop an online training program and toolkit (https://sites.google.com/pdx.edu/imls-gis-toolkit) that public libraries across the nation can use to get more involved in their local geospatial data ecosystems. Due to Covid-19, we were unable to conduct the pilot workshop at Carnegie. Yet, we did create a digital version of the workshop and our Carnegie partners all provided input (NOTE: In this next phase, they will actually test it out). In the end, we have determined that providing easy access to a larger audience and to a digital platform for GIS data and tools is an improved approach, especially since learning can be facilitated virtually and easily with the right access to tools and the right data to users.

Our new effort will further test and scale the toolkit to allow users access to open-source data, tools, and resources that help them conduct research, develop web and mobile applications, design data visualizations, share maps and resources, etc. We will also facilitate access to local technical assistance in geospatial data management and documentation, create feedback mechanisms for geospatial data publishers, convene and host relevant workshops and events, and connect data users. We have learned that most libraries are only beginning to play these roles in their local communities; our overarching goal is to build momentum around that process by enhancing GIS and geospatial data literacy in US public libraries. Our more specific goals of this project include the following:
- help share the power of mapping and geospatial data with all citizens;
- strengthen the role public libraries play in nurturing and promoting geospatial data resources in their communities;
- develop a nationally reproducible, hands-on training program focused on geospatial data and mapping literacy for library use.

In addition to the existing toolkit section dedicated to workshop materials (e.g., videos, handouts, quizzes, and activities), along with access to a data and mapping hub for libraries to upload, store, and manage their geospatial products, this toolkit will include the following elements:
- A **mentoring program** to connect public library staff with GIS learning opportunities and pathways that bring GIS agencies, organizations, and businesses together to help libraries and their patrons. This program will build upon the *ESRI-AAG GeoMentor Program* (http://geomentors.net/), an established K-12 GIS advocacy and mentorship program which connects local geospatial professionals with interested parties in order to form collaborative, mutually beneficial relationships. As such, we believe it is a natural partnership for our grant goals. While the GeoMentors program is currently focused on K-12 students and teachers (including homeschoolers), we aim to expand the program to include public library GIS training and advisory functions. Initially, we would like a local, registered GeoMentor to participate in sub-award workshop planning with their participating public libraries (where possible); depending on the results of our first round of sub-award workshops, we would like to explore the feasibility of GeoMentors planning *and* facilitating these workshops going forward. We will welcome anyone from the broad GIS community, across all disciplines and sectors, as volunteers to help us build this nationwide network of GeoMentors to assist public libraries and their staff with their project goals relating to using GIS. In addition, over the course of the two-year grant

period, the project team will work to identify a cadre of GIS professionals and organizations across the country who will commit to supporting (and sustaining) this effort longer-term.
- Different types of **online learning opportunities** (e.g., live and on-demand webinars, online courses, self-guided tutorials, etc.). These will be open and free to all public libraries who are interested and many of the opportunities will also include time to share and learn from each other. We will also host links to recordings after any live events (with permission from the presenters). Our free online learning activities will cover a variety of relevant topic areas; they will include workshops dedicated to educating entrepreneurs and others dedicated to helping small businesses start, grow and maintain their business or showing them how to use the GIS to do market research. Other workshops may cover resources on using GIS data in internal decision-making or what local (city, county, etc.) GIS resources are available for libraries.
- We will also assemble a working **list of geospatial resources** (e.g., technological tools, books, organizations, etc.) that enable librarians to be effective in their GIS endeavors. This list will be continually modified.

It is also important to note that while our work is focused on providing geospatial data and map making training to public librarians, any interested person is welcome and encouraged to use the resources on our website.

In addition to our online toolkit resource, we will establish a new library partnership program, following the IMLS-funded *Civic Switchboard* model of providing small sub-awards to a total of approximately 8-12 public libraries over the course of the two-year grant for projects in partnership with community geospatial data organizations. We are calling these "Field Projects," and they are intended to increase a library's role as a key participant in their GIS data ecosystem. With the awareness that all organizational situations are different, we will offer a range of funding in the amount of $1500-$5000 based on the needs and the scope of their proposed work. The projected projects should be new or a new component of an existing project, and they should demonstrate a commitment to understanding and engaging with their local GIS ecosystems. A stringent, but not laborious application process will be required to receive these awards, including a detailed project narrative to include project goals and objectives, target audience, project design and logistics, outcomes and deliverables, budget, timeline and measures of success. In addition, such items as CVs and letters of support will be required. Our project team will review applications, considering the strengths of each application in the following areas: (1) feasibility of project plan, timeline, and budget; (2) strength of project involvement in local GIS ecosystem; and (3) community, geographic and library diversity. The availability of these Field Project awards will be promoted to public libraries via relevant listservs (e.g., Public Library Association, Civic Switchboard, Digital Libraries Federation, American Association of Geographers, ESRI, etc.).

Examples of projects that may be pursued include the following:
- Training of reference librarians so they are able to utilize GIS to help patrons decide such things as: where best to move their family within the city or county, where they should locate a new small business, or how to help them create a free online web map.
- Setting up library workstations with some GIS capabilities that allow patrons to view maps created from data sets provided by the library.

- Offering interactive online services with GIS capabilities to library website users.
- Employing GIS to answer internal questions related to strategic planning (e.g., using GIS to analyze: patterns of patron use in public libraries and their branches; from what areas of the community are the patrons coming to use the various branch libraries; what the characteristics are of the populations served by each library; whether the materials used vary by area served).

In addition to performing their proposed work, each awarded project will be required to participate in scheduled check-in calls with the project team as well as to write a project report (2-4 pages). Additionally, we will provide specific questions designed to create a consistent structure for the final report. We will draw on these reports to further develop case studies that will become part of the toolkit. The resulting case studies will provide real-world examples of roles that libraries can fill across geospatial data ecosystems.

We will also have a contingency plan if a team is unable to fulfill their project deliverables due to unforeseen circumstances. In the event that some of the project components are not able to be acted upon, our goal will be to provide flexible types of support, with an emphasis on those most disproportionately impacted by the situation. For instance, we may accept verbal conversations/check-in, in lieu of written reports. We will also plan to work with teams on adjusting their timeline and/or deliverables in alignment with what they need to fit their new status, priorities, and plans moving forward. In addition to being responsive to our field project teams, we will also provide opportunities to share information about their projects with each other, as well as to solve problems, build trust and enhance their various initiatives.

While our team is deeply devoted to issues of open-source software access, our prior research has indicated that the success of a nationwide network of practice requires more consistency and accessibility than available open-source solutions provide. Because we envision program trainers originating from academia and local government, a majority of these individuals can be expected to have a working knowledge of ESRI products, while the same cannot be said of many open-source options. Additionally, ESRI has agreed to offset the cost issue by providing special organizational licenses that should be extremely affordable for even small library organizations.

As partners in this effort, ESRI will support libraries that do not already have GIS technology or need additional support. More specifically, ESRI will offer all of our Field Project awardees a low-cost way to acquire select ESRI products. Namely, they will be eligible for the 'Academic Departmental Agreement,' which provides access to most ArcGIS products, including ArcGIS Online, as well as technical support, software updates, and access to self-paced e-learning resources. This offering will be available in 3 configurations:

Size	Term License Annual Fee [1]
Small (5 Users)	$250
Medium (50 Users)	$500
Large (100 Users)	$1,000

Our objective is to maximize access and flexibility of use throughout the public library system, but with specific focus on our Field Project awardees, at an affordable cost. In addition, ESRI partners will work with each grantee on an individual basis to determine the most appropriate GIS solutions to their needs. ESRI's ArcGIS Hub will also provide the infrastructure for participating libraries to establish their own community-connected open data repositories and visualization platforms, completely under the control of the individual library.

It is our belief that libraries wanting to make better use of open-source geospatial data should focus on training workers to increase their data literacy and on giving staff the proper tools. Helping public libraries achieve these goals is the mission of this next phase effort. The evidence that we achieve this mission will come from our subaward case studies, which will help us identify: (1) which geospatial data projects work best based on partnerships and collaborations among various organizations and (2) which geospatial data ecosystems enable the regular release of potentially impactful data in order to address or attempt to solve a well-defined problem or issue that is a priority to local citizens. Our early findings have already identified some of the challenges that libraries face in implementing recommended resources, including: a lack of readiness (i.e., low technical and human capacity), lack of knowledge as to what their end-user or community member needs, and/or a shortage of resources. Our evaluation methods will include surveys, web data and analytics, anecdotal feedback, local project-based evaluation efforts, etc. We will also take copious notes of our meetings with Field Project awardees in order to document our process, including aspects that worked well and obstacles we faced moving forward. Our results will be disseminated broadly in hopes to help other libraries and geospatial data partners effectively scale up or spread our efforts to other contexts.

For the duration of the grant, the platform and program will be maintained by the PSU team. During this time, we will also negotiate with our national partners to establish a long-term sustainability plan that ensures this project lives beyond the grant period. One pillar of this that is currently being negotiated is a national GIS network hub hosted and maintained by ESRI in addition to the possibility of offering participating libraries low-cost, ongoing ArcGIS access. In addition, all of our project results will be available publicly in digital format via a centralized web portal.

D. National Impact
Public libraries are facing globalization of information, increased competition for public funding, the rapid pace of technological improvements in computing and telecommunications, demographic changes and increasing alternatives to library services. At the same time, COVID-19 has caused a major economic impact, including the closing of library buildings to the public. To remain competitive, libraries must develop initiatives and provide quality services that meet and anticipate the needs of their user communities. Data, in general, is one of the most powerful tools available in a democracy. Access to and effective use of data can deepen public participation, allowing communities to identify emerging challenges and craft effective, evidence-based policies to address them. Often, community problems require a geographic examination. GIS presents a new way of thinking for libraries and their patrons. Geospatial data (e.g., maps) that contain detailed information about social, economic, and political trends can be valuable tools for advocacy and policy change. Yet, these important resources have often been out of reach for community members, most especially those situated in underserved areas, or

members of historically disadvantaged demographic groups. Such maps can be constructed and analyzed using GIS; as such, public libraries that can provide such data and mapping capabilities can be instrumental in supporting their community. For example, the economic impact of COVID-19 has had a detrimental impact on many small businesses – the lifeblood of a local economy; GIS analysis can help small businesses identify unique factors in a search for successfully expanding into new markets (i.e., a suitability analysis). GIS technology could also inform – and map out – site selection decisions. Or, geospatial data could be used to analyze product placement across brick-and-mortar stores, to target repositioning certain products based on regional interests or to improve efficiency in its supply chain. At a more personal level, individuals or families planning to move into the area may have specific needs about finding a home. For example, parents of a particular race or ethnicity might want to live within a subdivision and school district that would allow their children to mingle with others of the same background. Using GIS, a librarian can show them which areas are most populated by people of similar race or ethnicity, and then layer the data with the school district map, allowing them to determine which neighborhoods and schools would be the best location. GIS can also be used to coordinate local services and information. For instance, a library could work with other local partners to locate day shelters throughout the region, for those experiencing homelessness. Or, a library branch may be utilized to serve the community as part of the overall continuity of operations plan for local services after a natural disaster or the like.

We are convinced that the time is now for libraries to harness the power and capabilities of GIS. It seems, in fact, that a lack of GIS professional know-how or expertise can actually be detrimental to success – especially in these ever-shifting times. Once public library staff feel comfortable with geospatial data and mapping, they will be better equipped to share those resources with patrons. As neutral, unbiased institutions with an established nationwide infrastructure, public libraries may actually be the *most* appropriate facilities for the management and distribution of GIS maps and data. People who need access to information automatically think of libraries, and it is libraries that users depend on for their data needs and for resources that can interpret data. In addition, librarians are proficient in collection development, cataloging, and addressing access and preservation issues. All this makes for a strong case to provide GIS services in libraries. By teaching public library staff the skills needed to provide access to spatial data, our project will enable participating libraries to design GIS-related projects/programs suited for their particular needs.

This project builds upon an IMLS planning grant for supporting GIS technologies and trainings in public libraries. We seek to expand public library capacity for GIS training and data management and create ways for library professionals to enhance their geospatial literacy skills in order to support the needs of their local communities. This will provide increased opportunities to partner and create collaborations to enhance GIS educational offerings and capacity at public libraries. We believe this project has all of the necessary components to be successful: it builds off of an existing training program; the project team has demonstrated expertise to undertake this project; we bring together a strong, comprehensive cohort of collaborators and stakeholders (i.e., representatives from the GIS sector, public libraries, networks of public libraries and more) to move forward on the goals. In fact, the impact of this project could be quite significant given the growth and need for GIS services and skills in the broader public community.

We firmly believe that the broad adoption and use of the learning materials and data developed by this effort has potential to educate learners about GIS effectively and efficiently and at relatively low cost. And, that these activities and strategies will both create change in library practices and will help transform how librarians respond to their community's shifting demographics and priorities.

Sources:
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[2] MMORALES. 2020. "America's Libraries Report for Duty as 2020 Census Opens." News and Press Center. March 12, 2020. http://www.ala.org/news/press-releases/2020/03/america-s-libraries-report-duty-2020-census-opens-0.
[3] Mitchell, Michael, Michael Leachman, and Matt Saenz. "State Higher Education Funding Cuts Have Pushed Costs to Students, Worsened Inequality," 2019. https://tacc.org/sites/default/files/documents/2019-11/state_he_funding_cuts.pdf.
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[5] Rahimi, Sohrab, Michael Martin, Eric Obeysekere, Daniel Hellmann, Xi Liu, and Clio Andris. "A Geographic Information System (GIS)-Based Analysis of Social Capital Data: Landscape Factors That Correlate with Trust." Sustainability 9, no. 3 (March 2, 2017): 365. https://doi.org/10.3390/su9030365.

Schedule of Completion

| Task	Timeline
Recruit graduate research assistant in advance of project commencement	
Establish communications channels for project team and national partners	
Hold first partner planning session	
Develop sub-award RFP package	
Release RFP call for first test sub-award/evaluate submissions	
Conduct initial sub-award workshop	
Revise guide according to first workshop feedback and observations	
Release full RFP call for sub-award participation/evaluate submissions	
Conduct sub-award workshops at selected remote libraries	
Revise guide according to selected workshop feedback and observations	
Present and participate in outreach on project work	

Timeline axis: 7/23/21 — 2/8/22 — 8/27/22 — 3/15/23 — 10/1/23
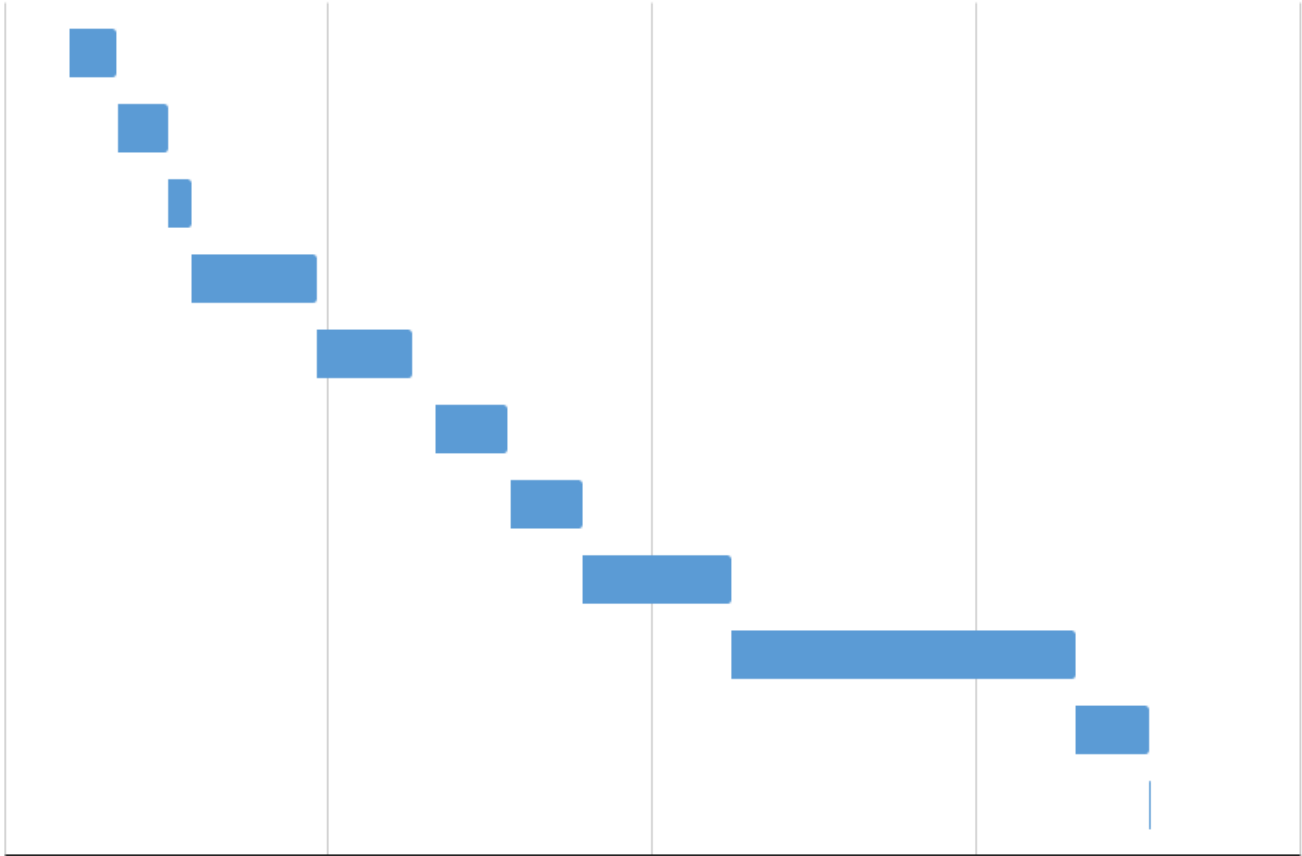
DIGITAL PRODUCT FORM

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?