Recommendations Report for the COPPUL Digital Preservation Network

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1. Executive Summary

The digital preservation landscape is complex and rapidly evolving. As collections become increasingly digital, university libraries are looking for solutions to address the substantial challenges associated with their emerging digital stewardship responsibilities.

As the demand for digital preservation escalates, COPPUL’s current digital preservation services are poised for transformation. The COPPUL Digital Preservation Network (COPPUL DPN) transformation project\(^1\) aims to transform COPPUL’s current digital preservation activities into a set of comprehensive, flexible, scalable, and sustainable services provided by a COPPUL Digital Preservation Network (COPPUL DPN).

The COPPUL DPN Manager undertook an extensive requirements gathering process which resulted in a series of recommendations intended to guide COPPUL’s efforts for the next 18 months. The following 14 recommendations, which are explored in more detail throughout this report, are the result.

Recommendations and next steps

Support, promote, and extend the organizational capacity of COPPUL members for digital preservation.

1. **Create a digital preservation advocacy toolkit** aimed at senior administrators and faculty, to effectively communicate the important role academic libraries play as stewards in the digital age, and how this role can situate digital preservation activities within campus IT services and infrastructures.

2. **Create an online self-assessment tool** to help members both get started with digital preservation, and to focus existing efforts.

3. **Formalize a peer matching service** to connect institutions at similar stages in their digital preservation development. Provide guidelines and recommend assessment methods and tools to enable ‘preservation peers’ to effectively support each other’s efforts.

4. **Create document templates and workflow diagrams** to help members: 1) undertake digital asset inventories; 2) create a digital preservation framework document; and, 3) create digital preservation action plans for specific types of content (e.g. ETDs).

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5. **Explore educational and professional development opportunities.** Work with allied organizations\(^2\) to offer professional development and educational opportunities to members.

Expand COPPUL members’ technical capacity for digital preservation.

6. **Modernize the COPPUL Private LOCKSS Network (COPPUL-PLN).** Reconfigure the PLN to: 1) enable drag-and-drop deposit; 2) provide storage-as-a-service; and, 3) allow expansion of network-wide storage capacity.

7. **Explore other preservation storage options.** Explore lower-tiered off-site preservation storage options for member content that might not, for a variety of reasons, require LOCKSS-level storage infrastructure.\(^3\)

8. **Act locally, think nationally.** Work with allied regional and national organizations to align efforts and enable multi-network, pan-Canadian collaborations.

Establish a governance, membership, and sustainability model for the DPN that enables COPPUL member libraries to achieve their institutional goals more rapidly and efficiently as a result of collaboration.

9. **Create a sustainable funding model for the COPPUL DPN** that provides: 1) a cost model, including initial investments and ongoing costs for staff and infrastructure; 2) a funding model that sets tiered membership fees for core services; and, 3) a revenue-sharing model that provides offset costs for institutions that host infrastructure on behalf of the network.

10. **Create a COPPUL DPN Charter** that: 1) outlines the mission, goals, organizing principles, and core services of the COPPUL DPN; 2) lists membership levels; and, 3) details the roles and responsibilities of network members, including participation on steering committees, sub-committees focused on organizational capacity building and technical issues, and working groups focused on services, systems, and emerging issues.

11. **Create a COPPUL DPN Membership Agreement** that outlines the terms of the agreement made between members of the COPPUL DPN.


Explore potential services for affiliates and non-members, and explore community partnerships with other memory institutions in Western Canada.

12. **Work with other regional and national organizations to establish one or more PLN caches outside of Western Canada.** This can be understood as a first step in working towards COPPUL's participation in an emerging network-of-networks, while at the same time increasing the robustness of the COPPUL-PLN.

13. **Create an MOU with the Canadian Association of Research Libraries (CARL)'s Portage Initiative** in order to effectively coordinate research data management efforts with COPPUL's digital preservation efforts, and to explore the possibility of the COPPUL DPN offering preservation services vis-à-vis a national research data platform.

14. **Explore hosted repository services** through collaborative efforts with initiatives like British Columbia Electronic Library Network (BC-ELN)'s Arca Repository Network⁴ and the Abacus Dataverse Network⁵. The COPPUL DPN could in turn offer Arca and Abacus participants reciprocal preservation services.

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2. Introduction

Digital preservation

“The apparatuses, policies, and procedures for preserving digital information are still emerging and the digital preservation field is still in the early stages of its formation.”

The digital preservation landscape is complex and rapidly evolving. As collections become increasingly digital, university libraries are looking for solutions to address the substantial challenges associated with their emerging digital stewardship responsibilities. And because digital preservation is “a complex of actors, policies, practices, and technologies,” it’s increasingly clear that these challenges cannot be addressed by technological solutions alone:

“Librarians and archivists must understand their own institutional requirements and capabilities before they can begin to identify which combination of policies, strategies, and tactics are likely to be most effective in meeting their needs.”

Perhaps in part because the transition from print to e-journals saw libraries relinquish significant control over content to commercial publishers, there is also an emerging recognition that “organizations can and should take responsibility for managing their digital collections, and that such institutions can realize many advantages in collaborative long term preservation and access strategies.” At the same time, effective preservation storage requires a certain level of geo-replication, and therefore inter-institutional collaboration, to address various place-based, jurisdictional, and organizational threat scenarios, is common. Digital preservation writ-large also requires the kind of expertise that tends to be found across multiple institutions. As such, current digital preservation initiatives tend to be network-based and collaborative.

COPPUL Digital Preservation Network (COPPUL DPN) transformation project

As the demand for digital preservation escalates, COPPUL’s current digital preservation services are poised for transformation. The COPPUL Digital Preservation Network (COPPUL

DPN) transformation project is a two-year project that commenced August 1st, 2015, which aims to transform COPPUL’s current digital preservation activities into a set of comprehensive, flexible, scalable, and sustainable services provided by a COPPUL Digital Preservation Network (COPPUL DPN). The COPPUL DPN will accommodate COPPUL members of all sizes, provide a high return on investment for members, and offer flexible and scalable services that suit a broad range of needs.

The COPPUL DPN transformation project will:

1. Support, promote, and extend the organizational capacity of COPPUL members for digital preservation.

2. Expand COPPUL members’ technical capacity for digital preservation.

3. Establish a governance, membership, and sustainability model for the DPN that enables COPPUL member libraries to achieve their institutional goals more rapidly and efficiently as a result of collaboration.

4. Explore potential services for affiliates and non-members, and explore community partnerships with other memory institutions in Western Canada.

Initially, Phase 1 of the COPPUL DPN transformation project saw the creation of:

- A project proposal and plan\(^{11}\)
- A communications plan\(^{12}\)
- Interim governance procedures\(^{13}\)

Following approval of these documents, the COPPUL DPN Manager undertook an extensive requirements gathering process, which included:

- Broad consultation with experts and affiliate organizations in Canada and the U.S., including Compute Canada, CARL, CRKN, OCUL, CAUL, Canadiana.org, BCNET, BC-ELN, University of Toronto Libraries, MetaArchive, and ADPNet.
- Attendance at several key conferences, including iPres.
- COPPUL director interviews.
- A COPPUL member survey on digital preservation.

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- COPPUL expert interviews.
- A literature review.
- A technical survey of existing COPPUL-PLN caches.

During March 2016, a detailed Phase 2 work breakdown structure (WBS) will be drafted for approval by the COPPUL DPN Management Committee, which will call for the creation of several transitional working groups to achieve the specific goals represented in this report’s recommendations, which are discussed in detail throughout the following pages.
3. Environmental scan

Research and outreach

COPPUL’s DPN Manager has taken the following steps to understand broader digital preservation efforts and initiatives and how COPPUL might work together with other institutions and organizations to achieve our goals:

- An extensive literature review and attendance at conferences.
- Participation as a founding member of CARL’s Portage Preservation Expert Group (PEG), as well as outreach to other regional preservation efforts in Canada, specifically the OCUL’s Scholars Portal and Digital Curation Community, and the Council of Atlantic University Libraries (CAUL)’s Digital Preservation and Stewardship Committee.
- Regular outreach to the Private LOCKSS Network (PLN) community at large, including regularly scheduled meetings with MetaArchive and ADPNet.
- Outreach activities to various allied organizations, such as BC-ELN’s Arca Digital Repository Network, BCNET, Canadiana, CRKN’s Integrated Digital Scholarship Ecosystem (IDSE) Initiative, Research Data Canada (RDC), and Compute Canada.

Exemplar networks and allied initiatives

From the Bibliothèque nationale de France to the National Science Library of China, pioneering efforts in digital preservation are happening all over the world. And while these efforts play a critical role in advancing the emergent field of digital preservation, the North American post-secondary environment, and especially what’s happening in Canada, is most relevant to COPPUL’s efforts at this time. In order to help frame these efforts, the following is a review of some exemplar initiatives in the U.S. and Canada.

U.S.-led efforts

MetaArchive

The COPPUL-PLN and MetaArchive were among the first Private LOCKSS Networks in the world, and MetaArchive, under the leadership of Dr. Katherine Skinner, is one of the most active. As such, it holds many lessons for COPPUL.

MetaArchive was established in 2004 with a Digital Information Infrastructure and Preservation Program (NDIIPP) grant from the Library of Congress. Its distributed preservation and network infrastructure uses the LOCKSS software platform developed at Stanford University. After launching as a collaborative effort led by Emory University, it was successfully transitioned in 2007 to “an independent, unincorporated, international membership association...for the
purpose of supporting, promoting, and extending a collaborative approach to distributed digital preservation practices.”

Points of interest

- MetaArchive initially started as a collaborative venture and was spun-off into a separate entity that provides preservation services beyond its initial membership and purview. In some ways this is similar to the CARL-led Canadian Foundation for Information (CFI)’s Canadian National Site Licensing Project (CNSLP) which eventually led to the creation of CRKN, and to CARL’s Portage Initiative, the results of which will likely serve the broader Canadian research community.
- MetaArchive membership now includes museums and other non-academic memory institutions. They increasingly target medium and small institutions that might not have the resources to participate in national efforts like APTrust and the Digital Preservation Network (DPN).
- Unlike APTrust, MetaArchive offers membership tiers, which makes it more feasible for smaller institutions to participate.
- MetaArchive has explored collaborative opportunities with other preservation initiatives, including Chronopolis, itself a replicating node in the DPN. They are currently looking at participating as a Digital Public Library of America (DPLA) service and/or content hub. Like many other networks, they are actively exploring participation as replicating nodes in other networks.
- There is a clear recognition at MetaArchive that LOCKSS presents significant barriers to use, and that these barriers must be addressed, especially within a network environment where members are using a wide variety of content platforms, and where content ingest is dependent on the development of platform-specific plugins. As such, MetaArchive is looking at content- and platform-agnostic ingest methods. There is significant opportunity for COPPUL to collaborate with MetaArchive as they explore this approach.
- Like all preservation networks, MetaArchive works hard to get its members’ content effectively ingested into the network, and to make this ingest easy enough to attract new members. Increasingly, network resources are being deployed towards helping members build the institutional capacity to fully utilize preservation storage services. As such, MetaArchive provides preservation policy templates and other resources to help institutions create the organizational frameworks necessary to effectively undertake digital preservation. Without these frameworks in place, there is a danger that members will underutilize network services, which can jeopardize ongoing participation.

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15 Canadian Research Knowledge Network. (n.d.). History. [http://crkn.ca/about/history](http://crkn.ca/about/history)
MetaArchive also has a mission statement that makes explicit the need to both raise awareness of distributed digital preservation issues, and to create enduring, geographically dispersed dark archives for members' content. Their governance structure encourages member participation through sub-committees focused not only on technical issues, but also on outreach and education, and content issues (i.e. data wrangling), and they have deployed a wide variety of communication tools for members, including a wiki containing extensive documentation such as best practice guidelines for helping members deal with specific types of content, such as ETDs.

MetaArchive worked with a contract consultant to carry out a Trusted Repositories Audit & Certification (TRAC) self assessment (and posted the results to their website), but they have not pursued official TRAC certification.

**Academic Preservation Trust (APTrust)**

“...APTrust is a consortium of higher education institutions committed to providing both a preservation repository for digital content and collaboratively developing services related to that content. The APTrust repository accepts digital materials in all formats from member institutions, and provides redundant storage in the cloud. It is managed and operated by the University of Virginia and is both a deposit location and a replicating node for the Digital Preservation Network (DPN). The APTrust consortium leverages the expertise of its members to identify and articulate needs for the digital content environment, to prioritize service development, and to collaboratively build solutions.”

**Points of interest**

- APTrust is managed by a large research library (at the University of Virginia), and is at present primarily used by other large research libraries, most of which steward a considerable volume and diversity of digital content. In this way, it is a less diverse ecosystem compared to MetaArchive, but its membership have significant financial resources which they are able to dedicate to the network as it develops.
- Membership is $20,000 per year, which requires participation in a variety of consortial activities and also includes 10 TB of storage. APTrust preservation storage is a service, and does not require hosting a content node.
- Although APTrust is led by research libraries, it relies on Amazon storage infrastructure (APTrust stores three copies of members’ content in AWS’s S3 service in Virginia and

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three more in Glacier in Oregon\textsuperscript{22}), which can be economically problematic over the long term,\textsuperscript{23} but also utilizes broadly deployed cloud infrastructure which is tremendously scalable (members can easily purchase additional storage in 5 TB increments).

- APTrust clearly recognizes that even for the best-resourced institutions, “the depth of technical expertise required to address [digital preservation] challenges is beyond the ability of most libraries,”\textsuperscript{24} and explicitly acknowledges the value of virtually pooling expertise.

- Based on informal reporting, APTrust members—regardless of size, and like almost all university libraries—find it challenging to create the organizational space within which to effectively identify and stage content for inclusion in the network: “In our experience, APTrust has been ready to accept deposits long before the institutions have completed their processes of selection and technical preparation of the content for deposit.”\textsuperscript{25} As mentioned, each participating institution is allocated 10 TB of storage. There are 17 participating institutions, but as of October 19\textsuperscript{th}, 2015, only 16 TB are being used.\textsuperscript{26} Under-utilization of storage infrastructure is a real issue, and represents an economic threat if uptake is too slow for decision makers at participating institutions. As such, APTrust clearly frames membership contributions in these early days of the network in terms of “building a set of basic production preservation services.”\textsuperscript{27}

- APTrust is content-agnostic. It accepts all types of content from its member institutions, including text, audio, video, and encrypted files.

- APTrust uses platform-specific Duracloud staging spaces to ingest bagged content to a Fedora-based repository hosted on Amazon infrastructure.\textsuperscript{28} This infrastructure is based on software readily deployed in university library environments. And, importantly, this allows for the potential indexing of ingested content (using Solr) for the future development of aggregated discovery services.

- The use of Duracloud also enables APTrust to easily integrate with DPN workflow services, allowing members the additional option of replicating their APTrust-based content in a diverse federated preservation network operating on Internet2 infrastructure: “APTrust will adhere to the principle aspirations of DPN by providing a path for content destined for long-term preservation and by replicating content from other DPN nodes.”\textsuperscript{29}

- APTrust is actively exploring preservation services in addition to storage, such as format migration and aggregate discovery. Importantly, they are also exploring hosted repository services.

• APTrust is pursuing trusted digital repository status.

DPN (Digital Preservation Network)

“DPN will ensure that the complete scholarly record is preserved for future generations. It will be the long-term preservation solution shared collectively across the academy that protect local and consortia preservation efforts against all types of catastrophic failure. The supporting ecosystem enables higher education to own, maintain and control the scholarly record throughout time. While commercial entities may partner with us to contribute to this effort at different points in time depending on priorities and business models, final control must reside with the academy.”

Points of interest

• Like MetaArchive and APTrust, DPN clearly recognizes the critical importance of the ‘academy’ maintaining control over the stewardship of digital content.

• DPN provides redundant copies of content stored in multiple, independently operated preservation repositories to ensure against the failure of any single repository for technical, economic, legal, or catastrophic reasons. It this way, it has the potential to be very robust over the long-term.

• DPN is best characterized as a network of networks, an “archive for archives”, which provides replication services primarily for other digital preservation networks and initiatives, like APTrust, HathiTrust, and Chronopolis.

• DPN brings together a number of preservation initiatives, some of which—such as Chronopolis and the University of Texas Digital Repository—had their origins in proximity to high-performance and supercomputing facilities, or—like HathiTrust—in collaboration with major commercial technology companies like Google. The DPN itself is hosted at Internet2, a “consortium led by over 220 universities working in partnership with industry and government to develop and deploy advanced network applications and technologies.”

• This speaks to the potential for collaboration between library-led regional efforts, high-performance computing facilities (i.e. Compute Canada), and high-speed networking (i.e. CANARIE). We see a similar alignment in Canada, with the emergence of CARL’s Portage Initiative, where repository and preservation services are being created on Compute Canada infrastructure, and with the recent appointment of former UPEI University Librarian Mark Leggott as Executive Director of Research Data Canada (RDC), which operates under the auspices of CANARIE.

• Figshare, a research data repository that CRKN is exploring as a possible service offering, is now a participating member in the DPN, and contributes content through DuraSpace’s DuraCloud Vault deposit node (DuraCloud Vault is a hosted service.

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providing preservation services through a partnership between DuraSpace, Chronopolis, and DPN\textsuperscript{34}). This points to possible collaborations with commercial vendors in an environment where content remains in the control of the ‘academy’ for the long-term.

**Canadian-led efforts**

**Canadian Association of Research Libraries (CARL) Portage Network**
- Portage is being led by the Canadian Association of Research Libraries (CARL), with representation from Canada’s regional academic library consortia, the Canadian Research Knowledge Network (CRKN), and other organizations.\textsuperscript{35}
- The aim of the Portage network is “to pool and expand existing expertise, services and infrastructure so that all academic researchers in Canada will have access to the support they need for research data management.”\textsuperscript{36}
- The Portage network will have two major components: a library-based distributed centre of expertise, and a national preservation and discovery system.
- Portage is working with Compute Canada to develop preservation processing and storage infrastructure using Globus GridFTP for data transfer and Globus Publications for repository services. Compute Canada is also working to customize Archivematica to process large data volumes.
- As a national research data repository system emerges from Portage’s efforts, there is an opportunity for regional academic library preservation networks to participate as service and/or content nodes in a pan-Canadian research data preservation infrastructure.
- COPPUL and Portage are actively exploring collaborative opportunities in this regard.

**Canadian Research Knowledge Network (CRKN)’s Integrated Digital Scholarship Ecosystem (IDSE) Project**
- With IDSE, CRKN is strategically positioning itself to play a coordinating role beyond content licensing, in the digital scholarship ‘ecosystem’.
- It is “an initiative to advance research in Canada by understanding the complexity of the digital landscape and by seeking opportunities to align key stakeholders and providers around a series of shared objectives.”\textsuperscript{37}


\textsuperscript{36} ibid.

• An important part of this ecosystem is digital preservation. CRKN recognizes that significant contributions to research risk being lost “because of the inability of academic libraries or memory institutions to adequately steward these scholarly productions.”

• CRKN will likely play a key role in helping to identify and surface key digital preservation initiatives within Canada and by creating resources to make these initiatives better known within the digital scholarship ecosystem. CRKN may also play an important role connecting allied efforts in the field of digital preservation, and in creating related advocacy materials.

• They also recognize the importance of working towards a network-of-networks, possibly by “leveraging existing Canadian trusted digital repositories (TDR’s) such as those at Scholars Portal and potentially Canadiana.org to establish a ‘HathiTrust North’, or exploring Canadian participation in HathiTrust.”

Canadiana.org

• “Canadiana.org is a coalition of memory institutions dedicated to providing broad access to Canada’s documentary heritage. Through [its] membership alliance, Canadian libraries share tools and capacity, partner on open-source projects, and spearhead digital preservation in Canada.”

• Canadiana operates a Trustworthy Digital Repository (TDR). The TDR preserves the documentary heritage digitized through Canadiana.org projects, as well as digitized or born-digital content, and content received from project partners.

• Like APTrust, Canadiana is interested in developing discovery services across content repositories.

• COPPUL and Canadiana are currently exploring a partnership that would see Canadiana participate as a replicating node in the COPPUL-PLN.

Ontario Council of University Libraries (OCUL)

• OCUL is the most active regional academic library consortia in Canada in the area of digital preservation.

• Scholar’s Portal was the first Trusted Digital Repository in Canada, and is one of only 6 in the world (along with Canadiana). The development of Scholar’s Portal, and its certification as a TDR, has nurtured a high level of digital preservation expertise and capacity within OCUL.

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39 ibid.


• The Ontario Library Research Cloud\(^{43}\) is offering preservation storage infrastructure based on OpenStack Swift, also used extensively for object storage by commercial vendors (e.g. Clouda, based in Halifax, used by BC-ELN’s Arca Network via discoverygarden for IR object storage\(^{44}\)), and Compute Canada. This choice of object storage may enable OCUL and OCUL members to more easily participate in federated preservation solutions developed by Portage and other pan-Canadian preservation initiatives, while at the same time providing the OCUL community with geo-replication a robust security.

• OCUL is exploring many areas that COPPUL is also considering, and is working with Artefactual to develop Dataverse-Archivematica integration. There are significant yet-to-be realized collaborative opportunities ranging from research data platforms, other types of hosted repositories, and Archivematica integration.

• There is an active OCUL Digital Curation Community, which “brings together OCUL members who have roles in supporting preservation and access to digitized and born digital materials. The scope […] encompasses the full digital curation lifecycle: including digital object creation/digitization, preservation, and the facilitation of access.”\(^{45}\) This provides an excellent venue for collaboration between COPPUL’s and OCUL’s digital preservation initiatives, and also encourages COPPUL to frame its efforts more broadly in terms of stewardship.

• It is also possible that a formalized COPPUL-OCUL partnership relating to some aspect of digital preservation could serve as the foundation or impetus for a broader national effort in this area.

• COPPUL and OCUL are actively exploring collaborative opportunities in the field of digital preservation, and have established monthly teleconference meetings.

Council of Atlantic University Libraries (CAUL) Digital Preservation and Stewardship Committee

• CAUL’s Digital Preservation and Stewardship Committee (DPSC) helps to foster and advance digital preservation and stewardship amongst its members.\(^{46}\)

• CAUL member Memorial University is also member of the SAFE-PLN,\(^{47}\) a Private LOCKSS Network which replicates content (including ETDs) in Europe and North America.

• The CAUL DPSC is currently in hiatus awaiting a new committee chair (former Chair Mark Leggott, as mentioned, has left the University of Prince Edward Island and is now Executive Director at RDC). The COPPUL DPN Manager will be presenting on

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COPPUL’s digital preservation efforts to the CAUL DPSC in the coming months, and there are excellent opportunities for collaborative efforts, especially as CAUL members look increasingly for collaborative solutions similar to those offered by COPPUL and OCUL, to address their myriad preservation challenges.

Emergent themes

The emergence of networks and networks-of-networks

“Currently, universities don’t have a cost-effective, fail-safe way to preserve the scholarly record or the content needed to produce new scholarship. Many institutions do have preservation repositories, but they are at risk of being single points of failure.”

- Whether preservation efforts are commercial or community-led, they tend to focus on a particular class of materials (such as the PKP-PLN, focused on Open Journal Systems content, or the CGI-DPN, focused on Canadian federal government documents and websites), a specific type of institutional context (e.g. large research institutions), or a specific jurisdiction (ADPNet). As such, many institutions participate in several digital preservation efforts.
- Preservation infrastructure is increasingly networked-based, and reliant on a wide range of specialized expertise across multiple institutions, high-performance computing facilities, and high-speed networks.
- There is considerable heterogeneity in the technology that is deployed across different preservation networks.
- Networks tend to be centrally administered, and are increasingly funded by the membership to provide preservation-related services. Many networks are initially developed and deployed, and subsequently undertake significant upgrades, through grant-funding or other ‘soft money’.
- Networks-of-networks are starting to emerge, especially at the national and international level, where multiple dark copies of network collections in technologically diverse nodes are protected against the risk of catastrophic loss due to malicious attack, and technological, organizational, or natural disasters.

Predominance of technological-focused solutions and the ‘adoption gap’

“May all your problems be technical.”

-Jim Gray

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Most preservation efforts still focus on technological solutions, especially preservation storage infrastructure and related services, such as content ingest, integrity checking, and disaster recovery.

Digital preservation is concerned with “maintaining the ability to display, retrieve, and use digital material in the face of rapidly changing technological and organizational infrastructures,” and as such clearly requires more than technological solutions. It is best characterized as a larger effort that involves a wide range of organizational activities.

As such, organizations cannot acquire an out-of-the-box comprehensive digital preservation solution. Even when participating in one or more digital preservation networks, they must develop their own programs best suited to their specific institutional context, which serve to integrate a wide variety of policies and procedures, tools, services, and expertise.

As such, there is a tension between digital preservation network services—which tend to focus on technology—and individual institutional digital preservation readiness.

This tension has created what some have called an ‘adoption gap,’ where even well-resourced networks are composed of individual members that find it challenging to use costly services to their full potential.

The significant challenges associated with geographically-defined preservation networks like the COPPUL DPN

While it is clear that any distributed digital preservation network is challenging to operate effectively, geographically-bounded networks arguably experience the most challenges, because they tend to involve a mix of very large and very small institutions. Smaller institutions are more likely to have trouble maintaining technology and rapidly deploying additional network storage to accommodate increasing demand from larger partners. They are also more susceptible in terms of staffing and money. The loss of just one key staff member, or even a small reduction in funding, can have a disproportionately negative impact on a smaller institution’s ability to maintain a trusted node within a network.

At the same time, and especially in an environment of increasingly centralized IT services, institutions of any size within a specific jurisdiction may not be able or willing to host the prerequisite hardware and software environments to participate in networks that require members to host a content or service node.

Large institutions are best-positioned to participate in larger preservation networks like the APTrust or the DPN, or with large peers in other jurisdictions. At the same time, and problematically, they are best-able to provide preservation expertise to regional efforts, as well as robust, trustworthy, and scalable infrastructure services.

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• Large institutions are also more likely to have a wider variety and larger volume of specific content types, such as research data, government documents, and locally-hosted journals, which may have pre-existing or developing preservation solutions (cf. Portage for research data, CGI-DPN for Canadian Government Documents, and the PKP-PLN for OJS-based journals). They are also better-positioned to participate in commercial preservation solutions such as Portico.

**Recommendations arising from environmental scan**

1. Recognize the importance of institutional capacity building as a requisite to effective participation in a digital preservation network, and create mechanisms to help institutions increase their readiness to undertake digital preservation.

2. Create a sustainability plan for the COPPUL DPN that allows larger institutions to participate effectively alongside small to medium sized institutions, perhaps through a revenue model that provides monetary and in-kind support to large network content nodes in exchange for preservation infrastructure services to the network.

3. Develop hosted preservation storage services that do not require members to host a content node.

4. Focus on optimizing the existing COPPUL-PLN to lower barriers to use and improve scalability, while at the same time explore the technical feasibility of becoming a content replication node for other emerging Canadian preservation storage networks (OCUL, Portage, etc.).

5. Provide preservation storage options in addition to LOCKSS. As such, explore partnerships with Compute Canada, CANARIE and its regional research network partners in Western Canada (BCNET, Cybera, SRnet, and MRnet), as well as commercial cloud storage providers.

6. Develop mechanisms for allied organizations and initiatives, including those outside the post-secondary sector, to effectively participate in the COPPUL DPN.

7. Work with other regional consortia and stakeholders across Canada to explore the feasibility of a Canadian digital preservation network-of-networks.

8. Explore the possibility of providing hosted institutional repository and research data management services, and aggregate discovery tools based on network content.

9. Explore the feasibility of achieving some level of trusted repository certification or self-assessment for the COPPUL-PLN.
4. Director interviews

“Anyone who thinks deeply about digital scholarship and where libraries are going has to be thinking about digital preservation.”

“When an institution has the capacity to undertake meaningful digital preservation, it has more opportunities to participate in the research life of a university.”

“We’re in this, it’s important, we need to do this.”

From October to December 2015, the COPPUL DPN Manager interviewed directors or designates at 21 of 23 COPPUL member institutions. There is an incredible amount of work being done throughout the system to create and steward a wide variety of digital resources, while at the same time the challenges remain daunting. Some key themes and specific recommendations emerged.

Emergent themes

- For the COPPUL DPN to be successful, it needs to demonstrate real value for individual institutions.
- Although many institutions are just starting to ‘get their feet wet’ in terms of digital preservation, there is an excellent level of understanding among directors as to what digital preservation is, and the organizational, technical, and economic challenges associated with it.
- There is also a general recognition that digital preservation is a multi-institutional, collaborative activity, if only because effective preservation storage requires geo-replication. This collaboration should not necessarily be limited to the post-secondary sector, and we should explore relationships with allied memory organizations and corporations.53
- There was near-universal support for COPPUL’s efforts in this area, even if there was not a clear and present need for specific digital preservation services at all institutions. There is a commonly-held ‘philosophy of supporting collaborative ventures’, especially at this start-up phase.
- Especially for smaller to medium-sized institutions, there is a clear recognition that consortial efforts around digital preservation are necessary if local efforts are to succeed.
- Although vendor-based solutions are viable options for some, many recognise that outsourcing certain aspects of digital preservation--especially storage--is not sustainable

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53 This fits well with the general trend that sees libraries, archives, and museum (LAMs) increasingly converging in the digital realm, as patrons look for digital objects based on topic or subject, rather than institutional source, and explore across institutions using search engines and other discovery tools.
in the long-term. There is broad support for digital preservation as a library-led and community-led effort.

- There is general support for collaboratively funding a position across multiple institutions to tackle this specific issue.
- There is general support for an ‘a la carte’ approach to service offerings through the COPPUL DPN.
- Because of limited local resources, or lack of access to local IT infrastructure, many institutions are looking increasingly at hosted solutions for digital asset management platforms, institutional repositories, and research data management, and digital preservation services.
- Successful COPPUL efforts in this area can serve as a foundation for emerging efforts moving forward.

Recommendations arising from director interviews

1. Create a framework within which effective collaboration can take place. Digital preservation is not primarily a technical challenge, but rather an organization one, and the COPPUL DPN needs to create mechanisms for individual institutions to work together, especially around shared expertise, experience, and documentation.

2. Focus on skills, knowledge, and documentation. Digital preservation tools and systems will not be used to their fullest if the local ability to undertake digital preservation is absent because of a lack of support, expertise, and policy frameworks.

3. Develop advocacy toolkits and deploy educational resources. Create resources about digital preservation (what it is and why it’s important) for directors to take to senior university administration, and for liaison librarians to take to faculty. Even smaller institutions that might not have clearly identified specific digital preservation needs might want to understand the basic issues so that, as things emerge, they will be in a position to respond.

4. Align the COPPUL DPN with regional, national, and international efforts. Especially for larger institutions, COPPUL’s efforts need to be effectively articulated with other regional, national, and even international efforts. We need to work with others in the field, especially within Canada, in order to align efforts across the country as effectively as possible.

5. Pursue external grant funding. Identify COPPUL DPN priorities and, especially in terms of technical development and institutional capacity building, explore grant-funded opportunities to kick-start specific initiatives or activities. There is also some appetite to explore a COPPUL ‘endowment fund for innovation’ where a centralized fund could target emerging efforts around digital preservation and other innovative activities.
6. Explore a COPPUL integrated preservation strategy. Coordinators for COPPUL’s digital preservation efforts and the SPAN project\(^{54}\) should explore strategic alignment and look at framing efforts in terms of a ‘COPPUL integrated preservation strategy.’

7. Create special incentives to preserve First Nations-related digital collections and knowledge. COPPUL could sponsor or otherwise support clearly-identified digital preservation efforts around First Nations collections, through targeted funding, capacity building efforts, community outreach, etc. This would support another of COPPUL’s strategic priorities “to establish COPPUL as a leader in developing, managing, and promoting indigenous knowledge in COPPUL institutions and across Canada.”

8. Explore COPPUL member access to BC-ELN’s Arca Digital Repository Network. At least three non-BC members mentioned this network, and the need for a similar offering within their jurisdiction.

9. Create digital preservation workflow diagrams for specific platforms. COPPUL should provide real-world examples and documentation for how to effectively integrate specific software suites into a digital preservation workflow. For example, demonstrate how DSpace, Archivematica, and the COPPUL Private LOCKSS Network might work together to provide a digital preservation solution for ETDs, and provide expertise around implementation.

**Participating institutions**

1. University of Manitoba
2. University of Winnipeg
3. University of Saskatchewan
4. University of Regina
5. University of Alberta
6. University of Calgary
7. University of Lethbridge
8. MacEwan University
9. Mount Royal University
10. Athabasca University
11. Concordia University of Edmonton
12. University of British Columbia
13. Simon Fraser University
14. University of Victoria
15. University of Northern British Columbia
16. University of the Fraser Valley
17. Kwantlen Polytechnic University
18. Thompson Rivers University
19. Trinity Western University
20. Royal Roads University
21. Vancouver Island University

5. Member survey

In the Fall of 2015, the COPPUL DPN Manager, in consultation with the DPN Management Committee, undertook a member survey. 16 complete responses were received. This represents a response rate of approximately 70%.

For full results, see Appendix 4: COPPUL member 2015 digital preservation survey, or visit https://docs.google.com/a/coppul.ca/forms/d/1VuB2wZpqEqmADEAPkrNoqJpJ4N7h8x27sDdqChvb1w/viewanalytics#start=publishanalytics.

Background

To help better contextualize the results, the following represents a sample of recent surveys of a similar scope:

SPEC Kit 325: Digital Preservation (October 2011)

This survey focused on ARL strategies to protect evolving research collections. The survey was conducted in early 2011. Sixty-four ARL members completed the survey for a response rate of 51%. “Judging by the survey findings, most ARL libraries view digital preservation as a complicated mix of technical and organizational responses to the needs of aging content. Most also see the provision of digital preservation services for their campuses as a key component of their 21st century missions. They are actively expanding their policies, workflows, and technical capacity for preservation.”

- Almost all respondents were responsible for stewarding digitized special collections, still images, ETDs, moving images, and audio materials.
- Less than a third identified being responsible for research data and web-archives.
- 60% were not planning on preserving commodity, licensed resources.
- 90% reported that they were engaged, or soon would be engaged, in preserving digital content for the long term.
- 70% were working collaboratively with other stakeholders across campus on achieving their digital preservation goals.
- Only two institutions had approved digital preservation policies in place.
- More than 30% reported having a dedicated preservation budget.
- The most frequently reported barriers to preservation were staffing and expertise.
- Participants were increasingly reaching out to institutional peers and seeking broader community-based opportunities to improve expertise.

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National Digital Stewardship Alliance (NDSA) Storage Survey (2011)

The NDSA Infrastructure Survey was conducted in 2011 and received responses from 58 members of the 74 NDSA member organizations who are preserving digital content, for a response rate of 78%. The goal of the survey was to ascertain the current storage practices of National Digital Stewardship Alliance member organizations.

“The storage survey revealed an inherent optimism in addressing future digital preservation storage infrastructure issues even as anticipated storage needs rise dramatically and technology changes often. The results also revealed the complexity of digital preservation storage planning, especially given the large number of preservation copies being maintained and the diversity of media used and requirements documented.”

- The majority of respondents were experiencing significant storage growth, with many approaching the 1 PB+ category.
- Current average usage of preservation storage is 492 TB per institution.
- 64% of respondents agreed or strongly agreed that they planned to make significant changes in technologies in their preservation storage infrastructure within the next three years.
- Anticipated need in three years was, on average, 1107 TB per institution.
- 60% planned on complying with the rigorous TRAC standards within three years.


The NDSA Standards and Practices Working Group surveyed 85 institutions in 2012 with the mandate to investigate how organizations are staffed and organized in relation to their preservation functions.

“Overall, the results of the Digital Preservation Staffing survey indicate that organizations are making do with what they have and generally think that their digital preservation programs and staffing are working well, but they feel a distinct need for more people to help do the work.”

- Most organizations surveyed had no dedicated digital preservation department.
- Close to half of respondents thought that the digital preservation function in their organizations was well organized, but a third were not satisfied.

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• Most organizations expected the size of their holdings to increase substantially in the next year.
• Images and text files were the most common types of content being preserved.
• Most organizations were performing the majority of digital preservation in-house, but many outsourced some activities, with digitization being the most common.

**Previous COPPUL surveys**

COPPUL has also undertaken a number of previous member surveys on similar issues.

**COPPUL Preservation Investigation (2010)**

This survey was based on the Digital Preservation Self-Assessment Tool. Six libraries completed the survey, providing for “a good representation of COPPUL members”.

• No respondents had undertaken a TRAC Audit.
• Only one library reported developing risk assessment tools for their digital collections.
• “Preservation” was mostly defined in terms of backup and storage redundancy.
• Respondents participated in preservation ‘collaboratives’ where available (e.g., COPPUL, LOCKSS, CLOCKSS, Portico).
• Digital preservation wasn’t broken out as a separate activity, but generally part of the collections or systems function.
• Documentation and policies were still very much in progress.
• All respondents were creating digitization projects, both in-house and through outsourcing.
• Most depended on operating budgets to support projects; 50% also used grant or donor funding.
• Most staff training around digital preservation was done in-house and in an ad-hoc manner.
• ContentDM and DSpace were the most commonly used platforms.
• Copyright was an issue for all respondents.

**COPPUL Digitization Initiatives and Practices (2011)**

This survey looked at topics such as project management, funding, selection, and preservation. 14 universities responding “ranging in size from small to large based on FTE students.”

• 57% of respondents had developed specific steps or strategies to preserve locally-digitized resources.

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59 *ibid.*
● 57% were also affiliated with an existing ‘preservation Network’ such as LOCKSS and Portico.
● Zero respondents indicated their organization had a campus-wide digital preservation strategy or guidelines.
● All respondents were creating digitization projects.
● 12 of 14 respondents relied on national grants to fund digitization projects.
● 12 of 14 also had dedicated digital preservation staff.
● Obtaining copyright permissions is an issue for the vast majority of respondents.

2015 Survey

Summary of results
● Overall, respondents recognized the strategic importance of undertaking digital preservation activities at their institutions, and especially the importance of communicating this to campus stakeholders.
● There is also a clear recognition that capacity-building at the institutional level is important. Respondents indicated a clear need for outreach and education programs, templates and other sample documents, peer-review services, and workflow examples, all in order to support their local efforts.
● These efforts are underway, but need help: less than a third of respondents felt well-prepared to undertake digital preservation over the next few years.
● At the same time, limited human resources, funding issues, and competing institutional priorities are creating a challenging environment within which to undertake effective digital preservation.
● These challenges present an exceptional opportunity for COPPUL to offer digital preservation-related processing and storage tools while at the same time helping institutions work together to collaboratively build capacity throughout the network.

Detailed results
● For full results, see Appendix 4: COPPUL member 2015 digital preservation survey, or visit https://docs.google.com/a/coppul.ca/forms/d/1VuB2wZpqEqmADEAPkrNogJpJ4N7h8x27sDdq1Chvb1w/viewanalytics#start=publishanalytics.
● Strategic priorities: Nearly 60% of respondents felt that digital preservation was strategically important or very important at their institutions, while over 93% felt that it was important or very important that libraries and archives communicate the value of digital preservation to their campus communities and other stakeholders.
● Institutional capacity building: There was strong support for many activities related to helping institutions undertake effective digital preservation on-the-ground locally. In terms of prioritizing COPPUL’s efforts in this area, some activities were rated higher than
• Research data management and digital preservation: 64% of respondents favoured COPPUL looking into providing a cloud-based, hosted instance of a data repository like Dataverse, which could then be integrated into preservation workflows involving systems like Archivematica and storage services like the COPPUL-PLN.

• SPAN and digital preservation: There seems to be mixed support for creating something akin to a COPPUL-wide integrated digital preservation strategy, with 40% of respondents either neutral or negative when considering the importance of strategically connecting efforts around SPAN and the COPPUL DPN.

• Platforms: There is a great deal of heterogeneity when it comes to platforms, with at least 15 being used to steward or otherwise manage local digital content. DSpace, ContentDM, and the PKP suite of software are—not surprisingly—the most common, but there are many institutions that are in the process of exploring the use of other platforms, especially those that combine multiple platform functionality. For example, almost a third of respondents are exploring the use of Islandora. Archive-it is also being explored by almost a third of respondents.

• Types of content: All institutions are managing a wide diversity of digital content, including faculty publications, text documents, still images, moving images, and audio recordings (93% of respondents are managing these content types). Even the

<table>
<thead>
<tr>
<th>Capacity-building activity</th>
<th>Number of respondents who rated this important or very important (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Templates for developing digital preservation documents</td>
<td>100%</td>
</tr>
<tr>
<td>Peer-matching service to enable institutions to collaboratively undertake digital preservation</td>
<td>87%</td>
</tr>
<tr>
<td>A web-based self-audit tool</td>
<td>87%</td>
</tr>
<tr>
<td>Education and training programs</td>
<td>80%</td>
</tr>
<tr>
<td>Digital preservation advocacy toolkits</td>
<td>80%</td>
</tr>
<tr>
<td>Resources around starting and effectively maintaining a web archiving initiative</td>
<td>80%</td>
</tr>
<tr>
<td>How-to guides for integrating preservation tools like Archivematica and LOCKSS into current workflows</td>
<td>78.5%</td>
</tr>
<tr>
<td>A central repository of COPPUL members’ digital preservation-related documents</td>
<td>73%</td>
</tr>
</tbody>
</table>
least-common types of content are being managed by a majority of respondents, including research data sets (80%), ETDs and institutional records (both at 73%), and websites (67%).

- Preservation storage: When asked “Would your institution be interested in other preservation storage systems aside from LOCKSS?”, almost 50% of respondents responded positively. Interestingly, almost 50% didn’t know.

- ‘Pinch-points’ and digital preservation effectiveness: Limited human resources, funding issues, and competing institutional priorities are creating a challenging environment within which to undertake effective digital preservation.

<table>
<thead>
<tr>
<th>Pinch points</th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial constraints</td>
<td>93.3%</td>
<td>6.7%</td>
<td></td>
</tr>
<tr>
<td>More pressing issues or priorities to deal with</td>
<td>93.3%</td>
<td>6.7%</td>
<td></td>
</tr>
<tr>
<td>Limited human resources</td>
<td>86.7%</td>
<td>13.3%</td>
<td></td>
</tr>
<tr>
<td>Limited access to IT resources</td>
<td>60.0%</td>
<td>40.0%</td>
<td></td>
</tr>
<tr>
<td>Challenges in creating organizational documentation like digital preservation</td>
<td>60.0%</td>
<td>33.3%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Limited on-site expertise around digital preservation</td>
<td>53.3%</td>
<td>46.7%</td>
<td></td>
</tr>
<tr>
<td>Copyright, intellectual property, or privacy issues</td>
<td>53.3%</td>
<td>26.7%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Lack of clearly-defined responsibilities for digital preservation among professional and/or technical staff</td>
<td>53.3%</td>
<td>40.0%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Not knowing where to start or being generally overwhelmed by the challenges associated with digital preservation</td>
<td>46.7%</td>
<td>53.3%</td>
<td></td>
</tr>
<tr>
<td>Not having enough locally-produced digitized materials to make digital preservation a current priority</td>
<td>26.7%</td>
<td>73.3%</td>
<td></td>
</tr>
<tr>
<td>A lack of support from senior campus administrators</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
</tbody>
</table>

- Overall preparedness for digital preservation: Only 27% of respondents felt prepared or very prepared to undertake effective digital preservation at their institutions in the next 3-5 years.

Recommendations arising from survey results
1. Create an advocacy toolkit on digital preservation for library administrators to share with senior university administrators, and for liaison librarians to share with faculty. This is in recognition of the importance of communicating the value of digital preservation to senior administration, and the strategic imperative this represents for most libraries.

2. Create mechanisms within the COPPUL DPN to improve members’ capacity to effectively undertake digital preservation, with an initial focus on: templates for policies and procedures, peer-review services, creating a web-based self-audit tool to help members identify gaps in their digital preservation readiness, and creating user guides and best practice documentation for dealing with the most common content types.

3. Explore the possibility of a hosted COPPUL instance of Dataverse, possibly using UBC EduCloud infrastructure.

4. Create preservation processing and storage infrastructure that effectively manages a wide range of content types, integrates with a wide ranging and ever-changing platform ecosystem, and that provides some level of choice as to level of preservation storage intensity.

5. Deploy outreach and educational programs to help increase awareness of the importance of digital preservation, and pursue possible external funding sources for digital preservation initiatives. This should help address some of the ‘pinch points’ around competing institutional priorities, limited human resources, and financial constraints.
6. Expert interviews

Twelve individuals at eight libraries were identified via the COPPUL DPN Management Committee and through directors’ recommendations. They were interviewed from October to December 2015 about the specific challenges associated with digital preservation at a representative set of small, medium, and large COPPUL member institutions. Several themes and recommendations emerged.

Emergent themes

- Preservation storage is a big issue, and most institutions are looking to COPPUL for support: “good storage is the base upon which we build anything else.”
- As specific institutions work towards their digital preservation goals, example documentation (workflow, policies, procedures, action plans, inventories, and templates for all) is highly sought-after.
- Resources are stretched very thin at most member institutions.
- For medium and larger institutions, the inability of the COPPUL-PLN to scale disk-space quickly, is problematic.
- The largest institutions are looking at national and international collaborations, as well as collaborations with similar-sized partner institutions within Canada.
- For smaller institutions, the inability to spin up a LOCKSS box is also a major barrier to participation.
- Currently, the COPPUL-PLN does not effectively respond to immediate demand, and governance issues contribute to its under-use (i.e. lack of an effective mechanisms for individual institutions to add content to the network quickly).
- The PLN has significant barriers to use in terms of getting content ingested from a wide diversity of platforms.
- In terms of storage, it’s important to think of tiers. Not all content needs the full LOCKSS treatment.
- Many see the PLN as good technology for a small percentage of hyper-critical content: “it’s good for the ‘scholarly record’, i.e. textual records (ETDs, reports, etc.) but it’s not something that’s necessarily a good fit for large and increasingly complex massive stuff.” Many institutions would like to explore other, especially cloud-based storage options.
- It’s a challenge for digital preservation to be recognized as an issue in need of resources outside those areas responsible for digital initiatives.

Recommendations arising from expert interviews

1. Lower the ‘barriers to entry’ for using the COPPUL-PLN: If we continue to use the PLN, we need to look at lowering barriers to entry by developing new tools (staging servers, LOCKSS-O-Matic) and ingest methods (for example, focusing on ingesting platform- and
content-agnostic Bags), and offering PLN storage-as-a-service to institutions without existing nodes. This would also mean locally-administering the PLN (it is currently administered by LOCKSS staff at Stanford).

2. Concisely articulate a vision statement across all COPPUL efforts (something akin to an “Integrated Preservation Strategy”).

3. Articulate regional efforts in relation to national strategies.

4. Develop services to address preservation activities related to gap analysis, peer-review of policies, procedures, workflows, etc., inventory templates, and templates for policy development.

5. Explore other preservation storage technologies, especially those being currently deployed as part of the object storage infrastructure for the Ontario Library Research Cloud.60

6. Explore collaborative opportunities with Compute Canada and WestGrid, and CANARIE plus the provincial Optical Regional Advanced Networks (ORANs) BCNET, Cybera, SRNet, and MRNet.

Participants
The following is a list of individuals interviewed by the COPPUL DPN Manager. Please note that these individuals are meant to represent a broad cross-section of COPPUL members, and that the DPN Manager is very receptive to feedback provided by other folks that would like to contribute to COPPUL’s digital preservation efforts.

- Brett Lougheed University Archivist/Digital Curator, University of Winnipeg
- Bronwen Sprout, Head, Digital Programs and Services, UBC
- Colin Elliot, Manager, Web Projects and Services, Athabasca University
- Dan Sifton, Coordinator, Library Automation and Technical Services; Dana McFarland, eResources Librarian; and, Jean Blackburn, Librarian; Vancouver Island University (in person)
- Geoff Harder, Associate University Librarian, Information Resources and Digital Initiatives, University of Alberta
- John Durno, Head, Library Systems, University of Victoria (in person)
- Mark Jordan, Head, Library Systems, Simon Fraser University
- Tim Au Yeung, Digitization and Repository Services, University of Calgary
- Dr. Umar Qasim, Digital Preservation Officer, University of Alberta

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7. Recommendations and next steps

For each requirements gathering step of Phase 1 of the COPPUL DPN transformation project, emergent themes led to numerous recommendations. These have been synthesized and represented in 15 recommendations for next steps. These recommendations are intended to guide COPPUL’s efforts over the remaining 18 months of the COPPUL DPN transformation project, and to form the basis for establishing a COPPUL DPN to serve members’ digital preservation needs for the foreseeable future.

Support, promote, and extend the organizational capacity of COPPUL members for digital preservation.

1. **Create a digital preservation advocacy toolkit** aimed at senior administrators and faculty, to effectively communicate the important role academic libraries play as stewards in the digital age, and how this role can situate digital preservation activities within campus IT services and infrastructures.

2. **Create an online self-assessment tool** to help members both get started with digital preservation, and to focus existing efforts.

3. **Formalize a peer matching service** to connect institutions at similar stages in their digital preservation development. Provide guidelines and recommend assessment methods and tools to enable ‘preservation peers’ to effectively support each other’s efforts.

4. **Create document templates and workflow diagrams** to help institutions: 1) undertake digital asset inventories; 2) create a digital preservation framework document; and, 3) create digital preservation action plans for specific types of content (e.g. ETDs).

5. **Explore educational and professional development opportunities.** Work with allied organizations to offer professional development and educational opportunities to members.

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Expand COPPUL members’ technical capacity for digital preservation.

6. **Modernize the COPPUL Private LOCKSS Network (COPPUL-PLN).** Reconfigure the PLN to: 1) enable drag-and-drop deposit; 2) provide storage-as-a-service; and, 3) allow expansion of network-wide storage capacity.

7. **Explore other preservation storage options.** Explore lower-tiered off-site preservation storage options for member content that might not, for a variety of reasons, require LOCKSS-level storage infrastructure.

8. **Act locally, think nationally.** Work with allied regional and national organizations to align efforts and enable multi-network, pan-Canadian collaborations.

Establish a governance, membership, and sustainability model for the DPN that enables COPPUL member libraries to achieve their institutional goals more rapidly and efficiently as a result of collaboration.

9. **Create a sustainable funding model for the COPPUL DPN** that provides: 1) a cost model, including initial investments and ongoing costs for staff and infrastructure; 2) a funding model that sets tiered membership fees for core services; and, 3) a revenue-sharing model that provides offset costs for institutions that host infrastructure on behalf of the network.

10. **Create a COPPUL DPN Charter** that: 1) outlines the mission, goals, organizing principles, and core services of the COPPUL DPN; 2) lists membership levels; and, 3) details the roles and responsibilities of network members, including participation on steering committees, sub-committees focused on organizational capacity building and technical issues, and working groups focused on services, systems, and emerging issues.

11. **Create a COPPUL DPN Membership Agreement** that outlines the terms of the agreement made between members of the COPPUL DPN.

Explore potential services for affiliates and non-members, and explore community partnerships with other memory institutions in Western Canada.
12. **Work with other regional and national organizations to establish one or more PLN caches outside of Western Canada.** This can be understood as a first step in working towards COPPUL’s participation in an emerging network-of-networks, while at the same time increasing the robustness of the COPPUL-PLN.

13. **Create an MOU with the Canadian Association of Research Libraries (CARL)’s Portage Initiative** in order to effectively coordinate research data management efforts with COPPUL’s digital preservation efforts, and to explore the possibility of the COPPUL DPN offering preservation services vis-à-vis a national research data platform.

14. **Explore hosted repository services** through collaborative efforts with initiatives like British Columbia Electronic Library Network (BC-ELN)’s Arca Repository Network and the Abacus Dataverse Network. The COPPUL DPN could in turn offer Arca and Abacus participants reciprocal preservation services.

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Appendix 1

Bibliography


Appendix 2

The shape of things to come: Reconfiguring the COPPUL-PLN

In order to lower barriers to use, COPPUL is exploring a PLN architecture that would enable a Dropbox-like deposit process for any zipped or ‘bagged’ file, using a number of open source tools, including OwnCloud https://owncloud.org/ and LOCKSS-O-Matic https://github.com/mjordan/lockss-o-matic. The following diagrams, provided by Mark Jordan at SFU Library, represent an initial possible configuration for self-deposit and self-withdrawal.

Self-deposit overview
Self-withdrawal overview

User withdrawing content → Sends notification email when files are ready

Selects desired files in OwnCloud → Generates list of deposited files owned by user

OwnCloud staging server → Retrieves selected files from LOCKSS boxes

LOCKSS-O-Matic → COPPUL PLN
Appendix 3

Relevant Organizations and Standards

The following section outlines various standards and organizations that are relevant to the COPPUL’s efforts in the emerging field of digital preservation. While it is not intended to be comprehensive, it should provide adequate context—along with this report’s main section entitled “Background research and environmental scan”—within which our consortial and institution-specific digital preservation efforts should be situated.

Intellectual foundations of digital preservation

- ISO 14721:2012: Space Data and Information Transfer Systems -- Open Archival Information System (OAIS) Reference Model: “OAIS defines the reference model for an open archival information system (OAIS). An OAIS is an archive, consisting of an organization, which may be part of a larger organization, of people and systems that has accepted the responsibility to preserve information and make it available for a designated community. It meets a set of such responsibilities as defined in this International Standard, and this allows an OAIS archive to be distinguished from other uses of the term ‘archive’. The term ‘open’ in OAIS is used to imply that ISO 14721:2012, as well as future related International Standards, are developed in open forums, and it does not imply that access to the archive is unrestricted.”

(http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284) The standard:

- provides a framework for the understanding and increased awareness of archival concepts needed for long term digital information preservation and access,
- provides the concepts needed by non-archival organizations to be effective participants in the preservation process,
- provides a framework, including terminology and concepts, for describing and comparing architectures and operations of existing and future archives,
- provides a framework for describing and comparing different Long Term Preservation strategies and techniques,
- provides a basis for comparing the data models of digital information preserved by archives and for discussing how data models and the underlying information may change over time,
- provides a framework that may be expanded by other efforts to cover long term preservation of information that is not in digital form (e.g. physical media and physical samples),
- expands consensus on the elements and processes for long term digital information preservation and access, and promotes a larger market which vendors can support, and
guides the identification and production of OAIS-related standards.

- ISO 20652: Space Data and Information Transfer Systems: Producer-Archive Interface Methodology Abstract Standard (PAIMAS): “PAIMAS identifies and provides a structure for the interactions which take place between an information producer and a deposit archive. The standard covers the first stages of the ingest process defined by OAIS (ISO 14721). It identifies the phases required for transferring information, and defines objectives, actions and expected results for each phase. It provides a methodological framework for achieving the phases and forms the basis for identifying and developing standards and technologies to support their delivery.” ([http://www.dcc.ac.uk/resources/standards/diffuse/show?standard_id=154#sthash.4CGkSz1j.dpuf](http://www.dcc.ac.uk/resources/standards/diffuse/show?standard_id=154#sthash.4CGkSz1j.dpuf))

- International Research on Permanent Authentic Records in Electronic Systems (InterPARES): “a collaborative research initiative led by the University of British Columbia that is focused on addressing issues of long-term preservation of authentic digital records. The research is being conducted by focus groups from various institutions in North America, Europe, Asia, and Australia, with an objective of developing theories and methodologies that provide the basis for strategies, standards, policies, and procedures necessary to ensure the trustworthiness, reliability, and accuracy of digital records over time.” ([https://en.wikipedia.org/wiki/Digital_preservation#InterPARES](https://en.wikipedia.org/wiki/Digital_preservation#InterPARES))

**Preservation repository assessment and certification**


  - Canadiana.org
  - Chronopolis
  - CLOCKSS
  - Hathitrust
  - Portico
  - Scholars Portal

- DRAMBORA (Digital Repository Audit Method Based On Risk Assessment): “a self-audit toolkit developed by the Digital Curation Centre (DCC) and DigitalPreservationEurope (DPE) to help guide repository managers along a similar route of analysis to that which
an external auditor would use to examine and analyse the work of the repository. Its
design is based on the experiences of the DCC audits of digital repositories conducted in
2006.”
(http://www.dcc.ac.uk/resources/repository-audit-and-assessment/drambora/drambora-faq)

- Data Seal of Approval (DSA): “was established by a number of institutions committed to
the long-term archiving of research data. By assigning the seal, the DSA group seeks to
guarantee the durability of the data concerned, but also to promote the goal of durable
archiving in general. Achieving the DSA means that the data archive or repository is in
compliance with the sixteen DSA guidelines, as determined through an assessment
procedure. Although these guidelines pertain to three stakeholders – the data producer
(three guidelines), the data consumer (three guidelines) and the data archive (ten
guidelines) – the data archive is seen as the primary implementer of the guidelines. The
data archive as an organization should assume responsibility for the overall
implementation of the DSA in its own specific field.”
(http://www.data-archive.ac.uk/media/57322/dsa_overview.pdf)

Other standards

- PREMIS (PREservation Metadata: Implementation Strategies): “The PREMIS Data
Dictionary [for Preservation Metadata] defines a core set of semantic units that
repositories should know in order to perform their preservation functions. Preservation
functions can vary from one repository to another, but will generally include actions to
ensure that digital objects remain viable (i.e., can be read from media) and renderable
(i.e., can be displayed, played or otherwise interpreted by application software), as well
as to ensure that digital objects in the repository are not inadvertently altered, and that
legitimate changes to objects are documented.”
(http://www.loc.gov/standards/premis/understanding-premis.pdf) See
http://www.loc.gov/standards/premis/ for complete details.

- METS (Metadata Encoding and Transmission Standard): “a metadata standard for
encoding descriptive, administrative, and structural metadata regarding objects within a
digital library, expressed using the XML schema language of the World Wide Web
Consortium. The standard is maintained in the Network Development and MARC
Standards Office of the Library of Congress, and is being developed as an initiative of
the Digital Library Federation.” (https://en.wikipedia.org/wiki/METS) METS allows for the
use of externally developed metadata schemes to be used for descriptive or
administrative metadata. PREMIS has been registered as a recognized metadata
scheme to be used as administrative metadata with METS.
(http://www.loc.gov/standards/mets/mets-extenders.html)
BagIt: “The Library of Congress, with the California Digital Library and Stanford University, has developed guidelines for creating and moving standardized digital containers, called ‘bags.’ A bag functions like a physical envelope that is used to send content through the mail but with bags, a user sends content from one computer to another.” (http://www.digitalpreservation.gov/multimedia/videos/bagit0609.html) Bags can be used by a variety of digital asset management systems (for example, Omeka https://omeka.org/add-ons/plugins/bagit/ and Islandora http://islandora.ca/sites/default/files/Islandora%20BagIt%20-%20iCampCA.pdf) and by Archivematica (https://www.archivematica.org/en/docs/archivematica-1.4/user-manual/transfer/bags/).

Digital preservation-specific organizations and networks

- LOCKSS: The LOCKSS Program (“lots of copies keep stuff safe”) is an open-source, library-led digital preservation system developed by Stanford Libraries to enable libraries and publishers “to preserve and provide access to persistent and authoritative digital content.” (http://www.lockss.org/) In terms of digital preservation at COPPUL member Libraries, there are two broad components of the LOCKSS Program that are important: a) the Global LOCKSS Network (GLN), and b) a number of Private LOCKSS Networks (PLNs).
  
  o The Global LOCKSS Network (GLN): The GLN is maintained by the Stanford University LOCKSS staff with funding provided by the LOCKSS Alliance, of which all current COPPUL PLN participants are a member. Over 530 publishers use the GLN as their ejournal and ebook preservation and post-cancellation access partner. A list of publishers and e-journal titles with ISSN and eISSN that have been processed since 1998 and is being preserved in the Global LOCKSS Network is available here: http://www.lockss.org/community/publishers-titles-gln/

  o Private LOCKSS Networks (PLNs): While the GLN tends to focus on high-value publisher content (ejournals and ebooks), PLNs tend to be highly targeted collaborative efforts of like-minded institutions working together to share the preservation responsibility (including governance and sustainability) of e-content important to the group. (http://www.lockss.org/community/networks/) “The range of content preserved in various Private LOCKSS Networks is vast, and includes photo image collections, audio collections, government documents and databases. The international Private LOCKSS Network community holds regular meetings and maintains a wiki.” (http://www.lockss.org/community/networks/)

  ■ Controlled LOCKSS (CLOCKSS): “a not-for-profit joint venture between the world’s leading academic publishers and research libraries whose mission is to build a sustainable, geographically distributed dark archive with which to ensure the long-term survival of Web-based scholarly
publications for the benefit of the greater global research community.” (https://www.clockss.org/clockss/Home) A list of participating publishers is available here: https://www.clockss.org/clockss/Participating_Publishers.

- Public Knowledge Project (PKP) LOCKSS: PKP has developed a Private LOCKSS Network (PLN) to digitally preserve Open Journal System (OJS) journals that are not part of the Global LOCKSS Network, or an existing PLN (such as the COPPUL DPN). “The PKP PLN is a dark archive. End users will not have access to the preserved content until after a ‘trigger event.’ After a trigger event, PKP staff will approve the importing of the preserved content into one or more OJS instances hosted by PKP member institutions. Once loaded into these host OJS instances, the content will be openly accessible.” (https://pkp.sfu.ca/pkp-lockss/)

- The Canadian Government Information Digital Preservation Network (CGI DPN): CGI-DPN is a project initiated in October 2012 by library staff at eleven member institutions (including several COPPUL members) with the singular mission to preserve digital collections of government information. “Digital materials produced by government agencies that are at risk of being lost are preserved as part of the program … [and the] network will also be used to act as a backup server in cases where the main server is unavailable.” (http://plnwiki.lockss.org/wiki/index.php/CGI_network)

- Portico: Portico provides libraries and publishers with “a reliable, cost-effective solution to one of the most critical challenges facing the scholarly community today—ensuring that the electronic resources you rely on everyday will be accessible to future researchers, scholars, and students.” Portico preserve e-journals (c. 22,000 titles), e-books (c. 535,000), and digitized historical collections (a title list is available here http://www.portico.org/digital-preservation/who-participates-in-portico/participating-titles). More than 920 libraries—including several COPPUL members—participate in Portico as a component of their digital preservation strategy.

- Artefactual Systems: Lead developer of the AtoM archival description software, and Archivematica, an integrated suite of free and open source tools that allow users to process digital objects from ingest to archival storage and access, in compliance with the ISO-OAIS functional model and other digital preservation standards and best practices. Artefactual is also the SaaS service provider for our COPPUL-negotiated instance of Archivematica, which is hosted on UBC’s EduCloud Server Service. Artefactual partners with a number of institutions on building functionality germane to the emerging

digital preservation needs of the COPPUL community, including:

- Working with UBC to implement automated ingest from DSpace to Archivematica. “Ingesting the repository’s 40,000+ items from DSpace to Archivematica means that they will undergo digital preservation micro-services, including file format normalization, and be preserved as durable, OAIS-compliant Archival Information Packages.” ([https://www.artefactual.com/ubc-library-running-automated-ingest-from-dspace-to-archivematica/](https://www.artefactual.com/ubc-library-running-automated-ingest-from-dspace-to-archivematica/))

- Partnering with the Ontario Council of University Libraries (OCUL) to develop the ability to ingest content from Dataverse to Archivematica.

- Collaborating with the Museum of Modern Art (MoMA) to develop Binder, meant to enable “active preservation management” in addition to archival storage. ([https://www.youtube.com/watch?v=TelwvLkt-84](https://www.youtube.com/watch?v=TelwvLkt-84))

- ArchivesDirect is a hosted service offered by DuraSpace in partnership with Artefactual Systems for creating AIPs for storage in DuraCloud. ([https://www.youtube.com/watch?t=17&v=u7Ryyo2UWGA](https://www.youtube.com/watch?t=17&v=u7Ryyo2UWGA)) This service is similar in scope to COPPUL’s Archivematica SaaS using UBC’s EduCloud.

- DuraSpace: An independent not-for-profit organization “providing leadership and innovation for open technologies that promote durable, persistent access to digital data.” ([http://www.duraspace.org/about](http://www.duraspace.org/about)) UPDATE: In January 2016, The Boards of LYRASIS and DuraSpace unanimously approved an "Intent to Merge". ([http://duraspace.org/node/2775](http://duraspace.org/node/2775)) LYRASIS is the organizational home for ArchivesSpace and CollectionSpace, and offers hosted services for ArchivesSpace, CollectionSpace and Islandora.

DuraSpace supports a number of open technology projects and platforms that are key components to COPPUL members’ digital preservation strategies, including:

- DSpace: Many COPPUL members’ primary institutional repository software for ETDs and other publications. And while DSpace is not “a complete solution to the problem of preserving digital research output,” ([http://dspace.mit.edu/handle/1721.1/29464](http://dspace.mit.edu/handle/1721.1/29464)) it was developed with the OAIS model in mind and can be relatively easily configured to get content into both Archivematica and a PLN.

- Fedora: The open-source repository component of our emerging Islandora project. “Islandora is an open source digital repository system based on Fedora Commons, Drupal and a host of additional applications. It is open source
software (released under the GNU General Public License) and was developed at the University of Prince Edward Island by the Robertson Library.” (https://en.wikipedia.org/wiki/Islandora)

- DuraSpace also includes the DuraCloud Service, which enables libraries and archives to upload, sync, and monitor content across multiple commercial cloud storage providers. DuraCloud “eliminate[s] the risk of storing content with a single cloud provider by making it easy to move and copy files of any size or format.” (http://www.duracloud.org/overview)

- Islandora Foundation: oversees the maintenance of the primary Islandora codebase. Islandora is “an open-source software framework designed to help institutions and organizations and their audiences collaboratively manage, and discover digital assets using a best-practices framework. Islandora was originally developed by the University of Prince Edward Island's Robertson Library, but is now implemented and contributed to by an ever-growing international community.” (http://islandora.ca/) The Islandora community has developed digital preservation tools and best practices, including “automated digital object file identification, automated checksum creation and verification, automated generation of PREMIS metadata, and the integration of BagIt allowing for the network transfer of objects in a given Islandora repository.” (http://vre2.upei.ca/islandscholar/fedora/repository/ir:10820)

- Internet Archive: a non-profit founded to "build an Internet library. Its purposes include offering permanent access for researchers, historians, scholars, people with disabilities, and the general public to historical collections that exist in digital format, including: texts, audio, moving images, and software as well as archived web pages in our collections, and provides specialized services for adaptive reading and information access for the blind and other persons with disabilities.” (https://archive.org/about/)

- Archive-It: a subscription web archiving service from the Internet Archive that helps organizations to harvest, build, and preserve collections of digital content. This is the tool used by a number of COPPUL Libraries for web archives. WARC files can be downloaded and processed using other preservation services such as LOCKSS, Archivematica, and DuraCloud (http://www.duracloud.org/archive-it). Also available are Archive-It Research Services, which “allow(s) any Archive-It partner to give users, researchers, scholars, developers, and other patrons easily-analyzed datasets that contain key metadata elements, link graphs, named entities, and other data derived from the resources within their collections.” (https://webarchive.jira.com/wiki/display/ARS/Archive-It+Research+Services)
National organizations and initiatives (Canada)

- **Canadian Association of Research Libraries (CARL):** CARL members include Canada’s twenty-nine largest university libraries as well as Library and Archives Canada and NRC Knowledge Management. Enhancing research and higher education are at the heart of its mission. CARL promotes effective and sustainable scholarly communication, and public policy that enables broad access to scholarly information. ([http://www.carl-abrc.ca/en/about-carl.html](http://www.carl-abrc.ca/en/about-carl.html))

  - **Portage:** “Portage aims to coordinate and expand existing library-based expertise, services and infrastructure so that Canadian researchers will have access to the support they need for research data management (RDM). Portage will have two major components: a network of expertise to provide access in both English and French to a comprehensive set of resources, tools and experts; and a preservation and discovery system to connect the various infrastructure and service components needed for national preservation and discovery of data.” ([http://www.rdc-drc.ca/carl-humphrey-named-initial-director-of-portage/](http://www.rdc-drc.ca/carl-humphrey-named-initial-director-of-portage/))

  - **Web archiving:** Susan Haigh, Executive Director of CARL, was previously in charge of Library and Archives Canada’s web archiving initiatives. Since taking the helm at CARL, she is working with others across the country to try to initiate a national conversation around web archiving (in terms of building and sharing expertise, collaborative collection building, etc.).

- **Canadian Research and Knowledge Network (CRKN):** “a partnership of universities dedicated to expanding digital content for the university research enterprise in Canada. From its inception as a pilot project in 2000, CRKN has played a key role in building knowledge infrastructure in Canada, providing equitable and cost-effective access to scholarly content for universities nationwide.” ([http://crkn.ca/about](http://crkn.ca/about))

  - **Integrated Digital Scholarship Ecosystems (IDSE):** an initiative to advance research in Canada by understanding the complexity of the digital landscape and by seeking opportunities to align key stakeholders and providers around a series of shared objectives. A key recommendation now before the CRKN Board involves “implement[ing] robust and sustainable services to address the many challenges of digital preservation. Those interviewed suggested the possibility of leveraging existing Canadian trusted digital repositories (TDR’s) such as those at Scholars Portal and potentially Canadiana.org to establish a “HathiTrust North”, or exploring Canadian participation in HathiTrust.” ([http://crkn.ca/sites/crkn.ca/files/site/idse_information_gathering_report_-_final.pdf](http://crkn.ca/sites/crkn.ca/files/site/idse_information_gathering_report_-_final.pdf))
- **Compute Canada**: in partnership with regional organizations ACENET, Calcul Québec, Compute Ontario and WestGrid, deploys state-of-the-art advanced research computing (ARC) systems, storage and software solutions. Traditionally, this computational power was deployed vertically in discipline-specific ways. More recently, Compute Canada is looking at horizontal applications that impact all disciplines, in a way analogous to the role research libraries hold at their home institutions. This may provide opportunities for the digital preservation community. For example, Chuck Humphries with the Portage research data management network is exploring the possibility of working with Compute Canada to host an instance of Archivematica that could be used to process research data sets into AIPs for storage on Compute Canada infrastructure or at home institutions or regional storage networks: “Research Data Canada has been coordinating a major effort among RDC active organizations to develop a pilot that will allow researchers to deposit their research data in repositories housed on Compute Canada storage facilities. The purpose of the pilot is to truly determine what is required to meet the needs of researchers from disciplines without developed data infrastructure. Among the organizations active in this RDC Pilot are Compute Canada, CANARIE, Canadian Association of Research Libraries, CANFAR, C-Brain, Scholar’s Portal, SFU Libraries, and University of PEI. The efforts to mount the pilot have been focused on connecting existing infrastructure and services via the CARL Portage library network and Compute Canada, and augmenting those resources with insights and experiences from disciplinary repositories.”

  (http://www.rdc-drc.ca/the-rcd-federated-pilot-for-data-ingest-and-preservation/)

  - Globus: Compute Canada is also introducing data replication services to multiple Compute Canada sites across the country using Globus, which “makes it simple to describe, curate, and preserve data at desired levels of durability.”

    (https://www.globus.org/)

- **Canadiana.org**: a coalition of 26 research and memory institutions with longstanding commitments to expand the scope of digital content available for scholarly research. It was “founded in 1978 to preserve Canada's print heritage and make it accessible for future generations, with a special emphasis on material that is rare, scattered or at-risk. Canadiana.org approaches all projects on a cost-recovery basis, investing revenues into maintaining and improving Canada's digital infrastructure.”


  - Canadiana.org Trustworthy Digital Repository (TDR): a digital preservation system that provides capability to preserve content digitized through Canadiana.org projects, as well as content already digitized or born-digital, and content received from project partners. The TDR's digitization standards and procedures are available here:

    https://docs.google.com/document/d/10Q03FCFJpzWjLg_HM2fFaAkCdJBaKWyvqC_L1qthbRA/edit.
CANARIE: “Twelve provincial and territorial network partners, together with CANARIE, collectively form Canada’s National Research and Education Network (NREN). This powerful digital infrastructure connects Canadians to national and global data, tools, colleagues, and classrooms that fuel the engine of innovation in today’s digital economy. CANARIE’s national backbone network provides interprovincial and international connectivity for Canada’s NREN.” (http://www.canarie.ca/network/)

Research Data Canada: “develops strategy, facilitates communication and partnerships among data initiatives, promotes education and training in data skills, measures progress in implementing the vision, brings attention to gaps, and acts as single point of contact for Canada in international data initiatives.” (http://www.rdc-drc.ca/) As mentioned above (see Compute Canada), “Research Data Canada has been coordinating a major effort among RDC active organizations to develop a pilot that will allow researchers to deposit their research data in repositories housed on Compute Canada storage facilities.” (http://www.rdc-drc.ca/the-rdc-federated-pilot-for-data-ingest-and-preservation/)

The Council of Canadian Academies (CCA): “an independent, not-for-profit organization that supports independent, authoritative, and evidence-based expert assessments that inform public policy development in Canada. The Council’s work encompasses a broad definition of science, incorporating the natural, social and health sciences as well as engineering and the humanities.” (http://www.scienceadvice.ca/en/about.aspx) The CCA recently released a major report, Leading in the Digital World: Opportunities for Canada’s Memory Institutions http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/memory/CofCA_14-377_MemoryInstitutions_WEB_E.PDF, with significant mention of the importance of digital preservation to the public interest, and a recognition that more needs to be done at the national level.

Regional organizations and initiatives (Canada)

Ontario Council of University Libraries (OCUL): OCUL is very active in the field of digital preservation. Here are some of their initiatives:

Scholars Portal: “The Scholars Portal TDR project is the first step in the development of a robust long-term preservation program for all Scholars Portal collections. Working from requirements set out in the Open Archival Information System (OAIS) reference model and the Trustworthy Repositories Audit & Certification (TRAC) checklist, Scholars Portal seeks to create a digital preservation system that can ensure the long-term integrity and usability of the objects in its care.” (http://www.ocul.on.ca/node/101; http://www.ocul.on.ca/node/97) As of February 2013, Scholars Portal’s e-journal
platform has been certified by the Center for Research Libraries (CRL) as a Trustworthy Digital Repository.

- OCUL Digital Curation Community: “The OCUL Digital Curation Community is an ongoing community that brings together OCUL members who have roles in supporting preservation and access to digitized and born digital materials. The scope of this conversation encompasses the full digital curation lifecycle: including digital object creation/digitization, preservation, and the facilitation of access.” See https://spotdocs.scholarsportal.info/display/ODCC/OCUL+Digital+Curation+Community+Home for more information.

- Ontario Libraries Research Cloud (OLRC): “The OLRC Storage Service is a cloud storage network, initially created for the use of OCUL members. This storage network seeks to provide an alternative to commercial cloud storage providers to allow OCUL members to more closely control their storage costs and maintain control of their data. This storage service utilizes industry-standard APIs and interfaces to maximize compatibility with existing library use cases, including institutional repositories and other preservation repositories. OLRC also addresses the need for geographically distributed storage, which many OCUL schools have identified as a gap in their preservation planning. Through the creation of storage nodes at multiple Ontario campuses, OLRC helps libraries mitigate risk associated with local storage failure while still maintaining full control of their assets and ensuring that they remain under Canadian jurisdiction.” (https://spotdocs.scholarsportal.info/display/ODLRC/About+the+OLRC)

- The Conference of Rectors and Principals of Quebec Universities (CREPUQ): CREPUQ has a mandate to “negotiation and administration of agreements on joint acquisition of various products, in particular documents in electronic form or access licenses for such products, with a view to concerted development of university library collections,” (http://www.crepuq.qc.ca/spip.php?article31&lang=en). In 2001, they released a report entitled Synthèse des normes applicables à la conservation et à la manipulation des documents sur support informatique (http://www.crepuq.qc.ca/documents/bibl/normes_info/support_electro.htm), which seems to mostly focus on preservation of materials on magnetic tape, floppy disk, and digital optical disk.

- Council of Atlantic University Libraries (CAUL): CAUL’s Digital Stewardship and Preservation Committee (http://caul-cbua.ca/sites/default/files/CAULCBUA%20RDWG%20ARDR%20Report%20May%202015.pdf) has done a significant amount of work in terms of articulating the need for an Atlantic Research Data Repository (ARDR). See http://caul-cbua.ca/sites/default/files/CAULCBUA%20RDWG%20ARDR%20Report%2C
for more details. IN terms of regional efforts around the preservation of research data, this represents a significant initial attempt, although the CAUL Board of Directors is currently taking a wait-and-see approach in terms of research data, especially in consideration of activities currently underway at Portage and Research Data Canada: “The Board agrees that it would be best to consider emerging national projects before proceeding with a substantial regional initiative.”

A full list of reports on digital preservation issues created by CAUL is available here: http://caul-cbua.ca/committee/digital-preservation-and-stewardship-committee/cteereports.

Institutional leaders (Canada)

There are many research libraries and other memory institutions that are playing a significant role in the digital reservation landscape. Here are a few:

- Library and Archives Canada (LAC): Initial publication of LAC’s Canadian Digital Information Strategy https://datalib.library.ualberta.ca/data/CDISfinalreport.pdf in 2007 was an important first articulation of the need for national efforts to ensure the preservation of digital information. After a period of institutional inaction there is a renewed focus on specific digital preservation initiatives at LAC, especially around web archiving (the International Internet Preservation Committee [IIPC] Steering Committee is currently being chaired by Paul N. Wagner, Senior Director General, Innovation & Chief Information Officer, Library and Archives Canada). Additionally, Thesis Canada Portal continues to harvest and provide redundant offsite storage for ETDs in some COPPUL member IRs via LAC’s Harvesting Program (http://www.bac-lac.gc.ca/eng/services/theses/Pages/harvesting.aspx).

- Simon Fraser University Library has been a leader in the Private LOCKSS Network Community, serving as the home institution for the development of the development tools and services like LOCKSS-O-Matic https://github.com/mjordan/lockss-o-matic and the PKP-PLN https://pkp.sfu.ca/pkp-lockss/, to name but a few. Also a leader in preservation-related integration of Fedora-based repositories, especially Islandora.

- University of Toronto is home to Scholar’s Portal and other significant digital preservation initiatives, including the U of T iSchool’s Digital Curation Institute, which "strives to be a focal point for digital curation and a world-class center of expertise in digital curation showing international leadership in interdisciplinary digital curation research, innovation, education, and advice. We focus on particular aspects of the already established curation agenda and on innovative research as the centerpiece of the Institute’s value proposition, expanding the frontiers of what we know about digital curation, identifying
new areas of relevance, and challenging established conventions.”
(http://dci.ischool.utoronto.ca/?page_id=10)

University of British Columbia Libraries has been working closely with Artefactual Systems to develop a digital preservation strategy that looks at the integration of Archivematica with DSpace and ContentDM. See http://www.slideshare.net/ubclibrary/ubc-librarys-digital for more details. UBC is also actively looking at TDR certification (http://diginit.sites.olt.ubc.ca/files/2012/07/UBCLibrary-PersistentDigitalCollectionsPlan-ProjectReportCondensed-1.pdf) and acts as a cloud service provided via their EduCloud Server Service (https://it.ubc.ca/services/web-servers-storage/educloud-server-service) for our hosted instances of Archivematica and Dataverse. UBC’s iSchool also hosts The International Research on Permanent Authentic Records in Electronic Systems (InterPARES) Project, a collaborative research initiative that is focused on addressing issues of long-term preservation of authentic digital records.

University of Alberta Libraries is very active in the digital preservation field, especially in terms of web archiving http://www.library.ualberta.ca/webarchive/ and work towards a TDR: “UAL is developing a scalable Trusted Digital Repository for the preservation of digital resources of various types. ERA (Educational Research Archive), digitized collections, audiovisual collections, data, purchased eBooks, and other materials are ingested (deposited) and safeguarded within this environment.” (https://www.library.ualberta.ca/digitization/preservation/)

York University Libraries has developed a very comprehensive institution-specific digital preservation strategy https://digital.library.yorku.ca/tags/digital-preservation-policy modelled on the work done for TDR certification at Scholar’s Portal.
Appendix 4

COPPUL member 2015 digital preservation survey results

NB: Some display issues may be present. To see original results, please visit https://docs.google.com/a/coppul.ca/forms/d/1VuB2wZpqEqmADEAPkrNoqJpJ4N7h8x27sDdqlChvb1w/viewanalytics#start=publishanalytics.

On scale of 1-5, how strategically important is digital preservation at your institution?

- Not important: 0%
- 1: 0%
- 2: 13.3%
- 3: 26.7%
- 4: 33.3%
- 5: 26.7%

On scale of 1-5, how important is it that libraries and archives communicate the value of digital preservation to their campus communities and other stakeholders?
On a scale of 1-5, how interested might your institution be in the following?

Education and training programs for enhancing the understanding of, and building competencies in, digital preservation

![Bar chart showing interest levels.]

Not interested: 1 0 0%
2 0 0%
3 0 0%
4 4 25%
Very interested: 5 11 68.8%

Digital preservation advocacy toolkits aimed at senior administrators and faculty members
Templates for developing digital preservation documents such as overall strategies and frameworks, specific action plans, procedures and workflows, etc.

Not interested: 1 0 0%
2 0 0%
3 0 0%
4 6 37.5%
Very interested: 5 10 62.5%

A web-based self-audit tool to help your institution determine its level of digital preservation readiness
Not interested: 1 0 0%
2 0 0%
3 3 18.8%
4 7 43.8%
Very interested: 5 6 37.5%

A central repository of COPPUL members’ digital preservation-related documents (strategies, frameworks, action plans, procedures, workflows, etc.)

Not interested: 1 0 0%
2 1 6.3%
3 4 25%
4 5 31.3%
Very interested: 5 6 37.5%

A peer-matching service to enable institutions to collaboratively undertake digital preservation activities (self-audits, gap analyses, creating inventories, selection for preservation, choosing appropriate preservation storage systems, etc.)
Not interested: 1 0 0%
2 1 6.3%
3 1 6.3%
4 7 43.8%
Very interested: 5 7 43.8%

Resources around starting and effectively maintaining a web archiving initiative (sample collection development and copyright policies, metadata best practices, etc.)

Not interested: 1 0 0%
2 0 0%
3 3 18.8%
4 7 43.8%
Very interested: 5 6 37.5%

How-to guides for integrating preservation tools like Archivematica and LOCKSS into current workflows for platforms like DSpace, ContentDM, and others

Not interested: 1 0 0%
2 0 0%
3 3 20%
4 4 26.7%
Very interested: 5 8 53.3%

Are there any other services related to digital preservation that you would like COPPUL to explore?

Other software suites besides Archivematica.
Digital policies, retrieving resources from PLN, DP workflows etc.
Cloud-based storage and supporting admin services to facilitate member participation in preservation but also experimentation and development work. Currently, we are renting space from commercial providers for development purposes but would prefer academic service provider.
For creation of digital assets, capital costs are a huge consideration. Smaller institutions likely cannot afford to purchase all of the appropriate equipment for digitization projects (up to the recommended quality standards), or keep these up to date as technologies change. Do we need to consider joint ownership of some equipment, or outsourcing digitization projects to larger institutions for a fee? I'm reminded (or I've made this up!) of early computer days where server/processing time was bought from a larger entity because a smaller institution could not afford it on site. I envision that hubs of technology could be created and those of us could buy time to use the technology. Perhaps this is something that could COPPUL play a role in facilitating.

Research data management is a specialized type of digital preservation service that engages faculty and end users in ways that other types of digital preservation may not, sometimes using specialized software. Do you think COPPUL should explore providing a cloud-based, hosted instance of a data repository like Dataverse?

Yes 10 66.7%
No 3 20%
Other 2 13.3%

What other hosted services related to your locally-produced digital content would you encourage COPPUL to explore?
Not so much other services but just wanted to register a comment regarding RDM which I'm sure you are aware of but in case you are not. An ACPOLEDS working group investigated RDM infrastructure options for smaller institutions this year. Both of their recommendations involved piggy-backing on larger institutions’ data repositories (for a service fee). In one scenario, COPPUL played a coordinating role. However, they recommended holding off on a final recommendation given the rapidly evolving landscape. It's not clear which platform (Dataverse, Islandora, or ComputeCanada) will emerge as the best bet.

n/a - happy with current range services although not currently in a position to use all.

Institutional Repository - extending ELN’s Islandora implementation to other western province PSts.

Not sure.

On a scale of 1-5, how important is it that efforts around digital preservation connect with print preservation efforts like COPPUL’s Shared Print Archive Network (SPAN)?

Not important: 1 0 0%
               2 2 12.5%
               3 4 25%
               4 5 31.3%
Very important: 5 5 31.3%

Dspace [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]
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<th>Count</th>
<th>Percentage</th>
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<td>0%</td>
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<tr>
<td>Not using, with plans to use</td>
<td>5</td>
<td>31.3%</td>
</tr>
</tbody>
</table>

**Digital Commons [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]**

<table>
<thead>
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<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using</td>
<td>2</td>
<td>15.4%</td>
</tr>
<tr>
<td>Adopting</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Not using, with plans to use</td>
<td>9</td>
<td>69.2%</td>
</tr>
</tbody>
</table>

**Other institutional repository [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]**

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using</td>
<td>2</td>
<td>16.7%</td>
</tr>
<tr>
<td>Adopting</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Not using, with plans to use</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>Not using, with no plans to</td>
<td>7</td>
<td>58.3%</td>
</tr>
</tbody>
</table>
ContentDM [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 9 (60%)
- Adopting: 0 (0%)
- Exploring the use of: 1 (6.7%)
- Not using, with no plans to: 5 (33.3%)

DigiTool [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 0 (0%)
- Adopting: 0 (0%)
- Exploring the use of: 0 (0%)
- Not using, with no plans to: 13 (100%)

Other digital asset management system [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]
**AtoM** [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- **Using**: 8 (53.3%)
- **Adopting**: 0 (0%)
- **Exploring the use of**: 2 (13.3%)
- **Not using, with no plans to**: 5 (33.3%)

**Hydra** [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- **Using**: 1 (7.7%)
- **Adopting**: 1 (7.7%)
- **Exploring the use of**: 2 (15.4%)
- **Not using, with no plans to**: 9 (69.2%)
Islandora [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 5 (33.3%)
- Adopting: 1 (6.7%)
- Exploring the use of: 5 (33.3%)
- Not using, with no plans to: 4 (26.7%)

Dataverse [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 4 (26.7%)
- Adopting: 2 (13.3%)
- Exploring the use of: 2 (13.3%)
- Not using, with no plans to: 7 (46.7%)

Omeka [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 2 (13.3%)
- Adopting: 1 (6.7%)
- Exploring the use of: 5 (33.3%)
- Not using, with no plans to: 4 (26.7%)
Scalar [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

Using  2  15.4%
Adopting  1  7.7%
Exploring the use of  4  30.8%
Not using, with no plans to  6  46.2%

Open Journal Systems (OJS) [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

Using  11  73.3%
Adopting  0  0%
Exploring the use of  2  13.3%
Not using, with no plans to  2  13.3%

Open Conference System (OCS) [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]
Open Monograph Press (OMP) [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 4 (30.8%)
- Adopting: 0 (0%)
- Exploring the use of: 1 (7.7%)
- Not using, with no plans to: 8 (61.5%)

Archive-It [Is your institution currently using, or adopting, or interested in exploring the use of, any of the following platforms?]

- Using: 3 (23.1%)
- Adopting: 0 (0%)
- Exploring the use of: 3 (23.1%)
- Not using, with no plans to: 7 (53.8%)
Using 7 43.8%
Adopting 0 0%
Exploring the use of 4 25%
Not using, with no plans to 5 31.3%

Are there any other related platforms that you’re using, or adopting, or interested in exploring the use of? Please describe.

Dataverse
Archivematica
hosting services for DSpace - possibly Open Repository

ETDs [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12 75%</td>
</tr>
<tr>
<td>No</td>
<td>0 0%</td>
</tr>
<tr>
<td>Don't know</td>
<td>4 25%</td>
</tr>
</tbody>
</table>

Faculty publications (papers, presentations, etc.) [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>15 93.8%</td>
</tr>
<tr>
<td>No</td>
<td>0 0%</td>
</tr>
</tbody>
</table>

66
Other text documents (PDFs, .doc, .ppt, etc.) [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]
Audio recordings [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]

Yes 15 93.8%
No 0 0%
Don't know 1 6.3%

Research data sets [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]

Yes 13 81.3%
No 0 0%
Don't know 3 18.8%

Websites, blogs, or social media [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?]
<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>11</td>
<td>68.8%</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>6.3%</td>
</tr>
<tr>
<td>Don't know</td>
<td>4</td>
<td>25%</td>
</tr>
</tbody>
</table>

Institutional electronic records (text documents, images, email, etc.) [Is your institution responsible for, or, in the next 3-5 years, anticipate being responsible for, any of the following types of locally-produced digital content (with the understanding that these are not always neat and tidy categories)?)

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>75%</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>18.8%</td>
</tr>
<tr>
<td>Don't know</td>
<td>1</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

Are there any other major categories of content your institution is, or will be, responsible for? Please describe.

One area that remains challenging is the preservation of subscribed electronic resources, not necessarily open source but ones for which we have perpetual access. Output of digital humanities projects - various forms (within 5 years will include some we can't currently imagine)

How much growth will your institution likely see in the amount of locally-produced digital content that your library or archives will be responsible for, over the next 3-5 years?
What types of locally-produced digital content do you think most appropriate for inclusion in a geographically-distributed preservation storage network like LOCKSS? Please describe.

unique born-digital materials, web archives, digitization files
ETDs, OJS journals, locally digitized collections such as newspapers, sketches, photos, videos, drawings, and locally created digital maps
Anything that has a wider appeal than just one institution. If there is interest for content outside of your own institution's needs then it seems appropriate to be included in a LOCKSS or LOCKSS like environment.
local online journals, thesis, conference & academic papers, teaching materials, local publications
ETDs, research publications of faculty, archival materials
While file size should be a consideration, in terms of content unique items should have a high priority - ETD's, oral history.
heritage, digitized, non-confidential assets
IR content - ETDs, scholarly publications, datasets, etc.; hosted journal content
local websites, local digitized Manitoba, etc.

Would your institution be interested in other preservation storage systems aside from LOCKSS?

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>8</td>
<td>50%</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Don't know</td>
<td>7</td>
<td>43.8%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>6.3%</td>
</tr>
</tbody>
</table>
Not knowing where to start or being generally overwhelmed by the challenges associated with digital preservation [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- **Yes**: 7 (43.8%)
- **No**: 9 (56.3%)
- **Don't know**: 0 (0%)

Limited on-site expertise around digital preservation [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- **Yes**: 4 (25%)
- **No**: 12 (75%)
- **Don't know**: 0 (0%)
Limited human resources [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- Yes: 14 (87.5%)
- No: 2 (12.5%)
- Don't know: 0 (0%)

Limited access to IT resources [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- Yes: 10 (62.5%)
- No: 6 (37.5%)
- Don't know: 0 (0%)

Financial constraints [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]
A lack of support from senior campus administrators [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- Yes: 3 (18.8%)
- No: 7 (43.8%)
- Don't know: 6 (37.5%)

Challenges in creating organizational documentation like digital preservation strategies and action plans [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

- Yes: 10 (62.5%)
- No: 5 (31.3%)
- Don't know: 1 (6.3%)

More pressing issues or priorities to deal with [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]
Copyright, intellectual property, or privacy issues [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

Yes 15 93.8%
No 1 6.3%
Don't know 0 0%

Lack of clearly-defined responsibilities for digital preservation among professional and/or technical staff [Do any of the following ‘pinch-points’ impact your institution’s ability to undertake digital preservation effectively?]

Yes 9 56.3%
No 4 25%
Don't know 3 18.8%

Are there other ‘pinch-points’ that impact your institution’s ability to undertake digital preservation effectively? Please describe.
primary obstacles = limited human resources/funding and competing priorities

With consideration to your locally-produced or locally-steward digital content, the platforms you use to manage it, and the digital preservation activities undertaken by your institution, how would you rate the overall readiness of your institution to undertake effective digital preservation in the next 3-5 years?

Not prepared: 1 0 0%
2 5 31.3%
3 6 37.5%
4 3 18.8%
Very prepared: 5 2 12.5%