



Digital Infrastructures that Embody Library Principles: The IMLS National Digital Platform as a Framework for Digital Library Tools and Services

Trevor Owens, Ashley E. Sands, Emily Reynolds, James Neal,
Stephen Mayeaux, and Maura Marx*

Institute of Museum and Library Services

Digital library infrastructures must not simply work. They must also manifest the core principles of libraries and archives. Since 2014, the Institute of Museum and Library Services (IMLS) has engaged with stakeholders from diverse library communities to consider collaborative approaches to building digital library tools and services. The “national digital platform” for libraries, archives, and museums is the framework that resulted from these dialogs.¹ One key feature of the national digital platform (NDP) is the anchoring of core library principles within the development of digital tools and services. This essay explores how NDP-funded projects enact library principles as part of the national framework.

The NDP represents the combination of software applications, social and technical infrastructures, and staff expertise that provide digital content, collections, and services to users. As libraries, archives, and museums increasingly

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provide expansive access to digital information, opportunities increase for collaboration around the tools and services libraries employ to meet user needs. Each cultural institution around the country can leverage and benefit from shared digital services and systems. A focus on building and supporting collective infrastructures is a key element of much NDP work; another critical aspect of this work is ensuring those tools, services, and systems exemplify the core principles of librarianship.

Librarian and archivist principles have been articulated and refined over time in the work of professional associations, including the American Library Association (ALA) and the Society of American Archivists (SAA). The ALA values are summarized as: access, confidentiality and privacy, democracy, diversity, education and lifelong learning, intellectual freedom, public good, preservation, professionalism, service, and social responsibility.² The SAA's core values of archivists encompass: access and use, accountability, advocacy, diversity, history and memory, preservation, professionalism, responsible custody, selection, service, and social responsibility.³ These professional principles are evident in the work that librarians and archivists do to enhance and improve the NDP.

In this essay, the IMLS's NDP program staff describe why a focus on principles became a core feature of the NDP platform framework. We demonstrate how these professional approaches intersect by highlighting projects in four thematic areas: connectivity and digital access, data privacy in civic and digital literacy, digital collections by and for diverse communities, and information access through eBooks. These four areas are neither mutually exclusive nor exhaustive of the work undertaken by NDP grantees, nor do they systematically cover each principle. Instead, the examples illustrate the ways library principles inform the focus of NDP work and the manner in which the work is conducted.

We describe these recently funded projects to present a principle-driven framework for future development of library tools and services. The NDP is intended as an approach to all community work on digital library infrastructures, not just IMLS-supported work. Before reviewing individual projects, we provide a short discussion of the central role principles play in the design and development of technical infrastructures.

Principles, Librarianship, and Digital Infrastructures

For decades, scholars have demonstrated that digital systems, both explicitly and implicitly, enact ideologies and values.⁴ The demonstration that values are present in the design process and embedded in technologies has been noted by multiple terms, including “values in design.”⁵ An interdisciplinary community of practice has developed around values in design, highlighting that all tools, services, and

systems espouse values.⁶ Katie Shilton explains that the values of a design team are enacted within the infrastructures they build: “the values held by designers affect how information technologies are imagined; how systems handle data, create categories, and draw inferences; and what affordances are available for user interaction.”⁷

In library and archival technology design, explicit consideration must be given to the principles that become enmeshed during design and development. There is a good chance tools and services could fail to live up to those principles if priorities are not deliberately addressed. A body of research has demonstrated how principles shape all layers of digital infrastructures, including discovery systems,⁸ search algorithms,⁹ protocols,¹⁰ and file formats.¹¹

Many of the technologies libraries need to fulfill their missions are originally developed for purposes outside library settings. It is vital to analyze tools and services for the extent to which they are compatible with library principles. For example, various commercial services may be in tension with library commitments to user privacy. While boutique software development is costly and challenging for libraries to undertake, these up-front costs must be weighed against the long-term drawbacks of using technology incompatible with the core values of librarianship. Further, if librarians are not directly involved in developing systems, or in the requirements and specifications of those systems, then librarians and archivists may cede control to systems and institutions that may not live up to deeply held library values.

As library services are increasingly mediated through digital tools and services, these tools and services can become core ways users interact with libraries. As these tools and services become the embodiment of libraries as cultural and civic institutions, it is essential that they reflect the principles that libraries find important. The way to ensure tools and services reflect these principles is for librarians and archivists to deeply engage in the design, implementation, and administration of these systems.¹² Ensuring that technical principles harmonize with library principles is integral to the IMLS approach to investments in the development of digital infrastructures. In the following section, we provide a brief background on IMLS investments in this area and the development of the NDP framework.

Developing the National Digital Platform for Libraries

Supporting both the development of national information infrastructures and the ability for the library workforce to make use of those infrastructures are key focal areas of IMLS’s enabling legislation.¹³ Over the past twenty years, IMLS has invested more than \$1 billion in developing and improving digital library tools, services, and infrastructures. The foundation of IMLS support for digital infrastructures

comes through the Grants to States program, which annually provides formula-based block grants to each state library administrative agency. From 2002 to 2011, the Grants to States program aided \$980 million in information infrastructure projects, including \$67 million of those funds toward digitization efforts. Alongside this core digital infrastructure support through the Grants to States program, the IMLS Office of Library Services (OLS) has consistently supported innovative work on digital tools and services through its competitive discretionary grant programs. From 2005 to 2013, the Advancing Digital Resources category of the National Leadership Grants for Libraries program invested \$30 million in the development of digital resources, tools, and services. Over the years, several other public and private funders—notably the National Endowment for the Humanities, the Andrew W. Mellon Foundation, the Alfred P. Sloan Foundation, the Bill & Melinda Gates Foundation, and the John S. and James L. Knight Foundation—have also made significant contributions to library and archives digital services and infrastructures.

Building on this longstanding commitment to enhancing digital library infrastructures, IMLS convened diverse stakeholder communities in April 2014 to discuss priorities for investments in digital tools and services.¹⁴ Participants emerged committed to a more strategic approach to the development of shared digital tools and services among libraries across the country. In 2015, OLS worked with stakeholders from across professional communities to establish targets and principles to further focus funding.¹⁵ One result of those discussions was the realization that the term “innovation” was often misunderstood to mean “novelty.” We heard repeatedly that the drive to innovate with new digital library services during the early 2000s led to fragmentation—many tools with few users. Libraries and consortia had quickly spun up new tools and services that were unlikely to be sustainable. In response, OLS has focused on investments that support interoperability between digital library tools and that sets sustainability as a focus of our discretionary funding programs.

The IMLS OLS is now in its third year of employing the national digital platform (NDP) framework for our investments in digital library tools and services. The NDP has both a broad and a specific meaning. Broadly, it can be conceptualized as a way of thinking about all the digital tools, services, infrastructures, and workforces that libraries utilize to meet user needs across the United States. Specifically, expanding the digital capabilities and capacities of libraries across the country is a priority for IMLS funding programs. Two OLS discretionary grant programs support work in this area: the National Leadership Grants for Libraries program (NLG) and the Laura Bush 21st Century Librarian program (LB21). The NLG program supports work addressing substantial challenges in library and archival practice, including research, software development, planning activities, and more. The LB21 program

supports education and training activities to diversify and strengthen the library workforce. As of mid-2017, between the NLG and LB21 programs, the IMLS funded eighty NDP awards. The portfolio of grants represents \$27 million in IMLS funds and more than \$15 million in cost-share provided by grantee institutions.

We now illustrate how librarians and archivists are leading with principles in design for digital infrastructures. Further, we demonstrate how NDP projects expressly weave library principles into infrastructures and offer insight into how future projects could build on these efforts. Awarded grants are indicated by their project titles and IMLS log number, which is a twelve-digit string of characters beginning with RE, LG, or SP. The log number is an internal unique identifier to refer to a grant and can be used to locate more information about each award on the IMLS website.

Connectivity and Digital Access

Libraries have a long history of serving as equity institutions, as sites that provide free access to information resources in support of lifelong learning. However, the content and services provided through the NDP are only useful to those who have reliable and robust internet connectivity. As information resources become digital increasingly, libraries have also become institutions that support digital inclusivity.

“Digital inclusion” refers to the infrastructures and services necessary to enable widespread access to, and use of, high-speed internet.¹⁶ Digitally inclusive practices may involve sustaining access to hardware, software, content, and broadband, as well as ongoing technical support, and digital literacy training.¹⁷ Open support for digital access crosscuts a series of core library principles including access, democracy, diversity, lifelong learning, intellectual freedom, the public good, service, and social responsibility. IMLS supports work that maximizes efforts to expand library and archival leadership in the movement to provide equitable digital access to communities across the United States. The following NDP projects pursue broadening connectivity nationwide.

Rural and tribal connectivity

Many libraries across the country have secured resources to establish themselves as digital connectivity hubs in their communities. However, smaller institutions that often serve populations with the most need may not have the capacity to ensure they are making the best use of the available connectivity resources.

In 2015, IMLS funded Toward Gigabit Libraries (RE-00-15-0110-15), an initiative to create a toolkit for library broadband network assessment as well as related training programs for librarians in rural and tribal libraries. Operated as

a partnership among a range of organizations, including University Corporation for Advanced Internet Development (Internet2) and the Association of Tribal Archives, Libraries, and Museums, the project is developing resources across five states. Beyond working toward access, the project also builds on the principle of professionalism by developing and training librarians to use the toolkit. Understanding how best to implement and run library networks is now a core part of the knowledge library professionals require to meet the needs of their users.

Connectivity beyond library walls

While urban libraries are frequently better resourced and able to provide access to the internet, often access beyond the walls of the library is not included in core networking infrastructures. Expanding the reach of library networks has the potential to considerably support efforts toward digital access equity.

In 2016, IMLS awarded a grant to the Brooklyn Public Library for the BKLYN Link project (LG-72-16-0130-16), which aims to develop a community-driven mesh network, providing free broadband access and technology-based training for young adults. Mesh networks are a method for enabling wireless internet access by employing existing radio nodes, laptops, and cellphones. Mesh networks offer the potential for shared network access beyond the walls of a library. Brooklyn Public Library is conducting community asset mapping, planning the technical structure of the mesh network, and developing user policies and procedures to install and sustain mesh networks. A technology-based youth fellowship program is being designed to teach young adults to install and maintain the mesh network, including strategies and tools for deepening community engagement. The core objective of this project, to broaden access to connectivity in a low-income community, further relates to a range of library principles, including digital access and the public good. The focus on creating technology-based fellowships for young people to maintain these networks demonstrates how library support for democratic values and social responsibility can be incorporated into project method, and not just project results.

In 2016, IMLS awarded Libraries Leading in Digital Inclusion and Disaster Response via TV White Space Wireless Connections (LG-70-16-0114-16) to San Jose State University's School of Information. This project similarly helps libraries explore expanding internet access beyond library walls through a low-cost wireless technology. The project will pilot TV White Space as an affordable method to provide basic wireless access to areas around libraries, as well as a community-based connectivity backup service during disasters. The project espouses library professionalism as it prioritizes piloting the service, developing curricula, and training librarians to make use of the technology within their communities.

These two recent NDP grants represent a broad range of issues that impact access, connectivity, inclusion, and equity in the United States. Those issues are intrinsic to, and necessary for, maximizing the potential development of the United States' digital and technological future. Each project is designed to be built locally, but each also has the potential to be used elsewhere through the development of guides, toolkits, and education and training resources, thus catalyzing change across the country. Each project explicitly focuses on helping libraries enhance their work toward access, diversity, lifelong learning, service, and social responsibility.

Additionally, these projects support professional service and development for librarians and lifelong learning for library users. Specifically, each project is focused on further supporting librarians in developing the digital skills and knowledge necessary to serve the needs of their communities. In the BKLYN Link project, the focus on lifelong learning is promoted in the vision of the technology fellowships designed as learning opportunities for young people. Community members, librarians, volunteers, and other learners are key components of connectivity and digitally inclusive infrastructures. Importantly, the NDP is not just tools and systems; it is also the skills and knowledge of librarians who build, maintain, and make use of those systems to serve users.

Data Privacy in Civic and Digital Literacy

Three LB21 NDP grants illustrate how intellectual freedom, user privacy, and supporting the public good come together in related but distinct areas of library practice. The ALA core values establish that “libraries are an essential public good and are fundamental institutions in democratic societies” and that “protecting user privacy and confidentiality is necessary for intellectual freedom and fundamental to the ethics and practice of librarianship.”¹⁸

Scaling digital privacy and data literacy in libraries

As illustrated in the previous section, libraries play a key role in providing broadband access and digital literacy training to diverse communities across the United States. While offering access to extraordinary amounts of information, the web also enables unprecedented surveillance and tracking of users. Libraries have responded to increased online surveillance by developing educational and training resources addressing the inherent risks and responsibilities of internet use. These resources aim to increase digital literacy while expanding the role of librarians as trustworthy information sources.

Individuals with the greatest digital literacy needs are also the most vulnerable to intrusion of personal information. In their role as providers of information infrastructures and training, librarians are uniquely positioned to prepare library users for the privacy challenges brought about by the prevalence of data sharing, profiling, collection, and surveillance technologies. Taking the expansive view of the NDP, all points of entry and places through which users access the web are components of distributed knowledge infrastructures, and library professionals are positioned to help users maintain their privacy across this distributed networked system.

Through Scaling Digital Privacy & Data Literacy in Libraries (RE-06-15-0050-15), Brooklyn Public Library, the Metropolitan New York Library Council, and other partners have developed and launched an initiative to improve digital privacy and data literacy among library professionals. In keeping with the cross-sector collaborations emblematic of work in the NDP as a whole, the project brings together librarians, policy advocates, technologists, and the communities they serve. The work also advances librarian education and leadership, which works to bridge not just the digital divide but also the privacy literacy divide. In keeping with principles around access, all educational materials created through this project are available for use and reuse online.¹⁹

Surveillance and audiovisual evidence management

As the world is increasingly recorded and documented, concerns about digital surveillance extend well beyond online activities. For example, across the country, law enforcement agencies are collecting significant amounts of audiovisual data about police activities, which can include suspects and innocent bystanders. Police agencies are also being asked to respond to calls for further transparency and to provide open access to a range of data that have historically been kept private. As researchers discover the technical methods for saving and sharing large amounts of police information, there remains a need for librarians and archivists to employ their expertise to work through the numerous ethical issues around collecting, managing, preserving, and providing access to law enforcement audiovisual information.

While much NDP work is focused on piloting technologies or scaling out systems and programs, IMLS also supports work scanning the horizon for emerging forms of digital content that will increasingly demand the attention of library and archives professionals. On the Record, All the Time: Setting an Agenda for Audiovisual Evidence Management (RE-43-16-0053-16) shows how the NDP can support exploratory work in developing shared agendas for managing emerging forms of digital content. Through this project, UCLA's Department of Information Studies convened stakeholders from law enforcement agencies, libraries, archives,

and other relevant organizations to develop a strategy for collaboration on the ethical and practical issues related to managing digital information and open data. In particular, the project focuses on articulating the challenges and priorities for the management and preservation of new forms of audiovisual evidence generated by the widespread use of surveillance cameras, smartphones, and body cameras in law enforcement. This project demonstrates how the library and archival principles of privacy, access, and preservation have the potential to inform the work of other civic institutions.

Open data for public good

Librarians are gradually taking on roles as curators and educators around the use, reuse, and management of civic data. All of these data assets, and the approaches to providing access to them, are functionally part of the NDP. The University of Washington School of Information has embarked on Open Data for Public Good: Data Literacy Education for Public Information Professionals (RE-40-16-0015-16). Project staff are developing an educational program focused on preparing both library students and practicing professionals to collaborate with local communities to build infrastructures that support access to, and curation of, locally significant open data collections. One of the major themes that emerged from IMLS's 2015 NDP gathering was the need for library education and training initiatives to include hands-on learning opportunities within professional contexts.²⁰ In support of that goal, the project includes a range of local civic partners to provide practical training opportunities as well as webinars and open educational resources for one hundred library students and professionals.

Digital Collections by and for Diverse Communities

Expansive access to digital collections is valuable for many reasons; however, it is especially important when all people can see themselves, their histories, and their communities represented in those collections. ALA's core values emphasize that librarians "value our nation's diversity and strive to reflect that diversity."²¹ Unfortunately, national digital collections are not always representative of the diverse communities libraries serve. In 2014, the Digital Public Library of America (DPLA) worked to identify "how often DPLA was representing some of America's underrepresented groups," and found many minority communities were underrepresented in DPLA metadata records.²² Such realizations have helped drive efforts to increase the number and types of organizations contributing to the DPLA content aggregator.

Expanding access to digital library collections and increasing the range of collections available to users have always been core NDP activities, serving the values of diversity and social responsibility. In recent years, IMLS has supported several projects that both diversify national digital collections and work to make digital library systems more accessible and responsive to the needs of wider ranges of communities. The work also speaks to the core principles of access and preservation.

Diversifying digital library collections

While lowering barriers to entry for participation in building and sustaining the NDP is an exciting and important area of work, increased diversity in collections also depends on institutions developing a deeper sense of the issues facing community archives and their users. The Amistad Research Center and multiple partners received a grant for the project Diversifying the Digital Historical Record: Integrating Community Archives in National Strategies for Access to Digital Cultural Heritage (LG-73-16-0003-16). The goal of the project is to address the potential impact of increased representation of marginalized communities and people in our digital cultural heritage. Responding to issues like those identified by DPLA, where marginalized or minority communities are misrepresented or not represented at all, the partner organizations seek to increase awareness of community archives and their unique challenges. The project is holding a series of meetings with community members, scholars, and others to develop a white paper that proposes concrete recommendations toward a more inclusive national digital platform.²³

UCLA received a grant to support Dr. Michelle Caswell's research into related community archives topics, with a project entitled Assessing the Use of Community Archives (RE-31-16-0117-16). Caswell is investigating the impact of independent, community-based archives in Southern California on the individuals and communities they serve, and creating tools for such archives to assess and articulate their local impact. While not focused on digital archives, this work is another important contribution to library and archives' understandings of their diverse user bases. Through their work with the public, and as mediators of library and archival collections, librarians are positioned to respond to these research findings and enable more productive local community engagement.

Designing systems for diverse community needs

Once librarians better understand their diverse communities, this knowledge can and should inform digital library systems design. For some communities, attention to cultural sensitivity around digital objects is essential. For example, indigenous

communities may have requirements regarding who can access certain types of traditional knowledge. IMLS has supported community-based efforts to protect and share cultural information through the development of specialized tools.

The Mukurtu Content Management System platform, based out of Washington State University, is a key example of a system with values at the forefront of its design. Mukurtu grew out of collaboration with Australia's Warumungu Aboriginal community; "mukurtu" is a Warumungu word for "dilly bag," a safe place for storing sacred items. The project has received two IMLS grants to support its development and expansion. Most recently, Mukurtu Hubs and Spokes: A Sustainable National Platform for Community Digital Archiving (LG-70-16-0054-16) has extended the platform to wider audiences and engaged a broader community of developers and contributors.

Mukurtu allows communities to implement granular controls over access and description, and aims "to empower communities to manage, share, preserve, and exchange their digital heritage in culturally relevant and ethically minded ways."²⁴ For example, Mukurtu allows communities to encode local cultural protocols, which may restrict access to a particular time, place, or role in the community. While it may appear that these controls contradict the core value of access, where "all information resources" should be made "readily, equally, and equitably accessible to all library users,"²⁵ this approach meets the particular needs of diverse communities by respecting cultural norms. The project thus promotes the values of confidentiality, diversity, and social responsibility by ensuring information is accessed and preserved in culturally sensitive manners.

Information Access through E-books

Beginning in 2013, IMLS has funded a series of related projects to further the development and implementation of tools and services for libraries to provide access to e-books. While the projects all explicitly focus on access, itself a central value of librarianship, they also support a range of other interconnected library values. We now explore these projects as a final example of how library values can be reflected in the development of digital library infrastructures.

To provide a robust and diverse collection of e-content, many libraries are required to work across a variety of different e-book provider platforms. In some cases, this results in five or six different platforms being presented to users. Notably, because content from different providers is directly coupled with particular applications and platforms, it is sometimes difficult to provide diverse collections of e-books that reflect the full range of library patrons' interests and experiences. Beyond this, each e-book vendor platform complies—to varying degrees—with features that support access to books for the blind and visually

impaired, presenting a challenge for libraries to ensure equitable access. Many provider applications collect data on library users. While vendors behind these applications may be supportive of library commitments to user data privacy, it becomes challenging for libraries to ensure that privacy rights are being respected across all of the different platforms. One way for libraries to address user privacy is to move increasingly into situations where librarians have more control over which data are collected from their users and how that data collection takes place.

Through Library Simplified (LG-05-13-0356-13) New York Public Library, in partnership with a broad coalition of public libraries, worked to develop a free and open source mobile application to make it significantly easier for library users to access e-book content.²⁶ The resulting software has now been launched as “SimplyE” and a range of institutions are rolling out the platform.²⁷ The central idea behind the project was to create an easy-to-use front-end application that merges together e-content purchased from a variety of vendor sources as well as free and public domain content.

Three more recent projects have significantly expanded upon efforts to simplify and streamline the landscape of e-book tools and services, while also exemplifying library principles. The Library E-content Access Project (LG-00-15-0263-15), led by New York Public Library, in partnership with public libraries and library consortia across the country, has resulted in further enhancements to the SimplyE application. The project addresses the development and curation of a high-quality set of free public domain works available through the platform, and assists with the launch of a related offering to low-income youth called Open eBooks. Through Open eBooks, a coalition of literacy, library, publishing, and technology partners secure low-income youth free access to current popular press titles. Here we see how the development of SimplyE software has enabled development of direct relationships with publishers and vendors to offer more equitable access to content. The most recent grant, SimplyE for Consortia (LG-70-16-0010-16), was awarded to a partnership of three regional library consortia and is focused on further developing and refining the SimplyE platform to better support resource sharing.

Together, these projects also directly connect to principles of professionalism. By working to ensure librarians and library staff are deeply engaged in the design and development of core library systems such as e-book platforms, the projects reflect the current and future role of librarians as information professionals. As libraries provide e-book circulation increasingly, it also becomes increasingly important that systems are designed to support, instead of subvert, the expertise and professional judgments of collections librarians. The roles that librarians play in featuring books and surfacing works for specific readers can, and should, be designed into the features of these platforms and services.

Ongoing Work

As with all technical infrastructures, principles are inherently built into digital library tools.²⁸ Library professionals now face the question of how to analyze the extent to which tools and services live up to library and archival principles, as opposed to competing principles. In this essay, we described how IMLS has refocused its work on library digital initiatives through the national digital platform (NDP) framework. Two concepts serve as the basis of the NDP: 1) all libraries can collaborate on shared tools, services, and digital approaches to meeting user needs; and 2) collaborations and shared infrastructures will only be useful to the extent they enact library and archival principles.

The strong work of librarians and archivists in the projects described here is a credit to how the field is taking an active role in shaping the United States' digital future. We highlighted projects that illustrate how libraries are becoming increasingly essential civic and cultural institutions for our digital and networked age. These examples reflect four thematic areas; similar stories can be told about projects in other thematic areas, illustrating other principles. For example, many NDP projects focus on preservation. The Digital Public Library of America, Stanford University, and DuraSpace project, Fostering a New National Library Network through a Community Based, Connected Repository System (LG-70-15-0006-15), and the Northwestern University Libraries project, Beyond the Repository: Integrating Local Preservation Systems with National Distribution Services (LG-72-16-0135-16), represent a range of projects focused on digital preservation infrastructure.

The projects highlighted throughout this essay demonstrate that library principles can be entangled with the design and implementation of technology at every level of digital library infrastructure. The projects described here seek to unite efforts across institutions while also addressing library principles. Importantly, these projects explicitly address library values while also implicitly building library principles into how the work is accomplished.

We envision a future in which the IMLS NDP supports librarians who ensure not only that the tools and services employed by libraries reflect library approaches, but also expand the reach of library principles through the strong social and civic roles libraries play within their communities. We hope this essay serves as a continuation of our dialogue with librarians and other stakeholders around the country. We continue to refine how we can establish tools, services, and training to best support library services in all communities.

The views and opinions expressed within this article are solely those of the authors and do not necessarily represent the official policies or positions of the Institute of Museum and Library Services.

Notes

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