

Published as part of *Building Trustworthy Digital Repositories Theory and Implementation* edited by Philip C. Bantin (Rowman & Littlefield, 2016)

IMPLEMENTATION: Building a Trustworthy System: Resources, Policies, and Management Structures—Understanding Our Trustworthiness

Erik A. Moore

In 2014, the University of Minnesota Libraries completed a year-long process of upgrading the underlying technology and reviewing the supporting policies, procedures, and resources of our intuitional repository, the University Digital Conservancy.²⁶ Employing an iterative approach to managing, the technology migration and policy review proved to be an efficient method to effectively deal with challenges and new opportunities as part of the overall process. The results are a repository system built upon the foundations of the professional standards set by our peers and the trust of the university community in the University Libraries. The migration process proved to serve as a type of self-assessment allowing us to evaluate our repository in a way that we had not done before. The resulting outcomes to the Digital Conservancy program include the ability to remain current with our technological offerings, to be agile in our responses to new demands from our community, and to be more transparent in our daily activities in an effort to be a more trustworthy system.

INTRODUCTION

Launched in 2007, the University Digital Conservancy is the institutional repository (IR) program of the University of Minnesota Twin Cities Libraries. Beginning in the fall of 2013, the University of Minnesota began a migration project to upgrade the

Digital Conservancy's underlying DSpace application and migrate all associated data and bitstreams to a contemporary version of the software. The reasons behind the decision to implement the migration were threefold. First, there had not been any version upgrades to the underlying DSpace 1.4 application or JSPUI theme layer. The early changes to the application and interface, including the bypassing of the CNRI service, contributed to a forking of the core code. Additionally, over the years, there had been several fixes implemented in the system, some using third-party add-ons. For example, DSpace 1.4 began experiencing difficulties in providing reliable optical character recognition (OCR) indexing of newly uploaded content. To solve the issue, newly ingested content was routed through an install of ABBYY FineReader to create the needed text files for indexing the full-text content of the repository. These changes ultimately limited our options in following regular upgrade paths and the implementation of new feature sets. Second, there had not been a review of functional requirements prior to the initial launch in 2007. It seemed important to take the opportunity to review our needs, both our constituents as well as our program, to generate a priority configuration list of required and desired functionality. Finally, the hardware infrastructure supporting the application had reached its end of life. It was necessary to move to new servers and update the software application to meet these needs.

IMPLEMENTATION STRATEGY

To meet our migration goals, the University Libraries chartered a small project group to oversee the process and tasked additional individuals to assist in particular areas as needed. The initial group consisted of the repository co-directors as the business owners, the director of our digital preservation unit as the technology lead, a systems developer as the repository architect, and a project manager. This group later expanded to include a user experience (UX) analyst and a digital preservation analyst. Additional participants provided their expertise as needed, including the Libraries' metadata strategist to assist in reviewing our data model, the copyright librarian to review policy statements and deposit agreements, and the repository manager for a complementary digital media repository.

The migration project charter outlined an implementation strategy that would achieve benchmark results over the course of the project and encouraged real-time consensus and iterative development to inform the next deliverable. In the initial implementation, there were five identified phases to mark our progress.

1. Analysis
2. Data migration
3. Functionality review
4. Development
5. Move to production

These phases were specific to our iterative model for accomplishing the data, software, and hardware migration. The first phase was a technological analysis of the potential migration options. This allowed us to do a quick environmental scan of the health of our repository and determine the points at which it might break. The primary goal was to separate out the needs of the data from the software and user interface. Using information gathered in the first phase, the second step was an “as-is” migration in the then contemporary version of DSpace 3.2. To do so, the database had to receive an upgrade in order to work with the repository software and hardware. In this case, “as-is” required development time for the partial upgrade. Reaching this second phase corresponded to meeting the goal of transitioning the application to new hardware and software with a database that could speak to the system. From a user perspective, the interface and available tools had not changed, thus the “as-is” descriptor. The third step in our migration was a review of existing and desired functionality. Informed by several attempts to detail a functional requirement list and our experience with the “as-is” production install, the fourth phase was the implementation and configuration of the DSpace application (version 4.1) and a complete switch of the underlying code base for the user interface on a development server. This implementation strategy allowed for us to develop in parallel to our production version using real data and to compare configuration changes made in development to the production version behavior. It also allowed us to apply the new XMLUI interface code base and make desired changes to enhance the user experience based on data we acquired through usability testing. The final phase in our strategy was to move the newly configured development version of DSpace 4.1 along with the new user interface to replace the production version implemented in the second phase.

CHALLENGES AND OPPORTUNITIES

From the outset, our methodology was to implement an iterative development strategy. This is evident in our phased approach to reach a production-ready application with identified configurable functionality. The iterative process allowed the migration team to react to both unexpected issues and new opportunities that arose during the project. The first two steps in the migration work (technical analysis of a data move from version 1.4 to version 3.2, and the actual movement of data into an “as-is” production version of 3.2) moved along quickly, with few challenges. The system developer was able to avoid a release-by-release upgrade path from DSpace 1.4 and instead was able to move more swiftly through a shorter series of Postgres database upgrades to reach version 3.2. The production side repository was then in a new stable hardware environment and required less attention for daily maintenance and up time, allowing both the repository architect and business owners time to begin a review of functional requirements as part of phase 3.

Identifying and prioritizing our functional requirements was the migration project's first major challenge. The challenge was multifaceted. First, the establishment of the functional requirements was a moving target. During the course of the project, there were two major releases of the application and several version updates, all of which added either new functionality or much-needed system improvements. With each DSpace version release, requirements would move from a "desired" column into an "included" column. Examples include a user interface for batch importing of metadata records and better end-user displays of content thumbnails. Second, the project's charter purposefully imposed a limitation on application development to supported configuration options or well-documented and maintained add-on modules. The repository managers and the technology lead weighed each functional requirement against the possibility of localization of the code base that would inhibit regular version upgrades. Having spent the previous six years in an environment that was not conducive to following an upgrade path due to code customizations, all members agreed to limit functional requirements to those supported by the software. To follow this directive, the team relied on the repository architect's feedback on available configurations and code changes. Yet, in what had been an iterative process, decisions were required that would limit available configuration choices going forward. DSpace offers two separate interface environments, a JSPUI and an XMLUI. Selecting one over the other would limit choices later on in the process. By selecting the XMLUI in DSpace 3.x, some configurations and user-interface options were then removed from our functional requirements, while others were gained. Another compounding factor in our functional requirement development was the release of DSpace 4.0 and a beta version of a new XMLUI interface, Mirage 2. Project team members recognized that the newly released software incorporated certain elements of our desired functionality as out-of-the-box configuration. The team then had to decide whether or not to continue developing an enhanced requirements list based on the functionality of the then production version (DSpace 3.2) or to start with the current release, remove from consideration any functional requirements not in the release as a configurable option, and focus all efforts to configuring the system as preferred and enhancing the site through the user XMLUI theme layer. Ultimately, the project team opted for the latter and began evaluating and testing the configurations and functionality of DSpace 4.1 in our development environment. Here, the newly acquired features in 4.1 of DOI support, SEO optimization for Google Scholar, and the availability of a simple embargo support in the user interface fulfilled desired functional requirements with no new development, only configuration. Our projected final move to production would not be just an improvement on our current version; it would be an upgrade to the most recent version, DSpace 4.1.

A second challenge to the migration project came in the form of an opportunity. In early 2014, the University of Minnesota Libraries established the Data Management and Curation Initiative (DMCI) designed to address the issues of long-term access to research data. A goal of the initiative was to establish a data curation service that included a repository environment where research data could be discovered,

disseminated, and preserved. In order to make the best use of resources and to manage scholarly content in a similar environment, the decision was made to include a data repository within our existing infrastructure of the institutional repository. This decision came at the same time that the migration project team were establishing the functional requirements. This extended the requirements review process and stretched our initial concepts of a traditional institutional repository. It quickly became evident that research data and other materials being deposited into the data repository would require a separate user upload process that included a curation process as well as a separate data model to gather the necessary information to describe data sets and ensure their reuse and distribution. In addition, the data repository required a custom user interface and record display to present the extended metadata profile and data files to a user.

The iterative methodology not only allowed the project team to account for the data curation initiative, but also provided an opportunity to review and rewrite the Digital Conservancy's existing policies and procedures. Most of the updated policy information contained new information specifically related to the data repository. The initial content guidelines for the Digital Conservancy had four components.

1. Contributors must be U of M affiliates to deposit works into the Digital Conservancy.
2. Works should be free from access restrictions and appropriate for open access.
3. The Digital Conservancy must be granted nonexclusive permission to distribute and preserve all works placed in the repository.
4. Digital preservation support will be provided at different levels for specific formats as specified in the Digital Conservancy Preservation Policy.²⁷

With the incorporation of the data repository and the work of the DMCI, the team added new policies specific to the data repository and had to crosswalk the policies to the existing program. In most cases, the policies of the Digital Conservancy are an umbrella policy for the data repository; however, for certain policies, including data guidelines, end-user access, preservation, and the deposit agreement, separate policies were needed to address the special issues in data management that were articulated in the functional requirements. In the case of the collection policy, the data repository included the four guidelines of the Digital Conservancy above, but also included specific data-only criteria for an acceptable deposit. These include the following:

1. Data must be authored by at least one University of Minnesota researcher.
2. Data must be nonrestricted or must not contain any private, confidential, or legally protected information.
3. Data must be deidentified of sensitive data.
4. Data must be deposited for open access. Authors have the option of embargoing access.

5. Data are digital, and each file must not exceed 2 GB.
6. Data must include adequate documentation for purposes of reuse and discovery.
7. Data should be in a final publishable state.
8. Data should consist of original and/or unique data.
9. Data contributors must have the necessary rights or permissions to share materials.
10. Data that contain third-party copyrightable materials may be subject to additional curatorial review and/or may not be accepted into the repository.

In these expanded guidelines, issues that are specific to electronic data sets as well as to born-digital files that have not already gone through a traditional publishing or review process are detailed. These processes for ingesting these items include reviewing for private or restricted information, requiring adequate documentation to place the data in context, and that the data should be unique, or not easily accessible from another source. These criteria and the reasons for their implementation are closely coupled with the same challenges that archives face in their born-digital records programs.²⁸

The availability of certain new functions and configurations provided an opportunity to see how their incorporation would affect our existing policies and procedures. For example, our install of the DSpace 4.1 application had the ability to allow self-depositors the option for implementing an embargo. Existing Digital Conservancy policy required immediate open access to repository content and had not previously offered an embargo option to individual submitters, although an up-to-two-year embargo option was available to the graduate school for electronic dissertations and theses. The repository managers decided to continue our long-standing procedure of providing immediate, open access to all individually contributed content. In this case, the new configuration disabled the option for self-embargo, maintaining the existing practice. In the case of the data repository self-submissions, allowing self-imposed embargoes remained a configurable option. In this case, those submitting data sets could embargo the content for up to a two-year limit to allow for publication or other use. Although it differs from the general practice in the Digital Conservancy, the different embargo policy in the data repository is further detailed in the end-user access policy, which both details the two-year embargo option as well as the procedures an end user might take to request embargoed content.²⁹

EVALUATING OUR TRUSTWORTHINESS

The University of Minnesota's Digital Conservancy is not a certified trusted repository according to the ISO 16363:2012 standard.³⁰ Nor does it meet all of the criteria in the 2007 CLR-OCLC TRAC checklist.³¹ It is likely that a key opportunity was missed during the migration and data repository projects to conduct a real-time

self-audit to better understand our functional requirements and mission to our beneficiaries, rather than as an after-the-fact self-assessment. However, in its policies, management, and daily operations, the Digital Conservancy meets a certain level of trustworthiness from its own institution. These underlying levels of trustworthiness were certainly enhanced by the repository migration and functional review efforts. Furthermore, the migration process likely brought the Digital Conservancy closer to a trusted repository as stipulated by the TRAC criteria and ISO 16363 standards.

The TRAC criteria checklist provided by CRL and the metrics provided in the ISO 16363 standards list five major areas of organizational infrastructure to begin the evaluation of trustworthiness. These include governance and viability; organizational structure and staffing; procedural accountability and policy framework; financial sustainability; and contracts, licenses, and liabilities. These aspects of a trusted system offer an opportunity to reflect on the specific criteria for a trustworthy repository to determine where the Digital Conservancy meets the checklist either by the spirit or letter of the standard, and where it continues to face challenges after our recent migration and upgrade project.

Governance and Viability

The Digital Conservancy is a program of the University Libraries and consequently is supported by the Libraries' mission and sustainability plans. As such, the Digital Conservancy operates under the organizational context of the University Libraries and subscribes to both the vision and mission statements available on its website.³² The Digital Conservancy does not have a formal mission statement. Rather, the Digital Conservancy functions according to a series of policies and procedures that direct its daily activities as well as provide consistency to decision-making processes. A series of principled statements and descriptions available via the Digital Conservancy help to correlate the program of the institutional repository to that of the principles that guide the larger presence of the Libraries and archives at the University of Minnesota. The Digital Conservancy defines itself as providing "long-term preservation and access services for the intellectual and creative output of the University's academic, research, and administrative communities." Furthermore, the content guidelines for the Digital Conservancy state that the "University Digital Conservancy is a program of the University of Minnesota Libraries that provides long-term open access to a wide range of University works in digital formats. It does so by gathering, describing, organizing, storing, and preserving that content."³³ These principles of preservation and open access are the underlying foundation to our trustworthiness.

The Digital Conservancy meets both the ISO standard for Organization Structure 3.1.1 and the TRAC criteria for Governance and Organizational Viability A1.1. The information provided on the Digital Conservancy's website informs the user that the IR is part of the parent organization, the University of Minnesota Libraries. The governing mandate for the organizational context is found in the University of

Minnesota Board of Regents Policy on Libraries and Archives and implicitly calls for the preservation of information as is necessary for meeting the metric.³⁴

The Digital Conservancy meets the ISO metric for succession (3.1.2.1) and TRAC's criteria (A1.2) primarily through granting a license to all of its content to the University of Minnesota's Board of Regents. As the state's only land-grant institution of higher education and as the only major public research university, the University of Minnesota is unlikely to cease operation or substantially change its scope or mission. As a libraries-based repository, the succession plan for the repository content is similar to all content managed and held by the library system. As such, content that is entrusted to the Digital Conservancy is licensed to the university's Board of Regents rather than the Digital Conservancy, or even the Libraries, directly.

Table 2.1. [AU: Please provide table title.]

| <i>Governance and Organizational Viability</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|--|--|---|--------------------------|
| TRAC Criteria and Checklist | A1.1 Mission statement | Mission statement for organizational context | YES |
| | A1.2 Succession plan | Statement documenting intent to ensure continuity of the repository; depositor agreements | YES |
| ISO 16363:2012 Standards | 3.1.1 Mission statement | Mission statement of parent organization specifically addresses or implicitly calls for the preservation of information | YES |
| | 3.1.2 Strategic preservation plan | Administrative decisions and policies | YES |
| | 3.1.2.1 Succession plan | Granting requisite rights necessary to ensure continuity of the content and repository services | YES |
| | 3.1.2.2 Monitoring organizational environment | Parent organization monitors budgets and financial analysis | YES |
| | 3.1.3 Collection policy | Collection and preservation policies | YES |

Instead the Libraries serves as the custodian of the content on behalf of the regents. For this succession to fail, it would take an act of the state legislature in removing the university’s charter—an unlikely scenario. The repository, through its parent organization, meets the ISO metric 3.1.2.2 for actively monitoring the organizational environment to anticipate a need to implement a succession plan.

Organizational Structure and Staffing

The Digital Conservancy meets most, if not all, expectations of the TRAC audit checklist (A2) and the ISO (3.2) for organizational structure and staffing. The Digital Conservancy has three staff roles that are directly associated with the operations and additional staff who are associated with the repository (TRAC A2.1-2, ISO 3.2.1.1-2). First, there are two co-directors for the Digital Conservancy who share the work of a full-time person. The co-directors are both well versed in all aspects of the repository, including policy, ingest, metadata, and the public interface. One co-director also serves as the university archivist. The other co-director is a professional librarian with either a subject or content specialty. The third staff member is a full-time professional position that oversees daily operations, acquisition workflows, promotion, and project management. Each of these positions has a detailed job description that outlines competencies and requisite skills needed to support the repository.

Table 2.2. [AU: Please provide table title.]

| <i>Organizational Structure and Staffing</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|--|----------------------------------|---|--------------------------|
| TRAC Criteria and Checklist | A2.1 Staff duties | Staffing plan; job descriptions | YES |
| | A2.2 Adequate staffing | Definitions of roles and responsibilities | YES |
| | A2.3 Professional development | Professional training budgets; performance goals | YES |
| ISO 16363:2012 Standards | 3.2.1 Staffing | Organizational charts; definition of roles | YES |
| | 3.2.1.1 Established duties | Competency definitions; job descriptions | YES |
| | 3.2.1.2 Adequate staffing | Organizational charts; definition of roles and responsibilities | YES |
| | 3.2.1.3 Professional development | Professional training budgets; performance goals | YES |

In addition to the core staff roles for the management and daily operation of the Digital Conservancy, a variety of staff are involved in specific aspects of supporting the repository. Additional staff include a software and database developer who maintains the system, oversees updates, and provides configurable changes as part of the Libraries' overall support of digital preservation and repository technologies. Multiple staff in our cataloging and metadata unit also provide as-needed support for submissions and description. Finally, a larger network of professional librarians support the work of the Digital Conservancy through the promotion of the repository as a resource and through recruitment of open-access scholarly content across campus.

All staff associated with the Digital Conservancy receive access to professional development and training to support their roles in contributing to a trusted repository (TRAC A2.3, ISO 3.2.1.3). Conference attendance, presentations, skills training, and workshops are continually offered and available to staff. For professional staff, this development is an expectation within performance goals and for advancement.

Procedural Accountability and Policy Framework

The Digital Conservancy defines its designated community as the “academic, research, and administrative communities” at the University of Minnesota.³⁵ Additional documentation provides content and preservation description information for the designated community. For example, scholarly articles will be made openly available on the Web and may be migrated to a more preservation-friendly file format in the course of deposit or at a later time. This provides documentation for meeting the ISO metric provided in 3.3.1 and the TRAC criteria A3.1.

The Digital Conservancy relies on its written preservation policy and the University Libraries Digital Preservation Framework to publicly state the commitment to preservation of digital assets and service requirements.³⁶ On its own site, the Digital Conservancy provides explicit guidelines on the types of works it will accept into the repository.³⁷ These content guidelines require that contributors be affiliated with the University of Minnesota as faculty, staff, or students. The works the contributors wish to deposit must be free from access restrictions and be appropriate for open, online access. Finally, the contributor must be willing and able to grant to the university a nonexclusive right to distribute and take preservation actions toward the works to ensure their availability and longevity. All permissions are documented through the available click-through license, an electronically available license, or a signed hard copy of the deposit agreement. These meet the standards for the ISO metrics 3.1.3 and 3.3.2 and TRAC's A3.3.

The Digital Conservancy, having gone through the migration process, is committed to periodic review and assessment of technological developments and evolving requirements. It is doing so through the establishment of a formalized management group focused on the DSpace architecture. The Libraries recently charged this management group with the goal of overseeing future development of supported repository services that are well articulated, reviewed, and prioritized. The group mimics

Table 2.3. [AU: Please provide table title.]

| <i>Procedural Accountability and Policy Framework</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|---|---|--|--------------------------|
| TRAC Criteria and Checklist | A3.1 Defined communities and accessible policies | Mission statement; definitions of communities; documented policies | YES |
| | A3.2 Procedures and policies in place | Written documentation of policies, procedures, and workflows | YES |
| | A3.3 Written policies for legal permissions to reserve content | Deposit agreements; digital preservation policies | YES |
| | A3.4 Self-assessment | Self-assessment schedule; results of self-assessment; implementation of outcomes | YES |
| | A3.5 Feedback procedures | Feedback mechanism; quality assurance records | LIMITED |
| | A3.6 Documented changes to operations and technology | Changes to policies and procedures; repository software changes tracking | YES |
| | A3.7 Transparency and accountability | Readily available documentation; unhindered access to content and associated information | LIMITED |
| | A3.8 On-demand information integrity measurements | Audit system for collecting, tracking, and presenting integrity measurements | LIMITED |
| | A3.9 Regular self-assessment | Dated audit checklists from self-assessment or objective audit | NO |

(continued)

Table 2.3. (continued)

| <i>Procedural Accountability and Policy Framework</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|---|---|---|--------------------------|
| ISO 16363:2012 Standards | 3.3.1 Designated community | Mission statement; definitions of communities; documented policies | YES |
| | 3.3.2 Preservation policies | Preservation policies | YES |
| | 3.3.2.1 Development of preservation plans | Current and past written documentation in the form of preservation policies, procedures, protocols, and workflows | YES |
| | 3.3.3 Documented changes to operations and technology | Changes to policies and procedures; repository software changes tracking | YES |
| | 3.3.4 Transparency and accountability | Technical audits and certifications; independent program reviews; contracts with service providers | NO |
| | 3.3.5 Provide information integrity measurements | Audit system for collecting, tracking, and presenting integrity measurements | LIMITED |
| | 3.3.6 Regular self-assessment | Completed, dated checklists from self-assessments and/or third-party audits | NO |

the migration project in both membership and scope, but it differs in its charter of ongoing assessment.³⁸ The work of this group will be informed by both the developments of the larger repository community as well as through contributor and user feedback collected through our online form and conversations with our community.

These examples of a digital preservation framework, a commitment to assess and grow the technology through a formalized charter, and the ability to receive user-contributed feedback meet most of the audit and certification guidelines. For accountability, the primary deficiencies under the ISO are a more transparent approach

to tracking changes to the operations of the repository (3.3.4), better tracking and presentation of integrity tracking (3.3.5), and the commitment to a regular schedule of certification (3.3.6).

Financial Sustainability

Requirements for the metrics listed under TRAC A4 and the ISO 3.4 state that a trusted repository should be able to prove its financial sustainability. Evidence supporting financial sustainability and practices for the Digital Conservancy are largely part of the broader organizational context of the University Libraries and the University of Minnesota. It is difficult to provide exact details on the financial sustainability of the repository. As a program of the Libraries, the Digital Conservancy is part of a dedicated budget that details staffing, training, technology support, and capital investments. The Libraries as the home organization participates in regular internal and external audits and forecasts potential risks and encumbrances. In terms of being a trusted repository, the standards are generally met through the budgeting, auditing, and forecast planning of the Libraries.

Contracts, Licenses, and Liabilities

As part of the overall migration project, staff were able to review existing policies, update where needed, and create new policies to address changes to the repository, including the addition of the data repository. In this area, the Digital Conservancy would likely meet all aspects of the audit criteria checklist for sections A5.1-3. For the ISO, this meets all metrics under 3.5.1. The primary source of all of our policies and procedures is our deposit agreement. The agreement can be reviewed and signed in multiple ways. First, individual contributors can review and sign as part of a click-through agreement during the submission process. Second, for those contributing content but relying on a third party to complete the submission, the contributor can agree to an electronic version of the deposit agreement with an electronic signature. Finally, all contributors may access a copy of the deposit agreement for review or signature as a PDF document on the Digital Conservancy site. The deposit agreement specifies that the repository has the nonexclusive rights to “access, reproduce, distribute and publicly display the Content, in whole or in part, in order to secure, preserve and make it publicly available,” and to “make derivative works based upon the Content in order to migrate the Content to other media or formats, or to preserve its public access.”³⁹ It states the available rights of both the contributor and the repository in terms of copyright and distribution. Finally, it asks the contributor to identify deposit concerns related to privacy or otherwise protected information.

As a license, the deposit agreement supports the enforcement of certain policies, namely the Digital Conservancy’s strict no-withdrawal policy. Content submitted to the Digital Conservancy is considered permanent through the granting of the non-exclusive license. In certain cases, items are withdrawn due to what was determined

Table 2.4. [AU: Please provide table title.]

| <i>Contracts, Licenses, and Liabilities</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|---|--|--|--------------------------|
| TRAC Criteria and Checklist | A5.1 Maintains contracts or agreements | Deposit agreements; policies on third-party deposit arrangements; contracts; definitions of service levels; web archiving policies; procedure for reviewing and maintaining agreements, contracts and licenses | YES |
| | A5.2 Agreements transfer preservation rights | Deposit agreements; policy statement on requisite preservation rights | YES |
| | A5.3 Specified actions in appropriate agreements | Submission agreements/ deposit agreements; written policies and procedures | YES |
| | A5.4 Track and manage intellectual property rights | Statements on managing intellectual property rights; deposit agreement; monitor intellectual property | LIMITED |
| | A5.5 Addressing liability and challenges to ownership | Documented track record for responding to challenges in ways that do not inhibit preservation; examples of legal advice sought and received | YES |
| ISO 16363:2012 Standards | 3.5.1 Maintains contracts or agreements | Properly signed and executed deposit agreements | YES |
| | 3.5.1.1 Agreements transfer preservation rights | Deposit agreements; policy statements on requisite preservation rights | YES |

| <i>Contracts, Licenses, and Liabilities</i> | | <i>Evidence</i> | <i>Meets Requirement</i> |
|---|---|---|--------------------------|
| | 3.5.1.2 Specified actions in appropriate agreements | Properly executed submission agreements and deposit agreements; written standard operating procedures | YES |
| | 3.5.1.3 Indicates it accepts preservation responsibility | Properly executed submission agreements and deposit agreements; written standard operating procedures; confirmation receipt sent back to producer/ depositor | YES |
| | 3.5.1.4 Addressing liability and challenges to ownership | Policy on responding to challenges; documented track record for responding to challenges in ways that do not inhibit preservation; records of relevant legal advice sought and received | YES |
| | 3.5.2 Track and manage intellectual property rights | Statements on managing intellectual property rights; deposit agreement; monitor intellectual property | LIMITED |

to be a violation of the original terms of the deposit agreement. A thorough review is conducted by repository staff as well as consultations with members of the university community to verify a withdrawal decision. Items that have been withdrawn are indicated with a tombstone record that directs a user to contact the Digital Conservancy staff with any questions. Other challenges to the ownership or rights of content in the repository are managed in a similar manner as a withdrawal request.

FINAL THOUGHTS

The entire process of reimagining and then migrating our institutional repository as both a service and an application demonstrated several important lessons. First, developing functional requirements is a difficult task. They must include the basics

needed for the service to be successful and must be realistic in terms of supporting a system that is so heavily customized that it cannot be upgraded. Eventually, our functional requirements transformed into our available configurations. Future requirement lists must be better documented and separate out the desired functionality of a system from the desired service. The two are not necessarily the same. When implementing the data repository, we were much more able to sort the two apart by defining the service in our policies and procedures rather than in our functional capabilities. Second, reviewing our policies and procedures was a very important aspect of the project and proved to be an important step. As the program of the Digital Conservancy expanded, first from a traditional scholarly and administrative IR to a data repository within the service, it was important to document how the policies served as an umbrella for the repository, or in certain areas, cascaded with certain types of content to be more nuanced in their application. The final outcome of our initial repository review and subsequent year-long migration process is a robust repository program that includes two major collecting areas: an institutional repository and a data repository. Each provides our community of contributors with a set of formal guidelines and procedures for the inclusion of content into the repository as well as a description of a set of services provided by the repository staff. Our technological platform is current and meets several benchmarks in the areas of security and accessibility. All content submitted to the repository is now managed through a system of virtual server machines managed by our Office of Information Technology. Access to the content and the user interface meets responsive design standards and meets open-access expectations.

The conclusion of the migration project and of our iterative process of review of both the functionality and the accompanying policies has provided the University of Minnesota with a repository worthy of the trust of its community and, consequently, can verifiably meet many of the established professional standards of a trustworthy system. Other criteria could be met with little additional effort, requiring only an institutional will on behalf of the repository staff, which certainly is present. Our experience demonstrates that the standards of a professional community can serve as beneficial benchmarks for our own efforts in trying to support the needs and services of our repository's community. To do so, a repository must understand how the standards translate into application. It can then apply and reiterate to meet future demands.

Things to keep in mind when conducting a self-assessment as either part of an operational change, in this case a software and user-interface upgrade, or to evaluate your repository with a set of standards in order to benchmark its trustworthiness include the following:

- Repositories should function for a primary community. At the University of Minnesota, that community is the researchers, scholars, students, and administrators.

- Repositories should serve a mandate or purpose. The Digital Conservancy extends the Libraries' mission and mandate to preserve and make available information as well as provides a solution to institutional mandates related to openness in research, open-access scholarship, and fulfillment of certain requirements related to the publication of student work. This ensures that the repository is incorporated into the larger policy framework for the organization and is more likely to be a financially stable program.
- Repositories should have well-formulated policies that both provide for the long-term access and preservation of the materials as well as clearly articulate the ownership and rights of the creator and the repository. The policies and associated deposit or submission agreements are the backbone of the ability to take preservation actions and become a trustworthy system.
- Documentation is key in understanding your system and being trustworthy. Having the ability to report out on changes to policies, requirements, software, or bitstream audits is a required element of any trustworthy repository. A key lesson learned after our migration process and a subsequent assessment is that it is difficult to track key decisions and changes after they are completed.

NOTES

26. University of Minnesota Digital Conservancy (UDC), <http://conservancy.umn.edu>.
27. UDC, "Policies and Guidelines," <http://conservancy.umn.edu/pages/policies>.
28. For an overview of the process, ethics, and privacy issues archives face in managing their born-digital records, see Matthew G. Kirschenbaum, Richard Ovenden, and Gabriela Redwine, *Digital Forensics and Born-Digital Content in Cultural Heritage Collections* (Washington, DC: Council on Library and Information Resources, 2010).
29. Data Repository for University of Minnesota (DRUM), "Policies and Terms of Use," <http://conservancy.umn.edu/pages/drum/policies>.
30. A self-assessment tool for ISO 16363 is available through the Primary Trustworthy Digital Repository Authorisation Body (PTAB) website: <http://www.iso16363.org/preparing-for-an-audit>.
31. Center for Research Libraries, *Trustworthy Repositories Audit & Certification: Criteria and Checklist* (Dublin, OH: OCLC, 2007), 9–19, https://www.crl.edu/sites/default/files/d6/attachments/pages/trac_0.pdf.
32. U of M Libraries. "Vision, Mission and Goals," <https://www.lib.umn.edu/about/goals>.
33. UDC, "Policies and Guidelines."
34. University of Minnesota Board of Regents, "Policy on Libraries and Archives," amended March 10, 2006, http://regents.umn.edu/sites/regents.umn.edu/files/policies/Libraries_and_Archives.pdf.

35. UDC, "Policies and Guidelines."
36. Ibid. See also University of Minnesota Libraries, "Digital Preservation Framework," <https://www.lib.umn.edu/dp/digital-preservation-framework>.
37. UDC, "Policies and Guidelines."
38. University of Minnesota Libraries DSpace Management Group, "Charter" (June 2015).
39. UDC, "Deposit Agreement," https://conservancy.umn.edu/pages/UDCDepositAgreement_Individuals.pdf.