Curatorial Agency in Institutional Repository Migrations: A Case Study of the University of Toledo Digital Repository

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Abstract

This case study focuses on the role of curatorial agency in the migration of the University of Toledo Digital Repository (UTDR). Institutional repository (IR) migrations are necessary preservation actions intended to ensure long-term access to digital content. Disruptions resulting from iterative migrations may diminish user trust in IR services and present other risks. Curatorial agency refers to the responsibility and authority of curators mediating between digital media and audiences and can mitigate some unforeseen or unavoidable effects of data migrations. Curatorial agency is established through connections and negotiations within heterogeneous actor-networks, which result in transformational processes, such as those associated with data migrations. Therefore, this case study takes a sociotechnical approach needed for an analytical framework, which merges elements of the actor-network theory with those of the Digital Curation Centre's (DCC) curation lifecycle model and a Levels of Representation in Digital Collections framework based on Lee's model. It focuses on the vital role of curatorial agency in UTDR migrations. Using a detailed account of the repository migration and framework analysis, this case study offers significant insight into the role of curatorial agency in managing migrations and establishing new curation strategies, including virtual exhibitions. Key findings include increased transparency of transformational processes in the UTDR migrations and in the role of curatorial agency in the preservation framework.

Introduction

The most recent migration of the University of Toledo Digital Repository (UTDR) demonstrates concerns about frequent data migrations for service quality and a lack of stakeholder support despite the benefits and importance of migrations as preservation actions. The preservation and management of digital media using trustworthy repositories (e.g., Lee & Tibbo, 2007) necessitate continuous conversations regarding the roles of *curatorial agency* and *actor-networks* as *institutional repository* (IR) migrations have become more frequent at institutions utilizing IRs to manage digital content. Therefore, they face increasingly difficult choices. IRs utilize a wide range of technologies to provide access to the intellectual output of colleges and universities (Crow, 2002). Migrations involve the relocation of data to different storage systems and computing environments (IBM, n. d.) and, in some cases, may also require *format migrations* defined as the 'transferring or transforming data from an aging/obsolete format to a new format' (Digital Preservation Coalition, n. d.). Curatorial agency refers to a position that combines authority and responsibility to mediate between digital content and audiences (e.g., Dallas, 2007; du Plessis, 2023) and is established within a broader framework of *digital preservation* practices (Higgins, 2008; Lee, 2011). This broader framework is the actor-network—that is, a network of heterogeneous actors (e.g., Latour, 1996, 2005; Herman, 2023), which enables the planning, execution, and evaluation of IR migrations.

As preservation actions, migrations are necessary to protect IR content from the adverse effects of digital decay, technological obsolescence, and other threats. Combinations of external and internal factors have prompted institutions to migrate their IRs from one hosting arrangement or software to another at varying frequencies. These factors range from staffing to technology issues, concerns about usability and scalability, metadata schema and interoperability, and the availability of customizations (e.g., Corbett et al., 2016; Meetz & Baird, 2022; Stein & Thompson, 2015). Transformations are unavoidable consequences of migrations, affecting data characteristics, context, location, information architecture, and community engagement. These changes can often have significant and unforeseen implications for the relationship between users and digital repository platforms due to lapses in access, broken links, and a loss of user trust, despite the obvious benefits of IR migrations. As certain risks are associated with varying degrees of disruption to services, collaborations, and strategic integrations, curatorial agency plays a vital role in ameliorating the impact of IR migrations on institutions.

This paper is a case study of the UTDR migration between 2000 and 2024. During this period, it utilized several digital repository platforms, data structures, metadata schemata, and curatorial approaches such as virtual exhibitions. Concentrating on curatorial practices, this case study examines the roles of actor-networks and curatorial agency in these migrations, as well as the causes of migration. Therefore, it takes a framework analysis approach to focus on digital preservation and curation. It uses a nested framework for analyzing the migration process and curatorial agency.

Conceptual Framework

The conceptual framework of this case study connects four key concepts: institutional repository (IR), *digital curation,* curatorial agency, and actor-network, as they interrelate in the context of data migration and digital preservation practices. As shown in Figure 1, an IR represents collections and services falling into the scope of digital curation, which in turn falls under curatorial agency. The actor-network is the network of human and

nonhuman actors engaged at all levels of this model as they shape the IR, digital curation, and curatorial agency.
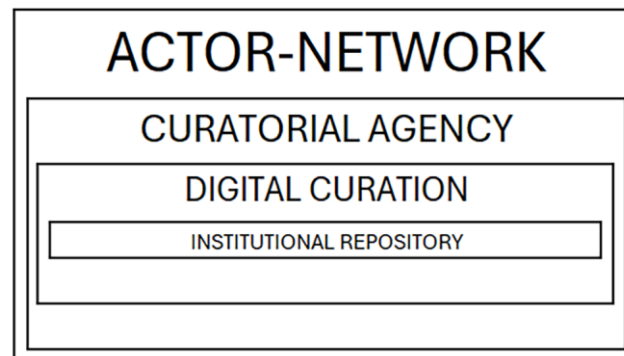

Figure 1. Case study conceptual model.

An IR can refer to digital collections and services, emphasizing two distinct yet mutually complementary aspects of IRs. In the definition originally adopted by the Scholarly Publishing and Academic Resources Coalition (SPARC), IRs are 'digital collections capturing and preserving the intellectual output of a single or multi-university community of colleges and universities' (Crow, 2002, p. 4). Elsewhere, Lynch defined IRs as, 'a set of services that a university offers to members of its community for the management and dissemination of digital materials created by the institution and its community members' (Lynch, 2003, p. 328).

The DCC indicates that the concept of a digital repository has since

> 'broadened from an initial focus on software systems to a wider and overall commitment to the stewardship of digital materials; this requires not just software and hardware, but also policies, processes, services, and people, as well as content and metadata. Repositories must be sustainable, trusted, well-supported and well-managed in order to function properly.'

> (Semple, 2006)

Multidisciplinary IRs differ from subject repositories, such as arXiv and SSRN, in that they contain scholarly work from affiliated faculty, institutional records (e.g., reports from academic units and administrative offices), and archival collections.

Digital curation, that is, the 'activity of, managing and promoting the use of data' (Lord & MacDonald, 2003, p. 12), spans beyond preserving data over their life cycle (e.g., Beagrie, 2004): it denotes 'stewardship that provides for the reproducibility and re-use [sic] of authentic digital data and other digital assets' and incorporates the use of 'trustworthy and durable digital repositories[,] principles of sound metadata creation and capture […] use of open standards for file formats and data encoding […] and the promotion of information management literacy' (Lee & Tibbo, 2007, ¶ 3). Jantz & Giarlo (2006) identified specific requirements for trusted repositories: (1) they must come with preservation policies, content description standards (e.g., metadata), and proper physical infrastructure (e.g., climate control, security, and disaster planning) needed for long-term preservation; and (2) they must use reliable systems of software and hardware that can follow certain rules and standards including support for globally recognized interoperability protocols, such as the Open Archives Initiative Protocol for Metadata Harvesting. Yakel (2007) has defined digital curation as an '[umbrella] concept that includes digital preservation, data curation, electronic records management, and digital

asset management' (p. 335). Compared with digital curation, digital preservation refers to 'the series of managed activities necessary to ensure continued access to digital materials for as long as necessary' (Jones & Beagrie, 2001, p.10). The DCC's curation lifecycle model (Figure 3) shows preservation and curation as alternating full life cycle actions requiring 'management and administrative actions throughout the curation lifecycle''' (Higgins, 2008, p. 137).

The working definition of curatorial agency adopted for this case study was drawn from du Plessis (2023, p. 7) according to which it is the degree to which curators are involved in preservation and the level of responsibility they shoulder as mediators between digital content and audiences within the relational curation space. From a viewpoint of museum curation,

> 'curatorial agency ... takes place in a complex interaction mediated by physical artifacts, contextual knowledge, and also, last but not least, gallery space and media ... [wherein] ... the construction of meaning through museum-based research and exhibition cannot be divorced from theoretical presuppositions on issues such as aesthetic experience, scholarly knowledge of objects and their cultures, and documentation practice.'

> (Dallas, 2007)

Rooted in *actor-network theory* (ANT) (Latour, 1996, 2005), a sociotechnical approach to analyzing transformational processes involves understanding negotiations between actors within hybrid networks. Actor-networks are 'networks of heterogeneous actors' (Herman, 2023) that bring human and nonhuman actors into organizational relationships and transformational processes associated with innovations. Although Latour (1996, 2005) had referred to human and nonhuman actors as *agents* or *actants*, respectively, to clarify the differences, for this case study, shall use *actors* in reference to humans and nonhumans whose *agency* is established as a '"relational effect" resulting from the negotiations between heterogeneous actors ... in transformational processes' (Herman, 2023, p. 7). In her case study of the Montreal MTL Urban Museum (MUM) app, Herman applies this understanding in the museum curation context, based on the *principle of generalized symmetry,* suggesting that an analysis of humans and nonhumans must be on the same terms. That case study takes a sociotechnical approach to examine the role of heterogeneous actors in changing how humans develop, view, and manage exhibitions (including virtual exhibitions and digital collections in an IR), as well as the transformation of curation spaces, practices, and knowledge. Herman points out that the sociotechnical approach rejects social constructivist and technical determinist assertions that knowledge arises from social interaction and technology drives social, political, and cultural changes. Actor-networks can consist of researchers, IR technology, librarians (Kennan & Cecez-Kecmanovic, 2007), as well as data sets, technology tools, digital platforms, technology stacks, IR user policies, description standards, metadata schemata, and documentation. Actor-network negotiations thus refer to a wide range of processes that can lead to innovation, remediation, and transformation of services, products, and institutional alignments. In the context of IR management, 'each actor translates the technology and interprets it according to his or her context and needs ... the system's architecture must be aligned with the work practices and cultures of the relevant groups for the system to gain acceptance' (Rieger, 2008, p. 10).

Therefore, the actor-network reflects the dynamic nature of the organization as it adopts new technologies, standards, and policies, and aligns them with its staff capabilities in transformational processes, such as IR migrations and curatorial innovations.

Methodology

This case study applies the ANT to analyze actor-network connections and negotiations in the UTDR migrations. Using a nested framework (e.g., Tyler, 2001) as a study design to analyze the connections and negotiations among interlinked components, this study seeks to explore the vital relationships and negotiations among various members and elements across the actor-network, as well as the role of curatorial agency. The chart (Figure 2) shows a nested framework, listing actors under the UTDR migration chronology, causes, and collaboration (left), and the DCC and LRDC preservation frameworks (right). The arrows identify salient connections between actors and curatorial/preservation actions; for instance, the UTDR migrations to Migrations (DCC), Collaboration (UTDR Migrations) to Community (DCC), and data (DCC) to representational levels (LRDC). This framework guides the UTDR migration analysis and methodology.
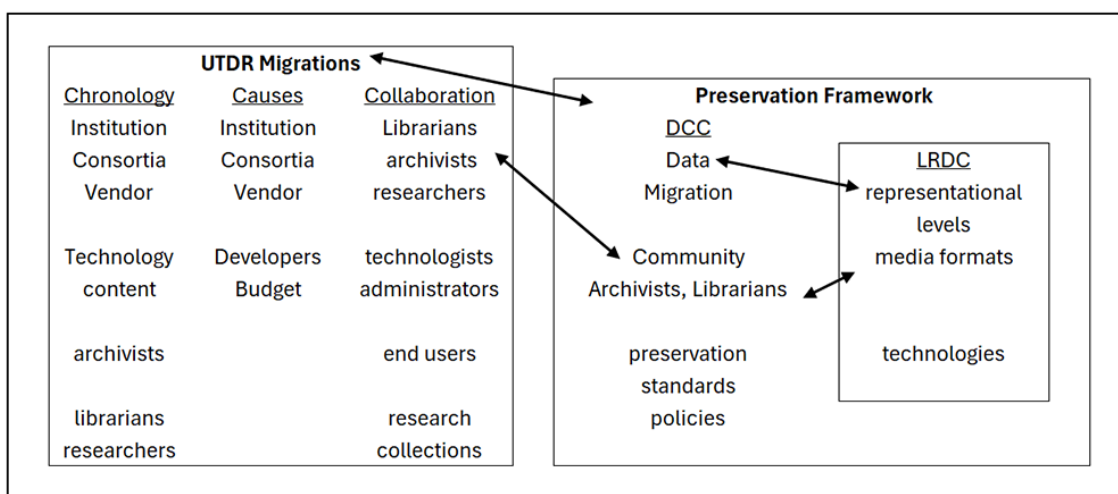

Figure 2.   Nested framework chart of the actor-network.

First, the analysis will present the chronology of the UTDR migrations, addressing the causes and collaborative aspects of the process. Actor-network negotiations within and beyond the institution, along with external factors contributing to these migrations, are important for assessing the dynamics of migration. Collaboration within and across the internal units of the university also illustrates how actor-networks function. Curatorial agency plays a vital role in navigating these migrations because it combines responsibility and authority in actor-network negotiations, focusing on maintaining access to the digital repository's content. Then, the analysis turns to curatorial agency in preservation frameworks: the DCC curation lifecycle model (DCC, n.d.; Higgins, 2008) and the LRDC (Lee, 2011). The DCC model brings actors and preservation actions into continual functional relationships throughout the digital content's life cycle. In addition, it will address remediation, reconfiguration, and various transformational processes (e.g., Herman, 2023) affecting data, structure, and workflow changes in the UTDR resulting from migrations. Finally, the LRDC framework examines the role of curatorial agency in actor-network negotiations across multiple levels of representation, where curators handle data in as many contexts, from the physical storage medium to aggregations, and convey as many meanings at these levels (Lee, 2011). Virtual exhibitions emerge at the intersection of these frameworks as an innovative approach utilizing the digital repository platform in ways that had not been considered on a broad scale. Therefore, the discussion offers curatorial viewpoints on virtual exhibitions as they are approached in this case study.

UTDR Migration: Analysis

Chronology, 2000–2024

The Ward M. Canaday Center for Special Collections, a department within the University of Toledo Libraries that manages archives, rare books, and manuscript collections, launched its digital curation program in 2000 by contributing selected records of historical significance to Ohio Memory. Ohio Memory has been a statewide digital library program of the Ohio Historical Society (OHS; subsequently renamed the Ohio History Connection) and the State Library of Ohio. It maintained a shared infrastructure using the CONTENTdm platform to manage digital collections of contributing member institutions throughout the state. In 2008, Ohio's statewide academic library consortium, OhioLINK, launched the Digital Resource Commons (DRC) as a shared infrastructure for participating Ohio colleges and universities interested in disseminating their digital content. The DRC utilized the DSpace platform, typically designed for scholarly content, but eventually extended its scope to curate cultural heritage collections as well. The university's membership in OhioLINK included access to DSpace with significant technical support from the DRC team.

Establishing an IR has been of strategic interest to the Center since 2008, as it had previously hosted the annual Authors and Artists exhibitions since 1988. The Center invited scholars and artists at the University of Toledo to contribute their works for display at these exhibitions, which featured exhibition catalogues containing bibliographical records of the exhibits. Because these exhibitions were limited to journal articles, books, and creative works published or presented in print and analog forms, the Center realized that maintaining an IR would go further to support discovery and increase the visibility of creative work and research conducted at the university, thus preserving both the content and access to the content. In addition, by this time, the Center had created the position of Digital Initiatives (DI) Archivist, which was subsequently converted into the DI Librarian position in 2009, to lead digitization efforts to provide open access to archival content in the DRC. A library-wide DI Task Force was also created as an advisory body to guide the IR development and expand its scope beyond manuscript collections, university archives, and rare books.

A brief exploration of Greenstone Digital Library in 2010, with the assistance of the systems librarian at the time, as an alternative digital repository platform, led to a decision against adopting it due to scalability issues, storage limitations, workflow concerns, and a lack of Information Technology (IT) support. However, in the meantime, the Canaday Center continued using the DSpace platform offered through the DRC until 2013, when OhioLINK ended its support for the DRC. This decision prompted the first IR migration and resulted in establishing the University of Toledo Open Institutional Archive (UTOPIA) as the first formally branded IR at the university, utilizing CONTENTdm at the time. The data received from the DRC team by the DI Librarian contained digital objects and metadata and underwent significant reappraisal, metadata remediation, and media restructuring before ingestion into this digital repository platform. In 2014, the University Libraries contracted Bepress to use Digital Commons with the plan to establish a formal IR for scholarly content and to host open access journals on its integrated publishing system. Faculty contributions to the DRC were migrated to Digital Commons, and the IR was formally renamed the University of Toledo Digital Repository, with the acronym UTDR.

The newly rebranded UTDR featured scholarly works and institutional records contributed by faculty and various academic units, departments, and committees. Digital Commons was also ideal for hosting electronic theses and dissertations (ETDs) harvested from the OhioLINK ETD Center via a live import feature. However, using two dissimilar repositories from 2014 to2016 eventually resulted in a bifurcated curation model with UTOPIA used for historical and heritage collections and the UTDR for scholarly and institutional data sets. The two systems differed in user interface design, workflow, collection structure, and metadata schema. Ultimately, the Libraries decided to merge the

repositories and end UTOPIA in 2016. Although this merger required significant remediation of metadata and digital objects, it has lowered hosting costs and simplified the workflow for the mostly solo DI operation because everything was finally in one repository using a single metadata schema, media format, and workflow model. However, dwindling budget in 2018 prompted the migration of digital repository data yet again, from Digital Commons to Islandora hosted by Lyrasis, at a significantly lower cost. Islandora's visually appealing design inspired the ideation of developing virtual exhibitions that had hitherto been developed using website templates (using the Dreamweaver software) and web servers maintained by the university. However, in 2022, Lyrasis announced it would end support for Islandora in favor of switching to DSpace within the next 2 years. After a series of vendor demos and comparing prices, the Libraries decided to remain with Lyrasis. A marked difference in this migration was that the technologists at Lyrasis led it, actively seeking DI feedback at various stages throughout the UTDR, which was completed in the fall of 2024.

These IR migrations presented a number of challenges and concerns due to disruptions in service and routine. The timeline of the UTDR migrations (Table 1) over the years shows whether a migration was involuntary (I) or voluntary (V) and whether it involved minor/major/no disruptions (d/D/nd). OHS, DRC, and UTOPIA correspond to using CONTENTdm, DSpace, and CONTENTdm again, respectively, before 2014. Thereafter, UTDR1/2/3 refer to the continuation of the UTDR utilizing the Digital Commons, Islandora, and DSpace platforms. Each stage represents a transformation or reconfiguration (e.g., Herman, 2023) due to significant changes to the IR service, workflow, and data. The curatorial agency gradually gained greater authority and responsibility during the transition from DRC to the UTDR, as vendors transferred greater control of collections and workflows to the DI Librarian.

Table 1.   UTDR migration timeline.

2000	2003	2008	2013	2014	2016	2018	2022	2023	2024/Present
[OHS (V, nd) to 2008]									
		[DRC (V, nd) to 2013]							
			[UTOPIA (I, D) to 2016]						
					[UTDR1 (V, nd) to 2018]				
							[UTDR2 (I, D) to 2022]		
									[UTDR3 (I, d)] ➡

Causes of migration

Factors causing the UTDR migrations include institutional, consortial, industrial, and environmental, which impact budget, consortial memberships, software support, preservation standards, metadata standards, and digital media. Budget, staffing, and internal support level were among the factors at the University of Toledo that affected the frequency of migrations and the choice of platform because maintaining the UTDR had consistently relied on external hosting and software provided by vendors. Drawing from case studies and related literature (Corbett et al., 2016; Meetz & Baird, 2022; Stein & Thompson, 2015), the matrix (Table 2) presents four scenarios corresponding to combinations of migration factors (rows) and actions (columns). Institutional and consortial factors overlap because of similar resources and capabilities, such as budget and staffing. Industrial and environmental factors span beyond the direct control of institutions and consortia; however, they can overlap in their impact on technology and vendor support, affecting software, hardware, storage, networking, hosting arrangements, accessibility, media file format, metadata standards, and interoperability. Actions taken by the institution, as evident in the UTDR migration chronology, can be either voluntary (V) or involuntary (I). Institutional factors have favored voluntary actions when the Libraries utilized the DRC and Digital Commons at different times; however, involuntary action was

necessary when shrinking budget caused the move away from Digital Commons to Islandora. Consortial factors, such as OhioLINK's decision to end support for the DRC, prompted the UTDR migration from the DRC to CONTENTdm in 2013. Similarly, a vendor decision by Lyrasis in 2022 to end support for Islandora in favor of DSpace led to an involuntary migration between those two platforms. Industrial factors alone may have supported voluntary actions elsewhere; that has not been the case at the Libraries. In addition, to date, there have been no large-scale environmental challenges arising from political or military conflicts, economic downturns, or natural disasters that have prompted drastic actions such as abandoning the UTDR. Data backup, nevertheless, has been part of the preservation and archiving strategy at the University Libraries and Lyrasis. The matrix (Table 2) demonstrates, by the simple mapping of factors and actions, how actors within and beyond the university can trigger migrations and various transformational processes.

Table 2.   Matrix showing migration factors and causes.

Factors → Actions ↓	Institutional/Consortial (or Vendor)	Industrial (Environmental)
Voluntary (V)	Increase digital services, expand discovery resources, and grow interest from faculty Available budget and staffing; dissatisfaction with a platform and/or service, available expertise	Availability of open source and proprietary technologies, customization and quick implementation, choice between in-house and externally hosted options, functionality, metadata, linked data, scalability, extensibility, and technical support
Involuntary (I)	Budget and staffing limits End of support (project, service, consortium)	End of support (platform, software, hosting, file format, and data type) due to deteriorating political climate, conflict, or disaster

Actor-networks in UTDR migrations

Within the institution, managing the UTDR has been a collaborative effort involving an actor-network, with the DI Librarian serving as the implementer and lead curator, and several library colleagues, faculty, and other stakeholders contributing advice, suggestions, and content. During the UTDR migrations, various technologies, content standards, and policies also formed the actor-network, further contributing to the reconfiguration of the IR as a service to the community. Curatorial agency focused on maintaining access to the UTDR, although its scope varied over the course of the migrations. Migrating the data in 2013, 2016, and 2018, which included digital files and metadata but not the platform, was solely a DI effort and included content restructuring. In 2024, however, the Lyrasis team led the migration from Islandora to DSpaceDirect more methodically and efficiently, using an interactive heuristic strategy that invited DI input at critical stages throughout the process. Other important actors included the UTDR Migration Advisory Group, which offered feedback on selecting the platform from a narrow range of possibilities fitting a tight budget. In addition, the invited members of this group provided valuable input on restructuring the IR after migration. Forming an interdisciplinary group of subject experts from academic units (including the University Libraries), researchers, and other stakeholders to plan future development was tabled until backlogs, metadata standardization, and other planned preservation actions were resolved. Engaging other actors, such as metadata and systems librarians, archivists, web

developers, user experience experts, and current IR users, has been a recommendation in various surveys (e.g., Corbett et al., 2016). This range of expertise was neither necessary nor available at the university because the platform was externally configured and managed. In addition, the DI operation had been largely a solo operation with occasional staff support; it did not require collaboration on a broader scale as described elsewhere. The UTDR actor-network (Table 3) presents human, nonhuman, and complex actors in continuous and functional relationships. Designated to represent crossover categories of actors in this case study, complex actors employ or engage people in coordinator or leadership roles, manipulate technologies, manage facilities, develop learning resources, support curricula, publish research, and curate archival collections. Therefore, the Canaday Center is a complex actor that acts within the scope of its curatorial agency to engage archivists, librarians, support staff, and student assistants to process and curate special collections, preserve archival records, mount exhibitions, and utilize physical spaces and technologies throughout the University Libraries to curate collections. The curatorial agency of the DI Librarian is specific within the Libraries and the Canaday Center because it includes maintaining the digital repository, developing digital collections and virtual exhibitions, and coordinating other digital projects.

Table 3. UTDR actor-network.

Human actors	Nonhuman actors	Complex actors
University of Toledo library employees (faculty, support staff, and administrators)	Posters, exhibits, photographs, reports, audiovisual materials, digital repository platform, submission policies, metadata schemata, media file formats, and description standards	University of Toledo Libraries
Ward M. Canaday Center (archivists, librarians, support staff, and student assistants)	Manuscript collections, archives, digitized rare books, yearbooks, college newspapers, physical and virtual exhibitions, digital repository platforms, finding aid management tools, submission policies, metadata schemata, media file formats, and description standards	University of Toledo Libraries
Teaching faculty	Reports, photographs, archived journals, digital archives, past publications, patent archives, digital repository platforms, submission policies, metadata schemata, media file formats, open educational resources, course syllabi, and curriculum,	Academic departments or university administration
Students	Symposia, posters, graduate student projects, digital repository platform, submission policies, metadata schemata, and media file formats	Academic departments or university administration
Administrators	Reports, photos, digital repository platform, submission policies, metadata schemata, and media file formats	University offices

| Technologists | Domains, DNS mappings, email accounts, and security | Division of Technology and Advanced Solutions, IT Department, and Network Engineering |

Preservation Framework and Curatorial Agency

DCC Curation Lifecycle Model and Transformational Processes

The preservation framework involves the systematic application of preservation actions by trained professionals to ensure long-term access to digital content and metadata. The DCC intended its curation lifecycle model (Figure 3) to be a generic yet adaptable framework for preserving digital content:
'While [it] provides a high-level view, it can be combined with relevant reference models, frameworks, and standards to help plan activities at more granular levels' (Higgins, 2008, p. 135).

This flexibility enables curators to focus on specific areas, actions, and data sets as needed, spanning from small digitized archival collections to large multidimensional digital repositories. Curatorial agency is demonstrated through the selection of preservation actions to mitigate threats, such as digital decay or repository migrations. Although most UTDR migrations (2013–2024) proceeded on short notice and without the benefit of planned preservation actions outlined in the DCC model (DCC, n.d.), this framework has served as a structure for evaluating preservation actions and considering future strategies.
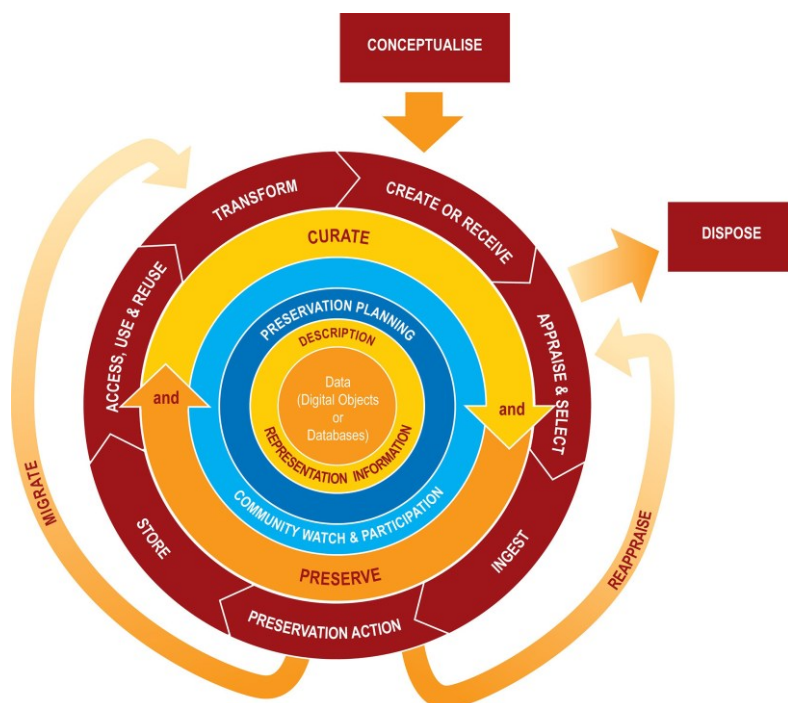

Figure 3. The DCC curation lifecycle model. Copyright 2008 by S. Higgins. Reused under CC BY 4.0, United Kingdom

The DCC curation lifecycle model presents a comprehensive preservation framework with full, sequential, and occasional actions in the DCC model (DCC, n.d., Higgins, 2008),

involving a broad heterogeneous actor-network to maintain expertise, standards, policies, and technologies. The implications of migration for the life cycle of digital content are significant because they result in transformations across content, metadata, and workflows in IR operations. The analysis incorporates the digital life cycle as a framework for strategies, procedures, and a series of preservation actions by archivists, digital curators, and community participants. In the UTDR migrations, these actions and those who take them have varied over time; however, the DCC model's framework grants institutions and communities considerable flexibility in exercising curatorial agency.

Curatorial agency during and after the UTDR migrations typically concentrated on the DCC model's preservation action area with a focus on the following actions: (1) ensuring data authenticity, integrity, reliability, and accessibility; (2) cleaning; (3) validation; (4) assigning preservation metadata and representation information; and (5) ensuring acceptable data structures or file formats (Higgins, 2007, 2008). In addition, storing the data in three separate locations was necessary, using the digital repository, a shared/networked directory maintained by IT and a portable hard drive stored in the Canaday Center's climate-controlled vault. Checksum monitoring has been a useful routine to monitor the integrity (or fixity) of digital files with the use of algorithms, such as MD5, SHA-1 and SHA-256, to generate notifications of any changes to data integrity when accessing those storage devices. 'An archivist can compare checksums or hashes generated before and after file transfer to determine whether the file has maintained the same value through the transfer process' (Society of American Archivists, 2025a). These sequential actions and storage solutions were necessary to guarantee access to data for continued use and reuse. Other sequential actions include routine-level work from Conceptualize to Transform on multiple levels that are not necessarily related to IR migration. Conceptualizing is critical at the repository, community, and collection levels in DSpace hierarchies because it conveys what the repository should represent and contain (similar to how archives establish a collecting scope) and reasserts the purposes it should serve. In addition, the DCC model can guide decisions on what to collect and curate as Create and Receive and Appraise and Select actions. For example, shifting to becoming a formal IR in 2014 contributed to creating a new, broader framework for the UTDR work.

Full life cycle actions, description and representation information, preservation planning, community watch and participation, and curate and preserve span beyond the scope of sequential actions in that they involve human actors (faculty members, administrators, researchers, students, and advisory groups consisting of community members and other stakeholders) with nontechnical roles falling under community watch and participation. The role of community participants is to '[maintain] a watch on appropriate community activities, and participate in the development of shared standards, tools and suitable software' (Higgins, 2008, p. 137). Because IT had not hosted and managed the UTDR, its limited support ranged from establishing the utdr.utoledo.edu domain name to updating the CNAME and other mappings after each successive migration. During the migration to DSpace, an IT review was incorporated into the contract review to ensure security and accessibility. However, maintaining the networks and storage capacities needed for shared storage has been in the IT purview throughout these years.

Transformational Processes in the UTDR Migration

As museums, such as Montreal's McCord Museum, engage technologies such as augmented reality and social media (e.g., Herman, 2023), they undergo remediation and reconfiguration through innovative approaches that expand or replace earlier curatorial models. Remediation refers to the 'representation of one medium in another' (Bolter & Grusin, 1999, p. 45), and reconfiguration implies a broader landscape that continually transforms, such as in the case of technologies (Herman, 2023). Archives and libraries that utilize digital technologies, whether in digital repositories or digital finding aid management systems such as ArchivesSpace, also undergo transformational processes,

and the UTDR migrations exemplify remediation and reconfiguration in these environments. Actor-network negotiations involving the institution, technology, policies, and collections have directly contributed to transformations in data, structures, metadata, and workflows as a result of migrations. In the DCC model, these transformations required reappraising the collections, storage capabilities, and re-evaluating the scope of preservation actions.

Data transformation

Over the 24 years, the UTDR underwent various phases of growth from slow to highly active periods to exceed 12,000 objects, which is modest in size compared with other IRs but significant under local circumstances. Expanding from its initial focus on heritage collections (2000–2013), the UTDR began to include institutional statistics, reports, and scholarly contributions from faculty, students, and various university offices. However, the Canaday Center has contributed the vast majority of the data, such as *The Collegian* (student newspaper), *Blockhouse* (yearbook), and digitized manuscript collections. The migrations required periodic collection reviews, which led to withdrawals from the UTDR due to changes in collection status (e.g., deaccessioning, new restrictions, or missing consents), policies, or changing technologies. For instance, ETDs were accessible on the Digital Commons platform (2014–2018) via a live import feature that supported harvesting metadata and digital objects. After migrating to Islandora (2018), ETDs were excluded because the installation lacked comparable features, such as live import, required to automate the continuation of the ETD harvesting process. In addition, staffing shortages contributed to their exclusion from that migration. Because ETDs were available digitally in the OhioLINK ETD Center and the ProQuest ETD database, they remained accessible to researchers in those databases. Capstone and other graduate student projects were also excluded from the migration to Islandora due to a policy revision requiring authors to sign a formal consent, and many of these projects lacked the required documentation of consent. The departments that initially contributed these projects to the UTDR did not require student authors to complete a consent form, and many of these projects might have required approval from the university's Institutional Review Board. In addition, the inclusion of virtual exhibitions demonstrates data transformation resulting from actor-network negotiations, because these projects have expanded the scope of data curation in the UTDR and the use of this technology to new ends.

Structural transformations

The UTDR migrations (2013–2024) resulted in specific changes to the following aspects of collections: (1) structure: between systemic hierarchies of DSpace and Digital Commons and virtual ones in CONTENTdm and Islandora; (2) metadata schema: between flat Dublin Core (DC) and hierarchical structures in Metadata Object Description Schema (MODS); (3) controlled vocabulary: ontological transformation and mappings; and (4) collection structures representing the relationship between content and context. These migrations resulted in the relocation and structural transformation of collections to fit DSpace, Digital Commons, Islandora, and CONTENTdm architectures at various times. The fixed hierarchies in DSpace and Digital Commons (community, collection, subcollection) present collections in contexts that represent provenance and other organizational relationships, an approach that archivists probably prefer for presenting collections in contextual relationships with record creators and related collections. In contrast, CONTENTdm and Islandora did not inherently enforce these hierarchies but offered significant flexibility and transparency in organizing the collections. The migration from DSpace to CONTENTdm (2013) involved separating the collections from the hierarchies in DSpace. Landing pages were necessary to represent the original structures and facilitate navigation across subject areas in the Canaday Center's collections (e.g., Business and Commerce, Labor, and Women).

A helpful feature in CONTENTdm was to use compound objects to maximize the number of digital objects with fewer metadata records (when retaining contextual relationships), resulting in less metadata work in turn. This process echoed the 'More Product, Less Process' concept in archival practice to reduce backlogs and accelerate access to archival collections (Greene & Meissner, 2005). Converting a few collections using compound objects was an appropriate approach for organizing *The Collegians* and others, where child collection items inherited metadata from their parent collections. However, after migrating to Digital Commons, it was necessary to restructure the collections to fit that architecture, which was set up to mirror the University of Toledo's organizational structure, similar to the way communities and collections are organized in DSpace. Therefore, Merging Canaday Center collections in CONTENTdm with Digital Commons required structural transformation that dissolved the compound objects created in CONTENTdm. However, the move to Islandora involved bringing these collections back into child-, parent-, and sibling-level relationships using hyperlinks that facilitated navigation across the collections, akin to how these structures were represented in CONTENTdm.

The most recent migration from Islandora to DSpace (both hosted by Lyrasis) required coordination because it involved several steps, including resolving structural challenges with Islandora and DSpace hierarchies and establishing collections and communities. Meetz and Baird (2022) outlined a similar, albeit more extensive, process: data extraction (metadata, page, navigation/hierarchy); initial analysis and normalization; data mapping and crosswalking; data ingest; data testing and validation; transform metadata from MODS into DC; and set up a test site. In some cases, relocating and restructuring were necessary to achieve clear association and structural compatibility to ensure each collection fits in a community. The Lyrasis migration team developed scripts and algorithms to automate the migration process, which was a significant and extended undertaking because collections in DSpace required restructuring the Islandora collections into communities and subcommunities, as collections in DSpace could not exist autonomously. Communities (and subcommunities) serve as containers for collections; therefore, breaking up established child–parent associations between collections as they had been in Islandora was unavoidable.

Metadata transformations

Migrations required significant metadata remediation in addition to the previously discussed transformations, due to differences between metadata schemas, such as DC and MODS. Only minor changes were necessary when migrating between platforms using DC (i.e., DSpace, CONTENTdm, and Digital Commons), involving changes to column headers, date formats, and delimiters. In contrast, moving to Islandora required significant remediation because of the hierarchical structure of MODS, which differs from the flat DC schema in this respect. Single-item submission processes were similar across most of these platforms, but Islandora differed, as it supported customizing metadata templates (Figure 4) to match specific content models (e.g., PDF, image, audio, and video). In addition, it allowed setting default values for specific fields to facilitate single-item submissions. As each form generated an XML form template, the XML file served as a model for the batch submission worksheet.

Figure 4. MODS metadata template (single-item ingest form template).

Significant curatorial interventions were necessary to prepare the system to accept batch submissions. The process involved using Visual Basic in Microsoft's macro-enabled Excel (.xlm) worksheets, OpenRefine (an open source tool for data cleaning), and the Oxygen XML Editor to normalize and validate XML metadata records. The Lyrasis support team furnished a metadata worksheet (Figure 5) with a macro script that had worked for another institution using Islandora. However, customizations were necessary to prepare batch submissions to the UTDR. The macro script (Figure 6) in this metadata worksheet also required extensive editing to generate MODS–XML records for each digital object represented in separate rows. On completion and inspection of the information (including spell checks), a click on the 'CREATE XML FILES' button on top of the worksheet generated an XML file for each digital object based on the identifier field. The designated subfolder, into which digital objects and XML files were organized, was converted into a ZIP package required to ingest the data set into the repository system.

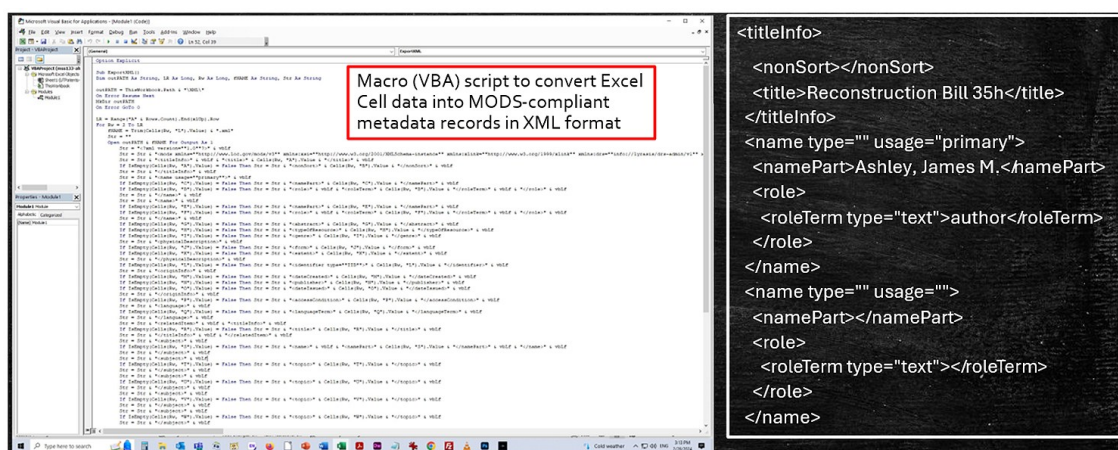**Figure 5.** Macro-enabled Excel worksheet.

Figure 6.   Metadata transformation using a macro-enabled Excel worksheet.

Validating XML files in the Oxygen XML Editor was not required, but helpful nonetheless in identifying encoding errors before ingesting. Ignoring the validation alerts resulted in ingest failure and required repeating the process. On successfully ingesting the package into Islandora, the system parsed the metadata for public display. With the full-text search capabilities of newer platforms, converting some items from image format into searchable PDFs was more desirable to support searching and discovery via the digital repository's user interface. This process required rescanning several PDF documents using Optical Character Recognition (OCR) technology to support extended searches and discovery.

Batch ingest processes in CONTENTdm and DSpace relied on auxiliary software, such as the Project Client and the SAF Creator, respectively. The latter parses CSV files, detects errors in the process, and generates packages containing the digital object, the XML metadata file, and the content inventory. In addition, it prepares and organizes files in auto-generated folders for conversion into a ZIP file before ingesting them into DSpace. A validation process ensures the integrity of the package and metadata and produces error messages if the metadata worksheet contains errors, missing files, or mismatches between file names in the metadata worksheet and the files. Warnings not resolved during package creation will alert users to fix them before the next attempt. Although the migration back to DSpace was handled by the Lyrasis migration team, post-migration remediations, corrections, and metadata enhancements were necessary to comply with metadata standards for interoperability and increase content discovery. The transformation of metadata alone demonstrates the extent of curatorial agency within actor-network negotiations involving curators, collections, metadata standards, and the technologies used in the process.

Workflow modifications

As evident in the previous descriptions, workflows are inseparable from curatorial agency because it is here that solo or collaborative processes are established. The migrations across the different platforms have resulted in various changes in content ingest workflows for projects involving the DI Librarian, support staff, and student assistants. Since the Libraries have continually relied on hosting the UTDR externally, the workflow has varied depending on the platforms used at different times. Selecting, digitizing, metadata creation, and preparing the packages were DI responsibilities; the vendors, particularly OHS and OhioLINK, maintained the platform and oversight of ingesting packages into the platform in the earlier years (2000–2011). The disadvantages of this arrangement included limited DI autonomy with a turnaround time of 1–2 weeks for the vendor to ingest the collection. However, after 2011, the OhioLINK DRC team gradually turned parts of this workflow over to the institutions and trained librarians or

archivists from member institutions to prepare the packages, upload them via using WinSCP (a File Transfer Protocol desktop client software), and complete the ingest process using command-line scripts using PuTTY (a terminal emulator program). At the University Libraries, this new workflow model gave the DI greater autonomy over the process and reduced delays caused by backlogs for the OhioLINK DRC support team.

Subscribing to Digital Commons, which was a new service and did not require a migration, coincided with that platform's new support for audiovisual media, enabling interaction with digitized cultural heritage materials via zooming and panning features similar to those in CONTENTdm. In addition, it supported data visualizations mainly intended for scholarly work, but could be utilized toward geospatial visualizations of cultural heritage collections, such as the *1875 Lucas County* and *Toledo Atlas*. This approach required adding geospatial information (e.g., geographic coordinates) to designated columns in the metadata records (i.e., dc.coverage.spatial) to support map-form visualizations, which was a response to digital humanities interests. Although the Bepress support team offered to assist with ingesting packages and creating submission templates (including customized metadata schemata), a preference for optimal autonomy prevailed for most of the time working with Digital Commons, which extended into working with Islandora and DSpace. Therefore, workflow arrangements throughout these migrations demonstrate actor-network negotiations with colleagues, vendors, and technologies. Each change and adjustment was a part of the transformational process and reconfiguration (e.g., Herman, 2023) that granted continuity despite the disruptions. Workflow modifications demonstrate another area of actor-network negotiations and curatorial agency in transformational processes to enrich the metadata and users' interaction with the IR.

Using subhead layers of representation in digital content (LRDC)

Curatorial agency plays a role in monitoring content integrity, contextuality, and documentation. Migrations can result in significant and often unexpected changes to data, data structures, contextual relationships, and meanings. Guha and McCarthy addressed the 'lifting problem' (as cited in Lee, 2011), resulting from the reuse of digital content in different contexts where they take on new meanings. This case study argues that such a 'lifting problem' remains an issue in cases of successive data migrations. In the digital environment, information related to digital content is scattered over multilevel structures where '[each] level conveys information and [...] meaning (emergent properties directly based upon, but not fully reducible to the level below) not available through any of the other levels - moving between levels involves translation that adds and removes information' (Lee, 2011, slide 10).

Curatorial agency and preservation efforts must therefore focus on preserving meanings conveyed at different levels of representation and on using metadata as part of documentation. This can vary by functional roles in organizations, with archivists and digital curators focusing on collections and other levels affected by migrations. Where available, digital forensics staff may focus their attention all the way to the physical properties of electronic media, responsibilities of technologists at the hosting vendor and at the institution's IT department.

As an integral part of the preservation framework in this case study, Lee's framework (2011) that informed the LRDC framework in this case study, focuses on curatorial interventions on eight progressive levels: (0) bitstream on a physical medium; (1) bitstream through I/O equipment; (2) sub-file data structure; (3) file as 'raw' bitstream; (4) file through filesystem; (5) in-application rendering; (6) object or package; and (7) aggregation of objects. The LRDC framework represents data in various contexts as they are migrated, relocated, recontextualized, and transformed during that process. The role of curatorial agency at these levels is vital for interpreting changes for documentation, planning, and preservation. The UTDR migrations (2013–2024) presented a compelling case for applying this framework in this case study. Up to 2013 (especially with OHS and

OhioLINK maintaining their shared infrastructures), curatorial agency also included consortial actors (repository managers, technologists, and others not identified). However, after the 2013 migrations, the balance of curatorial authority and responsibility shifted toward the institutions. A clear benefit of gaining autonomy is that institutions could experiment with curation approaches, such as virtual exhibitions, that were not possible in some hosted environments.

Unlike the broad application of the DCC framework, the LRDC framework for curatorial practices focuses on the technical details of curatorial work across multiple levels (or layers) of digital collections, from the physical to the intellectual. It is particularly important to understand these layers during IR migrations, when digital content is migrated across multiple contexts, conveying meanings at different levels (e.g., Lee, 2011). Therefore, it is an important part of documenting changes after migrations and planning for changes before migrating. The LRDC framework is useful in analyzing and evaluating the strategies applied to capturing files and other data at different levels (e.g., folder, software, and platform) before migration between dissimilar systems and metadata schemas, each of which varies in representing IR data. As UTDR migrations often involved different platforms, media formats, and metadata schemas, maintaining the content in a folder structure (accessible from a Windows-based system and file manager) was necessary. Lee's (2011) framework accounts for a wide range of possibilities for representation across multiple layers; however, in this case study, their relevance to migration depended on the roles of the vendor's migration team and the DI Librarian (Table 4). This is a descriptive model that will vary by IRs and institutional capabilities. Actor-network relationships and negotiations will also vary across situations in which actors play distinct roles in IR migrations.

Table 4.   LRDC framework and curatorial agency in UTDR migrations.

Level	Label (Lee, 2011)	Description (Lee, 2011)	Assigned curatorial agency in UTDR	Interactions in UTDR
7	Aggregation of objects	'Set of objects that form an aggregation that is meaningful encountered as an entity'	DI, Canaday Center, Vendor	Viewing, browsing, searching Digital Collections, Virtual exhibitions, Scholarly contributions in UTDR; editing metadata information directly in the UTDR; importing and exporting metadata and objects; vendor performing UTDR migration
6	Object or package	'Object composed of multiple files, each of which could also be encountered as individual files'	DI, Canaday Center	Viewing individual files and metadata in a folder before ingesting, batch editing of metadata and collections
5	In-application rendering	'As rendered and encountered within a specific application'	DI, Canaday Center	Viewing metadata worksheet in Excel or Libre Calc; editing images in Photoshop or IrfanView; editing

4	File through the filesystem	'Files encountered as discrete set of items with associate paths and file names'	DI, Canaday Center	PDF documents and passing through OCR Viewing, searching, browsing of files in File Explorer (Windows) or via Linux command prompts; moving and combining files into folders; reinforcing file naming conventions
3	File as 'raw' bitstream	'Bitstream encountered as a continuous series of binary values'	Vendor	Troubleshooting and restoring services and resources
2	Sub-file data structure	'Discrete "chunk" of data that is part of a larger file'	DI	Editing and validation of XML files in the folders and packages
1	Bitstream through I/O equipment	'Series of 1s and 0s as accessed from the storage media using input/output hardware and software (e.g., controllers, drivers, ports, connectors)'	N/A	(No bitstream-level editing is performed, and no digital forensics work)
0	Bitstream on physical medium	'Bitstream on physical medium'	Vendor	No bitstream-level editing is carried out, no digital forensics work (this may be an IT task investigating storage issues). Backup of content in dark archive platforms, such as DuraCloud and Amazon web Services

Actor-Networks and Curatorial Agency in Virtual Exhibitions

Beginning in 2018, the UTDR migrations to Islandora and DSpace facilitated the expansion of approaches to curating digital content in the form of virtual exhibitions using the digital repository platform, moving away from the Canaday Center's template-based approach in Dreamweaver. The center had historically used physical exhibitions to curate its archival and manuscript collections first. The virtual exhibitions were completed and published on the web by the time the physical exhibitions ended, which involved the transfer of the exhibited information from the physical curation space to the website as a collection of scanned documents, photographs, and hypertext to facilitate end-user navigation. Therefore, the virtual exhibitions adopted the traditional exhibition format by retaining the thematic relationships among exhibits through navigation links. The migration of virtual exhibitions in the digital repository was significantly more complicated than moving a website, because the latter involved mainly moving HTML, CSS, and other files between folders on the same or different servers without breaking the file structure or

hypertextual relationships. As discussed in detail in the following section, migrating the virtual exhibitions between two different digital repository platforms involved significant remediations that affected the collection structure, metadata schema, and user interaction with the destination platform. However, the digital repository has an advantage over websites, because it supports the discovery of these exhibits related to other collections and digital items, such as the corresponding exhibition catalogs. As end users can browse and search the digital repository, the search results may display several items that belong to different collections and may explore external links to finding aids and other websites on related topics. Therefore, virtual exhibitions represent new actor-network relationships as the digital curator, in this case, the DI Librarian, negotiated technologies in innovative ways that resulted in the remediation and reconfiguration of curatorial practice in archives similar in scope to those in the McCord Museum, using the MUM app (e.g., Herman, 2023), just with different technologies. In addition, these changes transformed curatorial agency as curators adjusted how they moderate between digital content and their audiences.

Migrating the virtual exhibitions from Islandora to DSpace

Islandora's visually appealing design and architecture, which featured custom thumbnails, inspired the creation of two virtual exhibitions (and a new one underway) in which end users could navigate the content from one exhibit case to the next or to the previous one in the order of the physical exhibition. The navigation system follows the exhibition structure, using added hyperlinks. As in previous virtual exhibitions created with Dreamweaver, starting the exhibition tour was necessary to orient end users to the exhibition plan and to enable them to follow the original exhibit order. Each thumbnail represents an exhibit case, which in turn represents a collection, with hyperlinked text that leads to other case views and back to the exhibition tour. The wireframe (Figure 7) shows the navigation path in Islandora, in this example, from the exhibition landing page (left) to exhibition information (middle) with a link to the exhibition tour (right). Navigating between exhibit cases followed the same model, with additional hyperlinks taking end users between the exhibitions in the original exhibition's order.
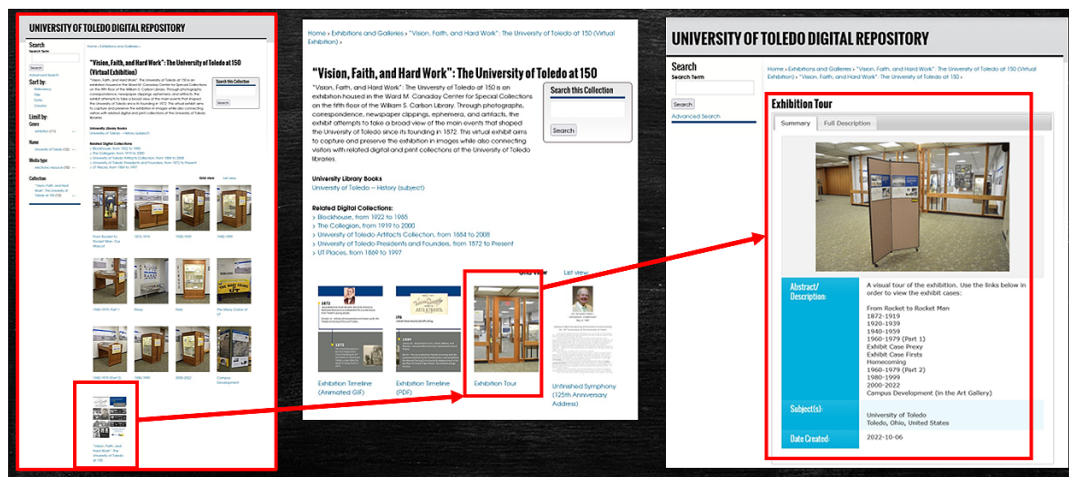
Figure 7.   Wireframe of exhibition navigation in Islandora.

The migration of the UTDR to DSpace has resulted in recreating this virtual exhibition with significant differences in the architectures of the two platforms. Structural transformations were addressed in detail earlier in this case study as part of transformational processes in the preservation framework. Virtual exhibitions demonstrate the effects of migrations and concomitant transformations, causing noteworthy changes in the relationships and ordering of collections as they fit into the

DSpace hierarchy (Table 5). 'Exhibitions and Galleries', which was a Level 1 collection in Islandora, became a Level 2 subcommunity in DSpace under University Libraries, which became a Level 1 community. 'Vision, Faith, and Hard Work' and other virtual exhibitions became Level 3 subcommunities designated to hold the collections (on Level 4) corresponding to the exhibit cases, ordered to match the display order in the physical exhibition. The Lyrasis migration team could migrate these exhibits as collections after the structural remediations performed on their end; creating the new multilevel structures and organizing the collections according to the original exhibition became a curatorial responsibility following the most recent migration.

Table 5.   Structural changes to virtual exhibitions.

Level	Islandora Structure	Level	Dspace Structure
Top (Repository)	Home	Top (Repository)	Home
Collection - LVL1	Exhibitions and Galleries	Community-LVL1	University Libraries
Collection - LVL2	"Vision, Faith, and Hard Work" (Virtual Exhibition)	Subcommunity-LVL2	Exhibitions and Galleries
Collection - LVL3	From Rocket to Rocket Man: Our Mascot	Subcommunity-LVL3	"Vision, Faith, and Hard Work" (Virtual Exhibition)
Collection - LVL3	1872-191	Collection-LVL4	UT at 150 - Exhibition Information
Collection - LVL3	1920-1939	Collection-LVL4	UT at 150 Ex.A - From Rocket to Rocket Man: Our Mascot
Collection - LVL3	1940-1959	Collection-LVL4	UT at 150 Ex.B - 1872-1919
Collection - LVL3	1960-1979, Part 1	Collection-LVL4	UT at 150 Ex.C - 1920-1939
Collection - LVL3	Prexy	Collection-LVL4	UT at 150 Ex.D - 1940-1959
Collection - LVL3	Firsts	Collection-LVL4	UT at 150 Ex.E - 1960-1979: Part 1
Collection - LVL3	The Many Color of UT	Collection-LVL4	UT at 150 Ex.F - Prexy
Collection - LVL3	1960-1979, Part 2	Collection-LVL4	UT at 150 Ex.G - Firsts
Collection - LVL3	1980-1999	Collection-LVL4	UT at 150 Ex.H - The Many Colors of UT
Collection - LVL3	2000-2022	Collection-LVL4	UT at 150 Ex.I - 1960-1979: Part 2
Collection - LVL3	Campus Development	Collection-LVL4	UT at 150 Ex.J - 1980-1999
Collection - LVL3	"Vision, Faith, and Hard Work" (Exhibition Information)	Collection-LVL4	UT at 150 Ex.K - 2000-2022
		Collection-LVL4	UT at 150 Ex.L - Campus Development

The exhibition's landing page in DSpace (Figure 8) has limited branding, exhibition description (used for the original exhibition), exhibit links, credits, collection listing with browse functions, RSS feed (as the linked open data feature in DSpace), and display options that support the ordering of collections by title, author, or another field. The arrows represent interlinking relationships of sibling-level collections, underscoring the role of curatorial agency in aligning the exhibition structure and interaction design with the narrative of the physical exhibition. The collections appear in a list at the bottom of the virtual exhibition landing site, which is a default feature of DSpace. Interlinking was achieved by adding directional hyperlinks, next, previous, and Home, for each collection, which enabled end users to navigate through the virtual exhibition. Enabling the HTML support in the description field made this approach possible. Although this intervention did not necessarily make DSpace a more aesthetically appealing platform for virtual exhibitions, it proved to be a suitable platform for curatorial approaches to digital collections. This approach alone demonstrates transformation resulting from migration, as collections were relocated and recontextualized within a new structure. Virtual exhibitions differ from conventional collections in DSpace in that the relationships in collections go beyond the archival concept of respect des fond, that is 'the principle maintaining records according to their origin and in the units in which they were originally accumulated' (Society of American Archivists, 2025b); the collections representing exhibit contents are related thematically and are connected with navigation links to facilitate end user navigation. Therefore, virtual exhibitions demonstrate a new role in curatorial agency that is necessary during and after the UTDR migration because, in the LRDC framework, these collections manifest new context and convey different meanings. Actor-network negotiations are different in this case because the original order of the physical exhibition emerges as another actor in this network.
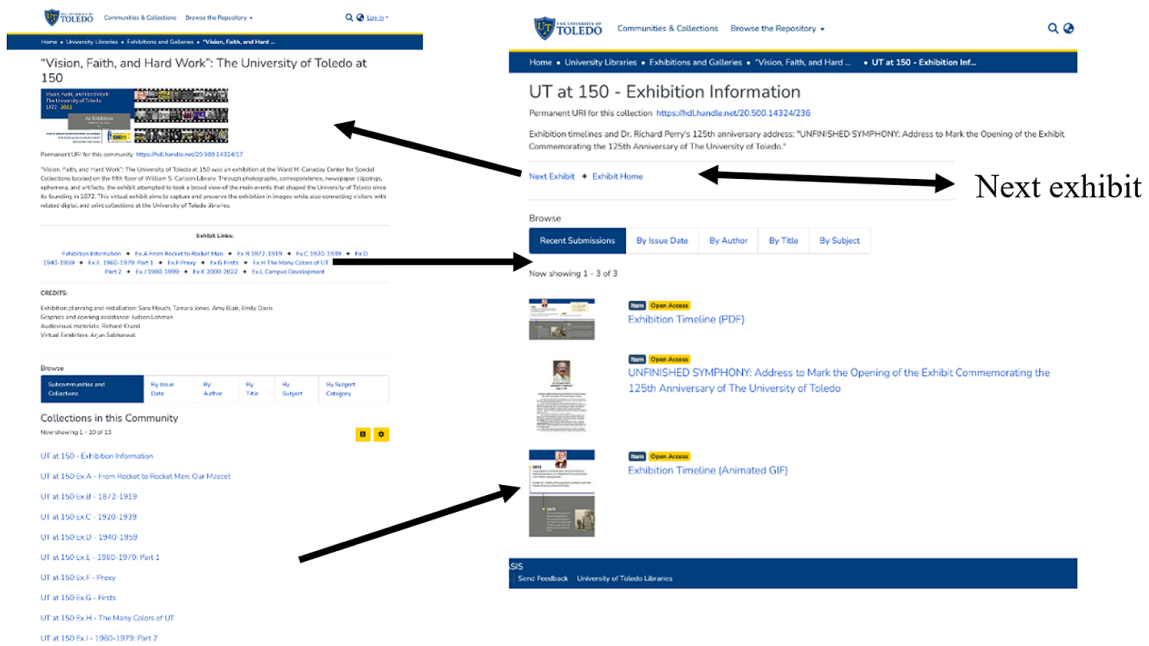
Figure 8.   Transformed virtual exhibition in DSpace.

Conclusion

As IRs undergo periodic migrations, actor-networks and curatorial agency play a vital role in navigating technologies, standards, and institutional capacities to ensure long-term access to digital content. As successive migrations will probably cause disruption in access to the IR as a service, the curatorial agency plays a key role in mitigating the effects of migration. This case study focused on the UTDR migrations between 2013 and 2024 and offered a historical background to the start of digital curation at the University of Toledo in 2000. The analysis utilized a nested framework to demonstrate the scope and role of curatorial agency within actor-networks within and beyond the institution. Although this case study focused on curatorial practice, the theoretical aspects of this paper are evident in its application of the ANT in the context of UTDR migrations, the DCC curation lifecycle model, and the LRDC as parts of a preservation framework. In addition, the use of ANT has been explored in relation to IR management and museum curation, utilizing innovative methods to curate heritage collections and analyze transformational processes, such as remediation and reconfiguration. Although these frameworks were not consulted for migration planning, they can contribute to understanding the role and scope of curatorial agency in institutional contexts, preservation frameworks, and curatorial techniques. Details of actor-network connections and negotiations lend significant transparency to migration as intended for sociotechnical approaches to identify the heterogeneous actors at work. The most recent UTDR migration was completed recently and has yielded significant insights into the roles of curatorial agency in IR migration, related decisions, and continued interventions, such as virtual exhibitions. Benefiting from lessons learned, curatorial agency is vital to advancing new initiatives.

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