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SERVICES

National Digital Infrastructures and Initiatives: A Report on the 2017 National Digital Platform at Three Forum

June 2018

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Introduction

IMLS INVESTMENTS IN DIGITAL LIBRARY INFRASTRUCTURES

Over the past several years, the Institute of Museum and Library Services (IMLS) Office of Library Services (OLS) has made significant investments in digital library projects. IMLS support in this area includes funding for the software applications, social and technical infrastructures, and staff expertise that provide digital content, collections, and services to all library and archives users. Between 2014 and 2017, IMLS invested over 33 million dollars on 111 projects related to digital infrastructures and initiatives in libraries, through the National Leadership Grants for Libraries Program (NLG) and the Laura Bush 21st Century Librarian Program (LB21).

IMLS has continuously worked with diverse stakeholder groups to refine its approach to investing in digital infrastructures for libraries and identify high-priority areas for future work. IMLS held stakeholder meetings in 2014 and 2015 to conceptualize and refine a funding framework called the National Digital Platform (NDP), a strategic approach to the "development of shared digital tools and services around the country."[1] The 2017 report "NDP at Three: The First Three Years of IMLS Investments to Enhance the National Digital Platform for Libraries"[i] provides more details on IMLS digital library funding since 2015 and explains three focal areas identified within the digital library infrastructures and initiatives portfolio of NLG and LB21 grants.

This report describes a third stakeholder meeting held in October 2017. IMLS convened the NDP at Three Forum to better understand the NDP framework's successes, challenges, and needs. Forum participants provided a retrospective of IMLS funding for digital infrastructures while considering how IMLS can continue to support initiatives identified as most pressing and with the greatest potential for impact. Seventy-five invited thought leaders from libraries, archives, and museums attended the Forum. Twenty-one participants spoke on five panels, including panels dedicated to each of the three focal areas, a panel about digital initiatives in museums, and a panel to discuss shared opportunities for future impact.

The Forum was a remarkable capstone for the development and implementation of the NDP framework, and an exciting window into future possibilities for funding of digital work in libraries. As IMLS continues to refine its funding strategies for complex and far-reaching digital library projects, these conversations serve as a reminder of the progress made so far as well as important grounding for future funding of shared digital library infrastructures and initiatives.

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1   Owens, T., Sands, A. E., Reynolds, E., Neal, J., & Mayeaux, S. (2017). *NDP at Three: The First Three Years of IMLS Investments to Enhance the National Digital Platform for Libraries*. Washington, D.C.: Institute of Museum and Library Services, Office of Library Services. **https://www.imls.gov/ publications/ndp-three-report**.

FOCAL AREAS

The following three focal areas emerged as ways to describe themes in the varied portfolio of IMLS digital library grants since 2015. The similarities as well as distinctions between the three focal areas demonstrates the breadth of IMLS awards for digital infrastructures and initiatives:

1. Building equitable digital communities

Libraries in general, and public libraries in particular, provide essential resources and services to improve life for people of all ages, both within the library and throughout the community. This includes a vast array of social and civic functions, including education, workforce development, public safety, and health information. IMLS has supported projects to increase digital inclusion, broadband access, and digital literacy.

2. Expanding digital cultural heritage capacities

Libraries and archives play an essential role in preserving and providing access to the nation's cultural record. New technologies, including those developed in libraries, have led to significant new opportunities for libraries to improve how they collect, preserve, provide access to, and enable use of cultural collections. IMLS has supported projects that involve enhancing tools, services, and practices to expand the capacity of libraries and archives to serve as memory institutions.

3. Opening scholarly communications

This focal area emphasizes the library's role in developing, enhancing, and training for the social and technical infrastructures necessary to support research and scholarly communications, which are defined broadly as including "any data or deliverable developed at any point during the research life cycle."[2] IMLS has supported projects including open source software development and open science, open scholarship, and open data initiatives.

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2   Owens, T., Sands, A. E., Reynolds, E., Neal, J., & Mayeaux, S. (2017). *NDP at Three: The First Three Years of IMLS Investments to Enhance the National Digital Platform for Libraries*. Washington, D.C.: Institute of Museum and Library Services, Office of Library Services. **https://www.imls.gov/publications/ndp-three-report**.

NDP at Three Forum Panels and Discussions

PANEL ONE: BUILDING EQUITABLE DIGITAL COMMUNITIES

PANELISTS

Don Means, Gigabit Libraries Network

Sharon Strover, University of Texas at Austin

Luke Swarthout, New York Public Library

Bonnie Tijerina, Data & Society

Kelvin Watson, Broward County Library

MODERATOR

James P. Neal, Senior Program Officer, IMLS

Topics raised in this panel included: digital privacy and digital inclusion, libraries as demand drivers, libraries as standards and interoperability innovators, and the responsibility of libraries to shape the library user experience through digital services.

Professional development

Bonnie Tijerina, the first panelist of the day, introduced the significance of professional development and capacity building for digital skills. This includes increasing librarians' fluency in digital privacy and security, and enabling them to support users' online privacy. This work supports the concept of digital inclusion, a theme repeated throughout the day.

Challenge: Focus on increasing digital literacy of both users and library staff, especially in digital security and privacy.

Collaboration

Fellow panelists echoed Tijerina's emphasis on the importance of collaboration. Tijerina mentioned civic organizations and others referenced libraries and archives of various sizes and domains (academic, nonprofit, etc.), scholars and researchers across disciplines, and corporate partnerships.

Digital inclusion

"Digital inclusion" is "the concept that all individuals and communities should be afforded broad and open access to and use of computers, mobile devices, and the Internet. Tijerina, Sharon Strover, and Don Means made a strong case for libraries as demand drivers for broadband Internet access, and as catalysts working at scale to ensure universal Internet access in the United States. Through sustained, collaborative, and creative efforts, libraries offer their users an on-ramp to vast Internet resources. For example, libraries provide access through portable hot spots, broadband, and most recently, TV White Space technology. TV White Space is the unused spectrum between TV stations, a block of frequency with potential to

expand broadband capacity and improve access.[3] By providing users with Internet connectivity, libraries also offer inclusion through connections to online resources, knowledge, culture, and community. Strover asserted that through this work, libraries impart "digital dignity" to populations that had previously been left behind by technology. Luke Swarthout discussed the "digital equity stack," in which three conditions must be met for users to truly be included in the digital community: access to the Internet, digital literacy (and privacy), and the applications and tools needed to use the technology. As Swarthout said, "We're not done until people are able to use the technology to change their lives."

Challenge: Support digital inclusion through a continued focus on digital equity, including security and privacy.

Library eBook technologies

Swarthout proposed two concerns that libraries face related to eBook technology. The first is opening and diversifying the eBook vendor market. The need to control and improve the eBook experience for library users is both immense and immediate. Second, libraries have direct access to their users and deeply understand their needs. Armed with this knowledge, they are well positioned to lead the development of library technology, focusing on innovative and intuitive interfaces to improve user experiences. James G. Neal, president of the American Library Association and University Librarian Emeritus, Columbia University, pointed out two further concerns: economics (the high costs of providing access to eBooks through black box platforms) and preservation (the lack of systematic methods for capture and long-term archiving of eBook material).

Challenge: Maintain greater control over the eBook user-library relationship, the eBook market, and eBooks themselves.

Libraries as innovators

Kelvin Watson's approach to inclusion is similar to Swarthout's. Both are developing apps that bring responsibility for user experience back into the librarian's hands. Watson asked what role libraries can play in influencing standards development, which leads to interoperability, connectivity, accessibility, and ultimately, usability. "Interoperability" refers to the ability to exchange, compare, contrast and make use of information resources, often through appropriately developed metadata and communication protocols (e.g., application programming interfaces, or "APIs"). Watson aims to build technologies that enable users to access all their digital needs from a single device with user experiences comparable or exceeding corporate offerings. The vision he posed is the library as "the center for culture."

Challenge: As technology develops, libraries must keep pace. Libraries must also provide user experiences that surpass current experiences with vendor technologies.

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3   Federal Communications Commission. (website) White Space. Accessed April 21, 2018, *https://www.fcc.gov/general/white-space*.

PANEL TWO: EXPANDING DIGITAL CULTURAL HERITAGE CAPACITIES

PANELISTS

Jefferson Bailey, Internet Archive

Karen Cariani, WGBH Educational Foundation

Bergis Jules, University of California, Riverside

Thomas Padilla, University of Nevada, Las Vegas

MODERATOR

Emily Reynolds, Senior Program Officer, IMLS

Topics in this panel included the need to engage a diversity of voices from non-traditional cultural heritage spaces and local communities, enabling computational reuse of collections, and cross-disciplinary partnerships.

Room for all voices

Throughout the day, participants mentioned the importance of building trust among cultural heritage organizations and beyond. Bergis Jules launched this panel by challenging attendees to make space for voices from local community organizations, small cultural heritage institutions, and other non-traditional collecting spaces. He called for "radically inclusive conversations" to influence the diversification of the digital historical record. New voices bring new ways of thinking and doing, which can be more widely broadcast by integrating community archives and their involvement in conversations at the national level.

Challenges: Establish trust, especially when working with new partners, because without it collaborations can easily fail. Ensure that collaborations are inclusive of diverse partners, and benefit all involved.

Cross-functional collaboration

Karen Cariani highlighted the IMLS Office of Library Services' two-page preliminary proposal as a means for enabling more robust collaborative opportunities, because the writing process is quick and efficient and challenges authors to present cohesive ideas briefly and clearly. This process helps partners understand their exact roles within a project. Cariani also described the need for cross-disciplinary collaboration—especially technology partners in the computational sciences. For example, computational linguists, who have been using natural language processing for years to study and dissect languages, could share their knowledge with librarians working to transcribe and describe complex digital assets, such as audio and video. Cariani's thoughts on cross-functional collaboration were echoed by all panelists.

Value proposition of NDSR

Cariani spoke to the work that has been done to build capacity among early career professionals in libraries and archives. Cariani described, and Thomas Padilla later agreed with, the value of the National Digital Stewardship Residency (NDSR) program for participating organizations, as well as for the individual participants. The NDSR is a residency program for recent master's degree graduates, focused on providing practical experience and mentorship to participants. The mission of the NDSR is "to build a dedicated community of professionals who will advance our nation's capabilities in managing, preserving, and making accessible the digital record of human achievement."[4] While such programs have been successful in training recent graduates, Padilla emphasized the need for continuing education opportunities for mid-career professionals as well.

Challenge: Use successful professional development programs for early-career professionals as models for the development of similar training, mentorship, and cohort-building opportunities for mid-career professionals.

Enabling computational use of collections

Padilla spoke about preparing collections that are "computationally amenable"—that can be processed and understood by machines. Partnerships to produce and use data in automated ways cross disciplines from STEM to humanities, and from the academic to the private sector. Jefferson Bailey talked about the need to move from bespoke systems development to technologies that work together, including commercially developed open source technologies that could be used in the cultural heritage context. These non-traditional collaborations challenge funders to broaden their focus beyond a single discipline, to consider that major outcomes may not be possible within 1-3 year grant cycles, and to be more open to funding "riskier" grant proposals. Padilla posited, "How can we curb our enthusiasm for quick wins" when most major breakthroughs can take years or even decades to be made?

Challenge: Provide opportunities to prepare library data for automation and support computational uses.

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4   Library of Congress. (website) National Digital Stewardship Residency. Accessed April 21, 2018, *http://www.digitalpreservation.gov/ndsr/*.

PANEL THREE: OPENING SCHOLARLY COMMUNICATIONS

PANELISTS

Sayeed Choudhury, Johns Hopkins University

Mercè Crosas, IQSS, Harvard University

Ixchel Faniel, OCLC

Mark Parsons, Rensselaer Polytechnic Institute

John Wang, University of Notre Dame

MODERATOR

Ashley Sands, Senior Program Officer, IMLS

Like the previous panelists, this group asked attendees to consider the value of collaboration and partnership and the challenge of building trust, in this case, with stakeholders throughout the entire life cycle of scholarly output, including researchers, librarians, IT staff, publishers, and users.

Integrating librarians

Panelists agreed on the value of the work already performed across the nation to develop programs that integrate library staff into research workflows in a "continuous, iterative, dynamic manner" (Sayeed Choudhury). Librarians are partners in research data management in many institutions, with a uniquely holistic view of the full data life cycle. As such, librarians are well suited to aid researchers in creating content that is useful, has integrity, and can be preserved over an appropriate period of time (either once or over several iterations of the data's evolution). However, as Ixchel Faniel pointed out, researchers' needs vary not only across disciplines but also within them. John Wang stated that faculty often do not understand the evolving role of librarians, especially in the realm of scholarly communications. Faniel reminded participants of the concept of "radical trust" (an idea presented earlier in the day)—to achieve it, librarians and researchers must establish strong relationships through shared experiences.

Challenge: Further integrate librarians into the scholarly communications life cycle, and develop better understanding and trust between disciplinary researchers and librarians.

Continuing education

Faniel described the successes and ongoing needs in the library community for professional development of scholarly communications staff. These librarians are often reallocated from other positions when scholarly communications and research data management programs are initiated within their institution. Faniel asked whether a "continuing education program [can] be maintained beyond the [individual] grants and integrated into a larger whole?" She challenged attendees to inventory and bring together the myriad curricula already available.

Open and interoperable technologies

Mercé Crosas focused much of her talk on software development—especially open source tools—that support research, reproducibility, sharing, curation, and preservation. Open repositories, cloud computing infrastructures, and tools for managing sensitive data, are being developed to integrate disparate workflows throughout the research life cycle to improve interoperability and user experience. Wang described a need for dynamic and integrated digital services that can manage the entire suite of academic artifacts, from the content itself, to metadata, legal agreements, software, hardware, and more.

Challenge: Instead of relying solely on developing new tools and services, promote reuse and integration of existing technologies where appropriate, including expanding extant technologies' reach through more interoperable platforms (e.g., APIs).

Measuring impact

Choudhury spoke in length on the concept of "impact," positing that librarians consider "return on impact" rather than "return on investment" as they think of the outputs and influence of their work. Choudhury suggested libraries consider that "if someone you don't know uses [data] and interprets it properly without contacting you, that's impact . . . if they use that [data] in unanticipated ways, that's impact." Similarly, Mark Parsons introduced the idea of "generative value," which is "the capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences."[5] Parsons pointed out during the Q&A that researcher incentive structures have not, in many disciplines, evolved to reflect Choudhury's explanation of "impact."

Challenge: Design tools and services with the flexibility to respond to unanticipated uses, including use by different actors and for different purposes than originally intended. Identify metrics for understanding impact in the short, medium, and long-term.

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5   Zittrain, J. (2008). *The Future of the Internet and How to Stop It*. Yale University Press. ***https://dash.harvard.edu/handle/1/4455262***.

PANEL FOUR: MUSEUMS AND THE NATIONAL DIGITAL PLATFORM

PANELISTS

Greg Albers, J. Paul Getty Trust

Samantha Blickhan, Zooniverse & Adler Planetarium

Michael Edson, Museum for the United Nations — U.N. Live

MODERATOR

Paula Gangopadhyay, Deputy Director of Museum Services, IMLS

This panel discussed including museums as natural NDP collaborators. Museums face many of the same challenges as libraries, creating opportunities for collaboration between and across the sectors. Panelists discussed these topics as well as others including crowdsourcing, digital literacy, and interoperability.

Broadly accessible and shareable content

Samantha Blickhan kicked off the panel with a discussion of the power of crowdsourcing to make content more broadly accessible, but also to build communities of users. Greg Albers addressed the need for openness, and said museums can start by making their collections available online when possible. The majority of IMLS funding for digital work in museums has focused on digitization, digital preservation, and digital asset management, indicating a field-wide interest in finding ways to make collections more accessible online.

Challenge: Continue to develop strategies and tools for making collections and collections data freely available online, and promote these approaches and perspectives across the museum sector. Lessons learned and technology developed should also be transferable to museums with fewer technological and financial resources.

Interoperable and agnostic technologies

Blickhan made a point early in the panel about the need for interoperable and agnostic technology. Agnostic tools and services are not dependent on the choice of underlying software or hardware systems. Interoperable and agnostic data and software development can break down data silos, and make data more accessible for research and use. By creating tools from the start that are interoperable with extant technologies, a single project has the power to support the needs of many institutions in improving in person and online visitor experience.

Challenge: Build systemic, sustainable, and shared solutions, rather than standalone systems perfected to a single purpose. Shifting this mindset is a challenge both the museum and library sectors face.

Professional development and capacity

Albers outlined the need for investing in staff professional development at every level of an institution. Without a digitally literate staff, museums cannot serve all users nor ensure digitally available collections.

Challenge: Provide additional training related to emerging digital roles, particularly at small and mid-sized museums. Additional research on the digital capacity of the museum sector could provide a way to more broadly understand these needs.

Social impact and engagement

Rather than solely making collections available online, Michael Edson proposed that institutions enable reuse of their collections to truly impact users' lives. The panel addressed the importance of a mission-driven, human-centric approach to complement the technical aspects of content sharing. As Edson stated, "Good technology [is] rooted in human relationships, values, listening—not just zeros and ones." Maintaining communications with users is necessary and can be a powerful means of driving the institution's mission. Edson wrapped up the panel by stating, ". . . most change happens in small, local groups—not online. . . . If you want to drive change, you shine a light on extraordinary people working in their own neighborhoods."

Challenge: Shift from a data and technology-centric mindset in the creation of tools and the running of services, to a community-centric vision. Focus on learning, reuse, and community engagement, instead of the digital means used to accomplish those goals.

PANEL FIVE: GOING FORWARD

PANELISTS

Kate Zwaard, Library of Congress

Loretta Parham, Atlanta University Center Woodruff Library

Chris Bourg, Massachusetts Institute of Technology

Cliff Lynch, Coalition for Networked Information

MODERATOR

Ashley Sands, Senior Program Officer, IMLS

In the final session of the day, panelists were asked to identify current challenges and forecast future opportunities for libraries. The panelists considered the impact of current library work and proposed where shared resources and collaboration could make the greatest impacts on this work. The conversation focused on how to meet challenges and take advantage of opportunities that await.

Interoperability

Much of the day's discussions focused on interoperability. Interoperability should be a fundamental part of any technology development plan—without it, tools and applications risk becoming niche data silos. Chris Bourg called this "shareable solutions to shared problems." Kate Zwaard called on the library community to consider that "every complexity we introduce is a barrier to entry to coders who are looking to use our collections." To ensure adoption beyond libraries, metadata and access through APIs must be broadly understandable and application agnostic. Bourg noted that metadata has been at the core of many problems librarians face, and challenged attendees to find solutions to make sharing and interoperability easier.

Collaboration

Building trust is key to collaboration. Helping organizations partner within sectors or across disciplines means investing in human capital to make those collaborations sustainable. Extending that trust-building to user communities is equally important to empower them to action, whether via their own discovery paths, through skills building, or in support of the library through crowdsourcing, hacking, or system integration. Bourg suggested libraries shift from an inward focus to one that includes the broader community, which may require institutions to revisit their missions. Bourg posited that libraries must not only partner with community members, but also center community perspectives and leverage their institutional resources for the public good.

Discovery

From serendipitous browsing to known-item searches, the panelists agreed that libraries need to continue to focus on better methods for discovery. This includes improved interfaces, open data (when appropriate), and greater personalization—while maintaining respect for users' privacy and security.

Preservation

Cliff Lynch identified preservation as another "critical problem" libraries face today. He highlighted many digital formats that have not received the amount of attention necessary because of cost, complexity, or the lack of existing tools. These formats include eBooks, dynamic news sites, social media, and audiovisual collections. He also expressed the need for preservation in general, and research data management specifically, to start at the point of creation. This requires libraries to educate and engage with creators and depositors as early in the content's life cycle as possible.

Scale

Several of the panelists spoke of the need for readiness to take on collections on a wider scale. Zwaard suggested partnerships with disciplines more accustomed to dealing with scale. The number and size of digital collections and supporting technologies hosted and maintained by libraries will continue to grow, many with their own technical, policy, and staffing requirements, and libraries need solutions for how to handle that growth.

Sustainability

The panelists addressed sustainability in a number of ways, but everyone agreed that sustainability remains one of the greatest challenges libraries face. The panel's discussion of this topic involved the importance of considering the short-, medium-, and long-term value of tools and services. Zwaard spoke of the burdens placed on libraries and library staff by continually building new tools without retiring outdated or underutilized ones, a phenomenon referred to as "technical debt." Parham reiterated this and challenged the attendees with her approach, which requires "stopping, reallocating, and rethinking and reprioritizing things that we are doing in service to [our] mission." Bourg spoke to the need to be deliberate when thinking about sustainability, asking tough questions about what stays and what an institution can "gracefully . . . let go of." Finally, as with earlier panelists, Bourg posed the challenge of allowing time for great solutions to emerge and to let go of the need for "quick wins"— the best research, discovery, and growth often happen over time, and libraries should be rewarded for steady forward progress.

Overarching Themes and Future Work

Forum panels spotlighted significant issues libraries and library professionals are successfully addressing and others that remain challenges or opportunities. While the panels each had a specific focus (e.g., digital cultural heritage, scholarly communications), many recurring themes emerged that all of the panels shared. This section outlines the overarching themes drawn from the panels and provides insights into opportunities for future impact.

ACCESS

Making collections available for discovery, sharing, engagement, and reuse, provides a fundamental way for libraries to serve their communities. In practical terms, however, access can be complicated for users because of the variety of software and tools libraries employ. Different systems with dissimilar interfaces can require varying levels of digital literacy and create barriers to access.

"Access" can also refer to the opening of digitized collections for unhindered or low-restriction discovery, access, use, and reuse. Art museums are leaders in this area. The J. Paul Getty Museum, for example, has made thousands of images freely and openly accessible through their website. By offering restriction-free access to their collections, museums are welcoming users to engage with, reimagine, and innovate with their content. Libraries have made strides in this area as well, particularly through institutional and domain repository development, increased focus on open standards and formats, and the Open Access movement (which is based on the premise that "the more people that can access and build upon the latest research, the more valuable that research becomes and the more likely we are to benefit as a society"[6]).

Access is an area rich with possibilities for research and development. Future work in this area might include developing software with enhanced interfaces comparable to private industry solutions, and facilitating new methods of engagement such as the computational reuse of collections. Another key area of ongoing work may be the integration of complex library applications, such as library and eBook catalogs, journal databases, and digital collections, so users do not have to navigate from one data silo to another to find what they need.

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6   SPARC. (website) Open Access. Accessed April 21, 2018, *https://sparcopen.org/open-access/*.

COLLABORATION

Forum panelists recognized that collaboration is a necessary and welcome component of wide-reaching, successful grants. Collaboration is encouraged in all forms: intra- and cross-disciplinary, local and national, public and private, as well as increased pollination between libraries, archives, and museums. Collaboration requires a dedication to communication and building trust, especially when moving beyond peer-to-peer collaboration to less familiar partners. These radically diverse collaborations are offering opportunities for greater access to new tools and innovation, breaking down information silos, and building ethical partnership models so a variety of voices can participate in positive change. Similarly, developing tools and technologies across communities can bring new perspectives to old challenges, and with them alternative solutions.

COMMUNITY

As with successful collaborations, serving our communities necessitates open and trusted relationships, in which everyone feels empowered to participate. For example, Bergis Jules called for "radically inclusive conversations" to diversify the historical record. Establishing trust and ease with other organizations and individuals is essential when moving among or between disciplines and domains, or when bringing organizations together that may not traditionally recognize themselves as part of the same community. Acknowledging the important role that *all* community members can play is a first step to building trust.

A key driver for 21st Century libraries includes enabling open and trusted community spaces where vital conversations can take place. Libraries are adept as leaders in this realm, but have an important role to play as mediators, translators, and listeners, as well. These roles are particularly important for building trustworthy and ethical partnerships with community archives, underrepresented or less resourced institutions, tribal libraries and archives, and organizations that may not feel ready or welcome to participate in conversations at the national level.

CONTINUING EDUCATION

Capacity building for, and representation of, all archives and library staff was a significant focus of the Forum. While opportunities exist and successful models have been established, such as the National Digital Stewardship Residency for new professionals, many mid-career librarians need professional development in areas such as digital preservation, local and community archiving, and reinforcement of library users' digital literacy. Likewise, areas of professional development that may be overlooked include collaboration, grant writing, and project management. Some librarians may need to retool for new careers in scholarly communications, digital privacy and security, and other emerging fields.

IMLS has funded many professional development programs through NDP over the past three years—some have created online resources and self-training guides as a result. Providing ongoing support after a project has ended to keep materials up-to-date and trainees engaged remains a critical, yet elusive, challenge.

DIGITAL EQUITY

Digital equity "ensures all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. Digital equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services."[7] The goal of digital equity is achieved through digital inclusion, when users have access to technology (such as WiFi), possess sufficient digital literacy to use that technology, and have the tools (e.g., software and hardware) to use the technology effectively. Also, users need to feel safe employing the technology, understanding, for example, the privacy risks related to its use. Especially in lower resource communities, library technology is often the only way that users can access the Internet.

Access, digital literacy (including digital privacy), and tool development were the focus of many projects described during the Forum. While there has been strong foundational work in all of these areas, panelists agreed that librarians can use their unique skills and positions within their communities to bridge the information divide by weaving together the outcomes of previous projects or developing new projects with digital equity and digital dignity as their goals. Hot-spot lending and TV White Space programs provide cutting edge examples of how digital equity can be pursued.

INFRASTRUCTURE

A number of themes directed at technical infrastructures arose during the Forum. Panelists emphasized the need for open and system-agnostic technologies to support interoperability and integration. Readiness for scaling technology infrastructures is increasingly important, as data are produced in greater and greater numbers by researchers and as analog collections (in particular audiovisual media) are digitized. Librarians must be prepared to take on this deluge with scalable storage, access, management, and preservation systems. Building siloed systems cannot scale—librarians must be prepared to collaborate on interoperable solutions, whether building on past work by developing new APIs for existing technology or developing new systems with interoperability as a primary goal. Together, these approaches illustrate the idea of the "library as platform," with collaborative approaches to broadly implementable, accessible, and sustainable systems for digital library collections.

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7   Siefer, A. (2016). What Do We Mean When We Say 'Digital Equity' and 'Digital Inclusion'? Benton Foundation Blog: Public Interest Voices for the Digital Age. Submitted October 27, 2016, *https://www.benton.org/blog/what-do-we-mean-when-we-say-digital-equity-and-digital-inclusion*.

PRESERVATION

Preservation is a pressing need for nearly all library and archives collections, but panelists felt a particularly timely focus on complex and fragile born-digital content including audiovisual media, dynamic and ephemeral news websites and social media, and eBooks. Additionally, research data, in its various forms, requires librarians to focus on long-term sustainability solutions alongside short- and medium-term use needs. A particular challenge for scholarly communications librarians is the need to embed themselves into the research data life cycle, ideally from the point of project conception, to ensure appropriate steps are taken to describe scholarly outputs for preservation.

SUSTAINABILITY

While sustainability can have many meanings, here it refers to the maintenance of library systems for as long as they are needed. Sustainability involves organizational support in the form of appropriate and long-term funding, staffing, and technology to ensure continuity of library services over time. To sustain core functions, libraries must prioritize services that are central to their missions. Letting go of projects that are no longer necessary or relevant to stakeholders can help balance resources and missions.

Sustainability is also about the long-term impact of services. Unlike the "quick wins" that bring immediate and sometimes fleeting recognition, long-term planning for services and systems enables librarians to support the evolving needs of an organization. Sustainability, maintenance, and long-term impact must be considered as early as possible for any program, even as ideas are being conceived.

Conclusion

The work described in this report illustrates the extent to which cultural heritage institutions are responding to the challenge of developing a more integrated, equitable, and dynamic set of shared infrastructures for digital library services. The NDP at Three Forum provided an opportunity for dialogue on how NLG and LB21 grants support, and can support, digital library work. Forum panelists and attendees identified priority funding areas for IMLS in the coming years including: access, collaboration, community, continuing education, digital equity, infrastructures, preservation, and sustainability. New grant projects focusing on these themes have the potential to provide greater access to and preservation of scholarly and cultural heritage resources, while ensuring these practices remain sustainable over the long term. Collectively, these efforts are helping libraries envision, refine, and implement digital infrastructures and initiatives. As libraries collaborate in the development of shared tools and services, IMLS will continue to promote best practices to support success in the field through its competitive grant programs.

Appendix A: Forum Agenda

9:00 AM - 9:10 AM: Welcome
Kathryn Matthew, IMLS

9:10 AM - 9:20 AM: Overview of NDP
Emily Reynolds, IMLS

9:20 AM - 10:10 AM: Building Equitable Digital Communities (Moderator: James P. Neal, IMLS)
• Bonnie Tijerina, Data & Society
• Sharon Strover, University of Texas at Austin
• Don Means, Gigabit Libraries Network
• Luke Swarthout, New York Public Library
• Kelvin Watson, Broward County Library

10:30 AM - 11:20 AM: Expanding Digital Cultural Heritage Capacities (Moderator: Emily Reynolds, IMLS)
• Jefferson Bailey, Internet Archive
• Karen Cariani, WGBH Educational Foundation
• Bergis Jules, University of California, Riverside
• Thomas Padilla, University of Nevada, Las Vegas

11:40 AM - 12:30 PM: Opening Scholarly Communications (Moderator: Ashley Sands, IMLS)
• Ixchel Faniel, OCLC
• Mark Parsons, Rensselaer Polytechnic Institute
• Mercè Crosas, IQSS, Harvard University
• John Wang, University of Notre Dame
• Sayeed Choudhury, Johns Hopkins University

1:30 PM - 2:30 PM: Museums and the National Digital Platform (Moderator: Paula Gangopadhyay, IMLS)
• Greg Albers, J. Paul Getty Trust
• Samantha Blickhan, Zooniverse & Adler Planetarium
• Michael Edson, Museum for the United Nations — U.N. Live

2:50 PM - 3:50 PM: Going Forward (Moderator: Ashley Sands, IMLS)
• Kate Zwaard, Library of Congress
• Loretta Parham, Atlanta University Center Woodruff Library
• Chris Bourg, Massachusetts Institute of Technology
• Cliff Lynch, Coalition for Networked Information

3:50 PM - 4:00 PM: Closing remarks
Robin Dale, IMLS

Appendix B: Attendee List

Greg Albers, J. Paul Getty Trust

Jefferson Bailey, Internet Archive

Howard Besser, New York University

Rhiannon Bettivia, University of Illinois at Urbana-Champaign

Samantha Blickhan, Zooniverse & Adler Planetarium

Karim Boughida, University of Rhode Island

Chris Bourg, Massachusetts Institute of Technology

Aaron Brenner, University Library System, University of Pittsburgh

Karen Cariani, WGBH Educational Foundation

Lillian Chavez, Mescalero Community Library

Timothy Cherubini, Chief Officers of State Library Agencies

Sayeed Choudhury, Johns Hopkins University

Euan Cochrane, Yale University Library

Mercè Crosas, IQSS, Harvard University

Will Cross, NCSU Libraries

Robin Dale, IMLS

Lorcan Dempsey, OCLC

Michelle DiMeo, Othmer Library of Chemical History

Michael Edson, Museum for the United Nations — U.N. Live

Dragan Espenschied, Rhizome

Dianne Fallon, York County Community College

Ixchel Faniel, OCLC

Ben Fino-Radin, Small Data Industries

Paula Gangopadhyay, IMLS

Amy Garmer, Aspen Institute

Daniel Gillean, Artefactual Systems

Harriett Green, University of Illinois at Urbana-Champaign

Nate Hill, Metropolitan New York Library Council

Jill Hurst-Wahl, Syracuse University

Salwa Ismail, Georgetown University Library

Bergis Jules, University of California, Riverside

Martin Kalfatovic, Smithsonian Libraries / Biodiversity Heritage Library

Elisabeth Kaplan, George Washington University

Michele Kimpton, Digital Public Library of America

David King, Topeka & Shawnee County Public Library

Kathi Kromer, American Library Association

Clifford Lynch, Coalition for Networked Information

Carol Mandel, NYU Libraries

Kathryn Matthew, IMLS

Stephen Mayeaux, IMLS

Laura McKenzie, IMLS

Don Means, Gigabit Libraries Network

Mary Molinaro, Digital Preservation Network

James G. Neal, Columbia University

James P. Neal, IMLS

Erin O'Meara, University of Arizona

Trevor Owens, The Library of Congress

Thomas Padilla, University of Nevada, Las Vegas

Loretta Parham, Atlanta University Center Woodruff Library

Mark Parsons, Rensselaer Polytechnic Institute

M. Cristina Pattuelli, Pratt Institute

Meg Phillips, National Archives and Records Administration

Sandra Phoenix, HBCU Library Alliance

Richard Reyes-Gavilan, DC Public Library

Emily Reynolds, IMLS

Tricia Rose-Sandler, Missouri Botanical Garden

Amy Rudersdorf, AVPreserve

Judy Ruttenberg, Association of Research Libraries

Ashley E. Sands, IMLS

Lisa Whitney Schermerhorn, Samuel H. Kress Foundation

Roger Schonfeld, Ithaka S+R

Elliott Shore, Association of Research Libraries

Katherine Skinner, Educopia Institute

Christian Skipper, Maryland State Archives

Sharon Strover, University of Texas at Austin

Luke Swarthout, New York Public Library

Ben Sweezy, IMLS

Tracy Teal, Data Carpentry

Bonnie Tijerina, Data & Society

Nicole Vasilevsky, Oregon Health & Science University

Ben Vershbow, Wikimedia Foundation

Jon Voss, Historypin

Zheng (John) Wang, University of Notre Dame

Kelvin Watson, Broward County Library

Helen Wechsler, IMLS

Nancy Weiss, IMLS

Zhiwu Xie, Virginia Tech

Scott Young, Montana State University

Kate Zwaard, Library of Congress