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Upgrading UVicSpace, the University of Victoria Libraries' Institutional Repository

Mise à jour de UVicSpace, le dépôt institutionnel des Bibliothèques de l'Université de Victoria

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Abstract / Résumé

This case study describes the process we undertook at the University of Victoria between fall 2023 and spring 2024 to upgrade our institutional repository's software from DSpace version 6.4 to 7.6.1. The open-source software had reached the end of its developer-support period, and some features were no longer functional. This new version offered several new and improved features that we were excited about. We provide a short history about our institutional repository; a literature review including an environmental scan of other Canadian repositories using DSpace; an explanation of our implementation strategy, user interface upgrades, workflow, and submission form changes; training we offered to our major stakeholders; the outcomes of our project;

and some thoughts on future directions. We also share our lessons learned from this major upgrade of UVicSpace with the goal of helping other groups upgrade to DSpace 7 or undertake a similar repository upgrade or migration project.

Cette étude de cas décrit les étapes prises par l'Université de Victoria entre l'automne 2023 et le printemps 2024 pour mettre à niveau le logiciel de notre dépôt institutionnel, DSpace, en passant de la version 6.4 à la version 7.6.1. Le logiciel libre avait atteint la fin de sa période de soutien par les développeurs, et certaines fonctionnalités n'étaient plus opérationnelles. Cette nouvelle version offrait de nouvelles fonctionnalités et améliorations excitantes. Nous présentons un bref historique de notre dépôt institutionnel, une revue de la littérature comprenant une analyse environnementale d'autres dépôts canadiens utilisant DSpace, une explication de notre stratégie de mise en œuvre, des mises à niveau de l'interface utilisateur, du flux de travail et des modifications apportées au formulaire de soumission, la formation que nous avons offerte à nos principaux intervenants, les résultats de notre projet et quelques réflexions sur les orientations futures. Nous partageons également les leçons que nous avons tirées de cette mise à niveau majeure de UVicSpace dans le but d'aider d'autres groupes à passer à DSpace 7 ou à entreprendre un projet similaire de mise à niveau ou de migration de dépôt.

Keywords / Mots-clés

University of Victoria, DSpace, institutional repository, upgrade, user interface design; Université de Victoria, DSpace, dépôt institutionnel, mise à jour, conception d'interface utilisateur

Introduction

Between fall 2023 and spring 2024, we undertook a project to upgrade UVicSpace, the University of Victoria Libraries' institutional repository (IR). In addition to performing a major software update, we also took the opportunity to make improvements to the IR's user interface (UI) and submission workflows and make other changes to help UVicSpace better meet the needs of our user community.

IRs are "digital archives established to collect, preserve, and distribute scholarly and research-related digital scientific outputs within an organization, particularly in academic and research institutions" (Formanek, 2023, p. 1). UVicSpace preserves scholarly and creative works by UVic faculty, students, and staff and makes them openly and freely accessible to anyone. As of spring 2025, it holds nearly 21,000 items. It is administered by the Copyright and Scholarly Communication Office at UVic Libraries. Like all DSpace IRs, UVicSpace is organized into communities, such as faculties and research labs, and each community contains one or more collections of items. To add an item, a user must first create an account and be added to the appropriate collection by an administrator. Every item goes through a review process to ensure that its metadata is complete and consistent, although the steps and people involved in this submission workflow vary by collection. For previously published items, such as articles, this workflow includes

checking the item's copyright status and ensuring that we are permitted to share it in an open access (OA) IR.

UVicSpace uses DSpace, an open-source repository software. Launched in 2002, DSpace was initially developed by the Massachusetts Institute of Technology (MIT) and Hewlett-Packard. Development of the software is supported by the user community, Registered Service Providers (e.g., Atmire), and Lyrasis. According to the Directory of Open Access Repositories (DOAR), there were more than 2,400 repositories using DSpace as of May 2025. It is the most widely adopted software for IRs (Formanek, 2023). It was developed to support open scholarship, making scholarly work openly accessible, discoverable, and shareable. Prior to fall 2023, UVicSpace was running DSpace version 6.4, which no longer had developer support as of July 2023.

This case study offers an overview of our upgrade project, with a focus on how we updated UVicSpace's workflows and UI. Our goal is to provide useful insights to other library teams as they upgrade their repositories to later versions of DSpace, join the Canadian shared institutional repository service Scholaris (which runs on DSpace), or embark on similar upgrade or migration projects. The paper begins with an overview of the history of UVicSpace to provide context for the project and for DSpace 7, and a survey of recent literature related to IR upgrades. We then describe our implementation plan for the project as well as the steps we took, considerations for scheduling the upgrade, challenges we faced, and its major outcomes. We conclude with a discussion of plans for future iterations of UVicSpace.

Historical Context

The University of Victoria (UVic) was founded in 1963, and the library opened its doors the year after. During its early years, students graduating from the University's Masters and PhD programs submitted one copy of their thesis or dissertation manuscript for binding and preservation in the library (Szabo, 2018). In January 2004, librarians presented a proposal to the Faculty of Graduate Studies (FGS) to use the library's new digital repository for archiving, preserving, and disseminating student theses and dissertations. In May 2011, FGS announced that the 40-year-old practice of students submitting print theses or dissertations would be transformed entirely into a digital process, and print submissions would no longer be accepted. The Electronic Thesis and Dissertation (ETD) collection was the first one added to UVicSpace.

UVicSpace has since expanded to become an OA digital repository for scholarship and learning that includes different types of works and formats (e.g., articles, books, book chapters, images, data, student posters, video, protocols, honours theses, presentations, technical reports, and open educational resources published by the library). Its users include not only graduate students but also faculty members self-archiving their publications, departmental staff members submitting graduate projects, research labs, community organizations, and library staff.

The Copyright and Scholarly Communication Office (CSCO) actively recruits content for UVicSpace. Through our mediated deposit service, we offer researchers assistance

with uploading their preprints, accepted manuscripts, published articles, or other types of scholarly outputs to UVicSpace. We also train collection administrators to make submissions to specific collections. We offer training sessions, guidelines, and templates for article cover pages to each collection's administrator. To preserve and to improve discoverability of UVic researchers' work, we also regularly search third-party databases and upload openly licensed articles to the repository.

About DSpace Version 7

DSpace version 7.0 was released in August 2021. It was the most comprehensive update of the software to date, featuring a new front-end UI and a new back end.[1] The new public UI is more user-friendly and responsive, with a modern look and feel as well as improved accessibility features. It also makes it easier for users to deposit items: the multi-page submission forms of previous versions have been replaced with a one-page form with drag and drop functionality for uploading files. DSpace 7 also features a streaming media viewer so that users no longer need to download media files to view them. The user dashboard (My UVicSpace) was also redesigned, making it easier to search for submitted items and items that are going through the review process. For administrators, the new admin sidebar menu provides easy access to tools for managing users, managing submissions, and batch importing and exporting, among other functions (Lyrasis, 2024).

In addition to an updated UI, DSpace 7 also has better security and other behind-the-scenes features. Many of the updates include improvements to the software's general security, including its vulnerability to malicious attacks, and to user authentication. For example, users must now enter their current password when creating a new password (Lyrasis, 2024). The updated user agreement aligns with the General Data Protection Regulation, helping to ensure the privacy and security of users' data. DSpace 7 also has improved search engine optimization (SEO), which makes it easier for users to find items in the repository through web searches. The new optional feature called Configurable Entities provides a different approach to modelling objects in the repository, allowing types of items (entities) to have defined relationships with other entities. For example, a person could have an author relationship to a publication and could be linked to a department at an institution.

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[1] Discussing the technical details of the DSpace upgrade is beyond the scope of this paper, but briefly, the new front end is based on Javascript, built on the Angular platform, and aims to align with current Web Content Accessibility Guidelines (WCAG 2.1). The back end is a refactored REST API accessed via a webapp and supports integrations with OAI-PMH, SWORD, and RDF. More details are available in the DSpace Technology Overview. For an overview of the changes in DSpace 7, see Lyrasis (2024) and Formanek (2023). We thank Ben Sheaff and Corey Davis for the technical aspects of the upgrade.

Although we make use of most of the new features in DSpace 7, we opted not to enable Configurable Entities, as discussed below. One downside of the new version is that upgrading involves building and customizing the UI from scratch rather than simply migrating from the older version, and the installation process is more complex overall (Formanek, 2023).

Literature Review and Environmental Scan[2]

Before creating an implementation strategy, we reviewed the literature about the role of IRs in the research ecosystem, best practices for preservation and discoverability, and UI design in order to define our goals for the upgrade project. We also conducted an environmental scan of other Canadian IRs to get a sense of the types of software they were using, the system features they implemented, their submission workflows, and the type of training they offered to users.

IRs in the Research Ecosystem

A review of the literature on the role of institutional repositories in advancing open scholarship in Canada shows that they are one of the essential elements in an OA digital research infrastructure because they facilitate self-archiving of publications, often called the “green” route to OA (Canadian Research Knowledge Network [CRKN] & Canadian Association of Research Libraries [CARL], 2023; MacCallum et al., 2020; Selman et al., 2024). Canada’s *Roadmap for Open Science* (2020) requires federally funded science publications to be OA upon publication as of January 2023 (Government of Canada, 2020). The 2015 *Tri-Agency Open Access Policy on Publications* requires OA with, at maximum, a 12-month embargo, and recommends self-archiving in an institutional or subject repository as a route to achieve this (Government of Canada, 2016). At the time of writing, the revised Tri-Agency draft policy released in March 2025 states that all federally funded research articles must be deposited in a Canadian IR upon publication, emphasizing the key role of IRs in the research ecosystem (Government of Canada, 2025).

At the institutional level, depositing scholarly outputs in IRs is a cornerstone of OA policies and commitments mandated by many universities and research libraries across Canada, including at UVic (University of Victoria Libraries, 2024). As at other institutions, our IR is essential for enabling us to fulfill these commitments. For a list of other Canadian university open access statements, see Winter (2017).

The literature also emphasizes that, as community-led, noncommercial research infrastructures, IRs provide an important alternative to commercial research-sharing

[2] We would like to thank Julia Gilmore at Scholars Portal for sharing resources that contributed to this literature review.

sites such as Academia and ResearchGate.[3] Most university-hosted IRs are built on community-led, open-source software such as DSpace, EPrints, and Islandora (CARL, n.d.) and have technical infrastructure support from library or university systems departments, although some university libraries contract private companies like Atmire to provide technical development. IRs are backed by institutional resources, mandates, and expertise, so they can ensure long-term preservation and discoverability to serve the public interest, and they do not monetize metrics or user data (Bond, 2017; Fitzpatrick, 2015; Fortney & Gonder, 2015; Tennant et al., 2019; Winter et al., 2020).

Preservation

IRs serve a key function in preserving not only the scholarly record of traditional publications such as articles, monographs, and book chapters but also non-traditional outputs such as learning objects, gray literature, podcasts, conference presentations and research posters. IRs also play a key role in preserving community-based research and making it available to the broader community (Bradley, 2021). As Laakso et al. (2021) argue, preservation of digital scholarship is a critical challenge, particularly for OA publications since they are more likely to face financial or technical barriers to prioritizing preservation. They note that depositing OA publications in institutional repositories is one way to ensure their preservation, citing several European policies that require deposit for this reason. Similarly, the *Tri-Agency Open Access Policy on Publications* strongly suggests that authors deposit their work in a repository even if it is openly accessible on a journal website (Government of Canada, 2016).

Depositing scholarly works in IRs is good preservation practice not only because it adheres to the principle of LOCKSS (Lots of Copies Keep Stuff Safe) but also because IRs are generally mandated to ensure long-term preservation and are resourced with the funding and expertise needed to do so. DSpace was designed to support long-term preservation of digital objects (Formanek, 2023). Like earlier versions, DSpace 7 uses an archival information package (AIP) backup and restore system, which allows the entire repository to be backed up to cloud storage and then restored if needed (Lyrasis, 2022). UVicSpace is backed up to the Ontario Library Research Cloud, a community-led cloud storage service from Scholars Portal (Ontario Council of University Libraries, 2024).

Discoverability

Successful repository implementations result in IRs that are “searchable, discoverable, deliverable and sustainable” (Afroz, 2014, p. 4). Several studies provide recommendations for repository managers in achieving this, such as through robust, consistent object metadata (Saundry, 2017) and effective, stewarded repository

[3] Concerns about the for-profit nature of commercial academic research-sharing sites have led to calls for scholars to abandon them in favour of community-led alternatives. See, for example, Bond (2017), Fitzpatrick (2015), and Gonder and Fortney (2015).

organization (Bacon, 2020). The Confederation of Open Access Repositories' (COAR) best practices for discoverability in IRs provide ways for improving discoverability, including the use of Dublin Core metadata standards; human- and machine-readable metadata; persistent identifiers (PIDs); search tools; and indexing in aggregators, discovery services, and repository registries (COAR, 2022). Like previous versions, DSpace 7 uses Dublin Core as its default metadata schema and assigns a handle (a type of PID) to each item, both of which enhance discoverability. DSpace can also be configured to mint digital object identifiers (DOIs) to new items, and existing DOIs can be recorded as part of an item's metadata.

Discoverability of IR content in third-party search tools is essential due to their ubiquity in users' searching habits (Pulikowski & Matysek, 2021, as cited in Macgregor, 2023). Being indexed in search engines—especially in Google and Google Scholar—and in other aggregators and indexes such as Unpaywall and OpenAlex is therefore crucial for ensuring discoverability for items in IRs. Employing technical repository optimizations related to file-naming and "mobile first" design, for instance, can lead to greater web discovery and usage of institutional repository content (Macgregor, 2020). SEO and indexing can be challenging for IRs, as can measuring and evaluating discoverability (Dong & Tay, 2023; Orduña-Malea et al., 2024; Woolcott & Shiri, 2023). As described below, we used the upgrade project as an opportunity to improve discoverability by revising our cover page templates and ensuring greater accuracy and consistency in our metadata.

Users' Perceptions

To inspire users' confidence, IRs must be trustworthy and reliable. Several tools can be used to determine if a repository is reliable, such as the Trustworthy Repositories Audit & Certification (TRAC) Criteria and Checklist (Nyitray & Reijerkerk, 2021), the Framework for Good Practices in Repositories (COAR, 2022), and the Desirable Characteristics of Digital Publication Repositories (White House Office of Science and Technology Policy, 2022).

Even when these characteristics are met and users can therefore place their trust in the IR, content recruitment from users can be the most challenging part in setting up an IR (Afroz, 2014). Faculty may not know of the existence of the IR (Narayan & Luca, 2017; Shukla et al., 2023) or may prefer to share their work in research communities, subject repositories, or commercial research sharing sites (Cooper & Springer 2019; Doro 2021). Advocating for the IR as one of many potential avenues for research sharing can help alleviate barriers to open scholarship on campus (Doro, 2021; Rothfus et al., 2024; Shukla et al., 2023).

Librarians must also address larger issues of resistance to OA publishing that limit repository uptake. Copyright anxiety, a lack of understanding about intellectual property and authors' rights, and a fear of harming relationships with publishers may cause faculty to avoid depositing their works in IRs (Salo, 2007; Shukla et al., 2023; Narayan & Luca, 2017). Self-archiving's lack of prestige within the context of tenure and promotion, as well as the administrative burden of depositing to IRs (Salo, 2007) must be

considered too. As we describe below, making UVicSpace more user-friendly was one of our primary goals in this upgrade project, and our communications with the UVic community about the launch of the upgraded UVicSpace provided an opportunity for outreach in addition to our ongoing content recruitment efforts.

User Experience (UX) Considerations

Disparate user groups may have different preferences and needs when it comes to using an IR. Walton (2018), for example, focuses on the needs of "information seekers" and "data maintainers" of institutional repositories, while Betz and Hall (2015) focus on depositors' experiences. As Gonzales et al. (2021) argue, incorporating a user-centered design approach in repository migrations and upgrades can improve nearly all functional areas of a repository. González-Pérez et al. (2021), meanwhile, highlight the importance of user-centered design for an IR's homepage in particular. Accessibility in both the software and the content of institutional repositories is an area that needs continued focus (Yang & Zhang, 2024).

It is also important to consider institution-specific needs, since these may vary widely across institutions and even across different user groups within an institution (Narayan & Luca, 2017; Chen & Zhang, 2014; Gonzales et al., 2021). We followed this institution-focused approach when upgrading UVicSpace, as described below, consulting with various stakeholder groups and focusing our efforts on parts of the repository that users tend to interact with the most, particularly the navigation menu, the homepage, and the submission forms.

DSpace Upgrade Projects

There are several examples in the literature of institutions that have performed IR upgrades to systems other than DSpace, including Islandora (Krejčíř et al., 2023; Moses & Stapelfeldt, 2013) and Hyku (Meetz & Baird, 2022). Several papers, though, discuss case studies of upgrading or migrating to DSpace specifically. Formanek (2023) comprehensively outlines some of the benefits of upgrading to DSpace 7 and offers suggestions to institutions as they upgrade from earlier versions. Some case studies of migration to DSpace 7 focus on the UX (Aery, 2018) or the overall process (Woodward, 2019), while others focus on the technical aspects of migrating an IR (Dobariya & Doctor, 2023; Johns et al., 2023). Still others have implications for DSpace upgrade projects while not specifically speaking to that topic, such as Salo's (2007) discussion of the dangers of modifying DSpace code for institutional customization, due to the issues this may cause for subsequent software updates.

Environmental Scan

Conducting an environmental scan of other Canadian IRs that use the various iterations of DSpace 7 was a crucial step before creating an implementation strategy. Before we began our environmental scan, we kept track of the timely discussions in the Canadian Repositories Community of Practice forum. We are grateful to the repository managers who shared their experiences in those forums; these discussions informed us of the

challenges we might face, the successes we might replicate, and colleagues who could provide insight when we had questions.

Once we had gathered preliminary information in this forum, we turned to the inventory of *Institutional Repositories Available in Canada* (CARL, n.d.), making note of Canadian IRs that ran on any version of DSpace 7 so that we could include them in our environmental scan. We also conducted an iterative Google search to identify other repositories in Canada (as of October 2023) that were using DSpace 7. The final list included the following 11 IRs:

- MacEwan University's RO@M
- Queen's University's QSpace
- Université Laval's CorpusUL
- University of Guelph's The Atrium
- University of Ottawa's uO Research
- University of Calgary's PRISM
- York University's YorkSpace
- University of Toronto's TSpace
- University of Manitoba's MSpace
- University of Regina's oURspace
- Vancouver Island University's/Royal Roads University's VIURRSpace

At the same time, we pinpointed specific features we were interested in implementing (e.g., Open Researcher and Contributor Identifier (ORCID) integration) and developed evaluation criteria for investigating how these IRs implemented them. These criteria allowed us to gather information pertaining to the organizational structure, design, and usability of these IRs, as well as the availability of help documentation (Table 1).

These features fell into three broad categories: structure, design, and metadata. Structural features contribute to the IR's overall usability and include navigation menus, the site's organization into communities and collections, and the location of information such as institutional details and instructions for using the IR. Design features affect the look and feel of the site and contribute to its usability, including the layout of the homepage, its banner image, the use of thumbnail images, and the design of submission forms. We looked at three pieces of metadata, all of which relate to discoverability: ORCIDs, which identify people involved in scholarship; DOIs, which identify digital objects; and Creative Commons licenses, which direct how users can share and reuse copyrighted material. We also looked at the non-exclusive distribution

license used by other IRs. This is a mandatory license that users must agree to when depositing an item, which gives the institution permission to distribute and preserve it. Finally, we evaluated any help documentation and user guides we could find related to the repositories' use and included space to capture any other notable features in the IRs that we examined. We conducted our environmental scan based on the criteria in Table 1 between September 2023 and February 2024.

Table 1

Criteria for Environmental Scan of Canadian IRs Using DSpace 7

Feature	Criteria
Navigation menu	● How is the navigation bar structured? ● What words or phrases are used for each tab/button?
Communities & collections	● Is the repository structured by academic unit or by type of publication? ● How many communities and collections does it have? ● Does it use sub-communities?
Footer design	● What information does the footer include (e.g., contact information, institution location) ● Does it include a land acknowledgement? ● Does it match the university website's footer and/or the university library's footer? ● How large is it?
Homepage design and layout	● What content is included on the homepage (e.g., image, introductory blurb, search bar)? ● What order are these content blocks in? ● Is there a lot of information "below the fold" (i.e., that users must scroll down to see)? ● Are communities and collections listed on the homepage? ● Are recent submissions listed on the homepage? ● What image is used at the top of the page? ● How is the introductory blurb worded, and how long is it?
Thumbnails	● Are thumbnails used for all items, including embargoed ones? ● Are icons used instead of thumbnails?
Submission forms	● What information is included in submission forms (if these were accessible)? How is it worded? ● How many types of submission forms does the repository have? ● Do the submission forms employ any customizations?

Feature	Criteria
ORCID	● Is there evidence that the IR is integrated with ORCID? ● Can users log in using their ORCID credentials?
DOIs	● Are DOIs minted in the repository? If so, for which collections? ● Do Electronic Theses and Dissertations (ETDs) have DOIs?
Creative Commons (CC) licensing	● Where is the Creative Commons license information listed on an item page (e.g., in the left sidebar)?
Non-exclusive distribution license	● How is the non-exclusive distribution license worded? ● Is there a separate license or section of the license for ETDs?
User guide	● Does the institution have a user guide with information on how to deposit objects into the repository? ● Is the guide embedded in the repository, linked (either in the introductory text body or as a button in the navigation bar), or completely external?
Other	Examples: ● Author names appearing as links so users can click to see a list of all their publications ● Presence of third-party analytics tools (e.g., Plum X) ● Single sign-on capabilities

The information we gathered as part of this environmental scan informed our decisions about which changes to prioritize and provided inspiration for how they could be implemented. For instance, there were some features we found in our review of these institutional repositories that intrigued us but which we ultimately did not pursue in our upgrade due to time limitations. One example is hyperlinked author names in individual item pages, which point users to the author's other publications in the repository (this is a feature in multiple repositories, including University of Guelph's Atrium, University of Toronto's TSpace, and Université Laval's CorpusUL). Another is the inclusion of a hyperlinked Creative Commons license in the left sidebar of an item page, such as in Vancouver Island University and Royal Roads University's shared repository VIURRSpace. Others included ORCID integration and DOI minting, as discussed below.

Implementation and Outcomes

Initial Plans and Goals

Our implementation strategy, created in partnership with Corey Davis, Digital Preservation Librarian and technical administrator for UVicSpace, and Inba Kehoe, Head of the CSCO, was to develop a project charter. This project charter listed the project team members and their roles, the project's scope and deliverables, its timeline,

its stakeholders and sponsors, and potential constraints and dependencies. The primary deliverable was a feature-equivalent version of our existing IR with DSpace 7 as the technical infrastructure, including any existing customizations (e.g., to the design and submission forms) and any existing third-party integrations (e.g., an ORCID author look-up tool). We upgraded to DSpace 7.6.1, the most recent yet stable version available at the time.

While Davis and Ben Sheaff, our programmer, focused on identifying the functional requirements of the IR and on the technical considerations for the upgrade, the CSCO team focused on UI considerations. We identified several goals for the upgrade project informed by community best practices (as discussed in our literature review and environmental scan), institutional needs, and capacity. One of these goals was to update the overall look and feel of UVicSpace to be more user-friendly to encourage greater use of the site. We also aimed to improve the discoverability of items. In addition, we wanted to streamline submission workflows to better meet the needs of our various user groups. Finally, we planned to update our training materials for our unit, the Metadata unit, the Graduate Admissions and Records Office (GARO), and for student, faculty, and staff users, as well as offer hands-on training sessions with various stakeholder groups and on-demand training.

The main challenges we anticipated were staffing capacity and timing. As is often the case, all team members had limited time to devote to this project and were juggling competing demands, so scheduling regular brief meetings to check in, share updates, and troubleshoot issues was helpful. All team members had to learn how the new software worked, how to customize it, and how best to train users with varying needs and existing experience with the old version of the software.

The timing of the upgrade was an important consideration, since it required the site to be down for at least a few hours or possibly a few days. Graduate students are required to deposit their theses and dissertations in UVicSpace after their defense and usually under tight timelines, so it was imperative that the upgrade did not interfere with students fulfilling this requirement. Accordingly, we planned the upgrade for late February, avoiding thesis and dissertation submission deadlines and causing the least possible disruption to students.

Project Timeline

The UVicSpace upgrade project took approximately seven months from the initial planning in September 2023 to the launch in February 2024 and the wrap-up in March. In addition to the initial planning stage, there were four main phases to the project:

1. Information gathering (conducted iteratively between September 2023–February 2024)
2. Development and testing (October 2023–January 2024)
3. Launch and training (February 2024)
4. Wrap-up (February–March 2024)

The individual tasks we worked through during these phases are itemized in Table 2. Our process was iterative. For example, we continued building on our initial environmental scan during the development and testing phases, and we fine-tuned the configuration in response to feedback we received during training sessions.

Table 2

Phases and Timelines for the Upgrade Project

Phase	Task	Associated Task Timeline
1: Information gathering	Initial planning	August 2023
1: Information gathering	Development of project documents, including project plan and charter	August 2023
1: Information gathering	Environmental scan	September 2023 to January 2024
2: Development and testing	Weekly team meetings	September 2023 to February 2024
2: Development and testing	Homepage design	September 2023 to November 2023
2: Development and testing	User interface design	October 2023 to January 2024
2: Development and testing	Updating submission workflows	October 2023 to December 2023
2: Development and testing	Updating submission forms	October 2023 to January 2024
2: Development and testing	XML editing	September 2023 to January 2024
3: Launch and training	Updating LibGuide	December 2023 to February 2024
3: Launch and training	Training	November 2023 and February 2024

Phase	Task	Associated Task Timeline
3: Launch and training	Stakeholder communication	October 2023 to February 2024
3: Launch and training	Campus-wide communication	February 2024
3: Launch and training	Launch	February 16-23, 2024
4: Wrap-up	Working out bugs	February to March 2024
4: Wrap-up	Wrap-up meeting	March 2024
4: Wrap-up	Identifying future directions	January to March 2024 (and ongoing)

Development and Testing

To develop and test upgrades to UVicSpace, we worked in a sandbox version of DSpace 7 that included data cloned from the current repository, collaborating closely with our Systems colleagues to ensure things were working the way we wanted. Our team made as many changes as we could through DSpace's admin menu and worked with the Systems team to make others. For example, to make changes to submission forms (as discussed below), we consulted with stakeholders to determine what changes were needed, edited the XML configuration files, then shared those files with our programmer for review and testing. This process involved a lot of trial and error, but having the opportunity to do hands-on configuration of the site and XML editing helped us understand how DSpace works, including what features we could feasibly implement, and which required a future iteration of the software.

UI and Homepage Design

In order to meet our goal of improving users' interactions with UVicSpace, we took advantage of the opportunity presented by the DSpace upgrade to improve the site's UI. The design, layout, and organization of our homepage is intended to be eye-catching, yet streamlined and easy to navigate. We reorganized UVicSpace's navigation bar from the out-of-the-box DSpace buttons of "Communities & Collections," "All of UVicSpace," and "Statistics" to "About," "Browse," and "Statistics." To reduce visual clutter, we removed the "Communities" list from the homepage so that "Recent Submissions" would be more prominently visible, drawing attention to the content and contributors of the repository rather than its structure. We also reduced the introductory description of the repository, keeping most of that explanatory information in the linked LibGuide. Inspired by the nice photograph of Queen's University's campus on the QSpace IR, we looked for our own intriguing image to include on the UVicSpace homepage. The addition of the colourful banner image, identified with the help of UVic Libraries' Communications Officer, was a highlight of the upgrade for us. The banner image is a photo of a colouring page filled in by a member of the UVic community during one of the

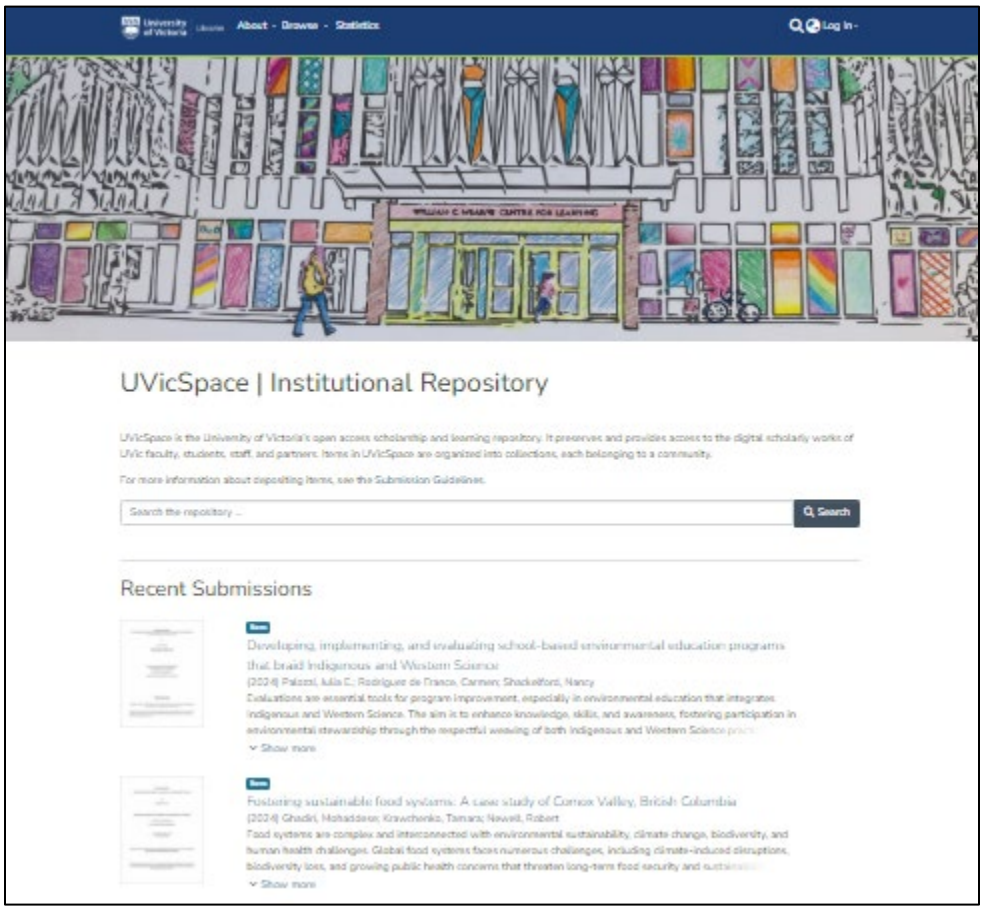
Libraries' outreach events, and as such, it showcases the importance of engagement with the Libraries and of user contributions to UVicSpace. It creates an engaging welcome page to the repository, especially in comparison to the blander homepage of version 6.4 (Figures 1 and 2).

Figure 1

Homepage of the Previous Iteration of UVicSpace Built on DSpace 6

Figure 2

New Homepage for UVicSpace Built on DSpace 7



Our footer was inspired primarily by the footer of UCalgary's PRISM repository, which included links to all relevant information for users (e.g., copyright, legal notice, accessibility, and contact information) and a land acknowledgement. In the navigation bar, we also made sure to transfer important hyperlinks that were there in the previous UVicSpace instance (i.e., policies, guidelines, license information, and frequently asked questions).

Other key UI and design decisions included clarifying the wording of the site's navigation menu. We changed "All of UVicSpace," which is the out-of-the-box DSpace language, to "Browse"; added an "About" option that links to policies and guidelines; and removed unnecessary options such as "Browse by Subject Category." We also updated the UVic Libraries' logo in the top left corner of the repository website, ensured that thumbnails appeared on items, tested the video streaming function, and consolidated publications by author in the "Browse by Author" function.

Submission workflows and forms

Updating our submission workflows and forms was our next major task. A submission workflow is the process through which an item is submitted, reviewed, and archived in the repository. One key feature of DSpace is that submission workflows are configurable: different communities and collections can have different submission workflows to meet an individual collection's needs (Smith et al., 2003). Although configuring submission workflows is technically very straightforward, determining the appropriate workflow for the needs of our various stakeholders was the most challenging part of this phase of the project.

By default, in DSpace 7, any user can submit to a collection, and submissions are archived automatically, but this workflow can be changed by creating (enabling) one or more user groups in a collection:

- Collection administrators can add items or decide who can submit items to the collection. They can also edit item metadata (after submission), delete items, and map items from other collections (subject to authorization).
- Submitters can submit to a collection.
- Reviewers can accept or reject submissions. They cannot edit a submission's metadata.
- Editors can accept or reject submissions. They can also edit the submission's metadata.
- Final editors can only accept submissions or edit the metadata. They cannot reject a submission.

To determine what changes should be made to our existing submission workflows, we consulted with various stakeholder groups. We began by reviewing and updating the submission workflow for ETDs since it is the most complex, involving three user groups (students, GARO, and Metadata). Although by default ETDs are OA as soon as they are archived, students have the option of requesting a one-year embargo if they are planning to publish their work; these embargoes are applied during the submission workflow. Based on our consultations with GARO and the library's Metadata team, we eliminated one of the review stages. Metadata staff were acting as Editors and Final editors, so we eliminated the Editors group to avoid redundancy. The updated submission workflow for the thesis collection illustrated in Figure 3 is as follows:

1. The graduate student user is added to the ETD collection by one of the Collection administrators from GARO.
2. The student fills out the ETD submission form, attaches the ETD file with the embargo information, if applicable, and submits it for review, following the instructions in our UVicSpace Guidelines.

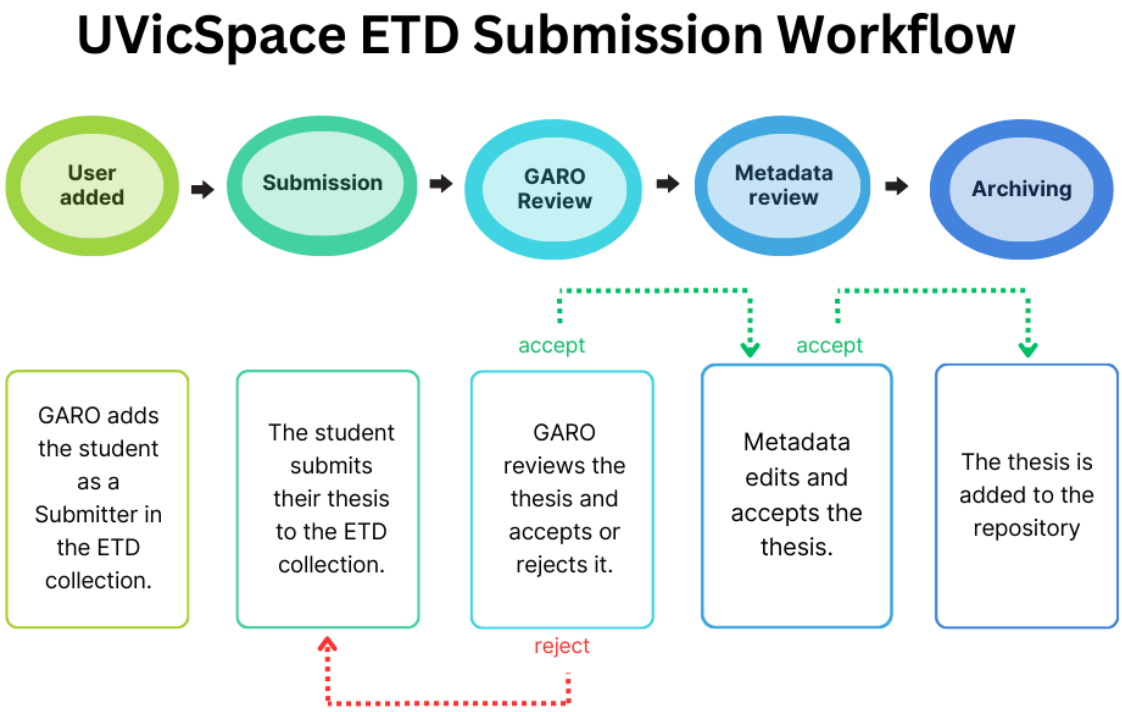
3. GARO staff review the submitted file to make sure it follows the formatting requirements defined by FGS. If the formatting requirements for the manuscript are not met, GARO staff reject the submission with specific instructions for corrections. The submission is returned to the student's My UVicSpace dashboard so they can make the necessary corrections and resubmit their manuscript. When formatting requirements are met, GARO approves the submission.

4. The library's Metadata team reviews the submission, makes necessary corrections in the item's submission form, and confirms that an embargo has been applied, if applicable.

5. The Metadata team accepts the submission and archives it in the ETD collection. The item is automatically assigned a Handle as a PID.[4]

Figure 3

Workflow Diagram for ETD Submissions



[4] Handles are managed by the Global Handle Registry (GHR), which is overseen by the Switzerland-based DONA Foundation. The Handle.Net Registry (HNR) is administered by the US Corporation for National Research Initiatives (CNRI). For more on PIDs in the GLAM sector, see Koster (2020). Although it is possible to assign DOIs in DSpace, we did not enable this function as part of this upgrade project, as discussed below.

We configured the updated ETD submission workflow in the sandbox and tested it thoroughly by moving test items through each stage and impersonating the various user groups. Once the workflow seemed to be working well, we tested it again with the GARO and Metadata staff to ensure that it was working as anticipated.

Next, we reviewed the submission workflows for graduate projects and for general submissions. Because these workflows were already working well, we did not make any significant changes.

Our submission forms were changed the most during the upgrade because of changes to the UI in DSpace 7, institutional changes, feedback we received from GARO and Metadata staff, and our own experiences as site administrators. The single-page submission form introduced in DSpace 7 is a big improvement from the previous multi-page form, which was cumbersome and intimidating for users, particularly for students who are generally not experienced users of the site and are often submitting their work under tight deadlines. Institutional changes meant that the ETD form's dropdown list of departments and programs was out of date, so we updated it. We also took the opportunity to clarify some of the language in the forms to make the submission process as user-friendly as possible. Our consultations with GARO and the Metadata team revealed specific parts of the form where students consistently entered incorrect information. For instance, the form includes a "Bibliographic Citation" field to capture citation information for independently published articles or book chapters that are included in a paper-based dissertation, in which each chapter is a published paper. Students often copied the entire bibliography from their thesis into this field by mistake. With this in mind, we clarified the instructions on the form and in our UVicSpace guidelines to be more explicit about what should and should not be included in that field. These types of changes not only improve the user experience but also ensure the metadata we collect is correct and consistent, which in turn helps improve the discoverability of items in UVicSpace.

One less-than-ideal change to submission forms in DSpace 7.6 is the way embargoes are entered. Rather than filling in a date on the submission form (as in the previous version), users now need to click on each embargoed file (which DSpace calls a "bitstream") and apply the embargo date in a popup window. This process involves more clicks than before, making it less user-friendly, and it has a bug that affects the way dates are entered (Lasou, 2024). We worked with the Metadata team to revise these field labels, the hint text, and the instructions to address these challenges to make the submission process clear for students and reduce the number of corrections the Metadata team needed to make.

One welcome change related to submissions in DSpace 7 is that it is easier to see which stage of the workflow an item is in. In DSpace 6, items appeared in a general working "pool." Now, a user sees an item only when it is in their own workflow. For instance, GARO team members see a thesis only when it is ready for their initial review. Once the item moves on to the next stage, only the Metadata team can see it in their workflow list. Moreover, items now have colour-coded tags indicating where they are in the workflow. For example, items that have been reviewed and accepted have a green

“archived” tag. This feature is particularly helpful for graduate students anxiously waiting for their theses to be approved, since they can see their submission’s progress through the stages of the workflow. One roadblock we ran into, however, was that out of the box, these tags did not have user-friendly names: items submitted but not claimed were tagged “waiting for controller,” and those being reviewed were tagged “validation.” It was surprisingly difficult to find the configuration setting to change these labels, but thanks to our programmer, they now read “awaiting review” and “editing in progress,” respectively.

Another improvement we made related to submissions was to redesign our cover page template. We require cover pages for previously published submissions, such as journal articles, which include bibliographic details, copyright and licensing details, and the original citation. However, cover pages are a known challenge for Google Scholar indexing because they can cause metadata extraction to fail, which is a barrier to discoverability (Acharya, 2015; Westin, 2021). After determining that the structure of our cover page was preventing some items from being indexed properly, we redesigned the cover page template to place the key bibliographic information at the top, where Google’s crawler expected it to be. The new cover page structure for UVicSpace included the article title, author names, and publication year at the top and the copyright statement and institutional information at the bottom of the page. It was designed and tested to ensure that items are indexed in Google Scholar.

Launch, Communications, and Training

The communication and training stage for this upgrade included sharing information about the launch and the repository’s scheduled downtime with our stakeholders and the wider campus community. For this, we created a blog post and a digital slide (which the UVic Libraries’ Communications Officer disseminated across campus), sent emails to specific individuals and campus groups, published a post on our unit’s blog, and placed an informative banner on the existing UVicSpace homepage. The library’s web team also placed a banner on the Libraries’ homepage advising our users of the upcoming change.

We launched the upgraded version of UVicSpace in late February 2024. Having given notice to users, we paused submissions while the Systems team performed the upgrade to the site. We started with a soft launch followed by training sessions with some stakeholder groups, which gave us an opportunity to make any final changes to the site before the official launch.

Our training efforts flowed into two streams. The first was updating the instructions in our UVicSpace Guidelines, and the second was running training workshops with GARO staff, Metadata staff, and CSCO staff. We ran two sessions for GARO: one in November 2023, when the site was still in development, and another in February 2024, after the soft launch. Sessions with Metadata and CSCO took place after the soft launch as well. Training sessions for each group consisted of an introduction to the new system, including an exposition of the differences between DSpace 6 and 7. We then walked through the specific processes and functionalities that were appropriate for each group

and invited them to practice and experiment themselves. For GARO, we focused on the Reviewer role: how to claim items for review, how to return items back to the pool, and how to reject an item and send feedback to students. For the Metadata team, we focused on the Editor role: how to access the bitstream to review it against the item metadata and how to map an item to the ETD collection for each department. For CSCO, we focused on how to deposit items, as they operate the Libraries' mediated deposit service and actively recruit content. We created training documents for both GARO and Metadata staff, which we shared with them before each session and updated afterwards based on their comments and feedback. We also updated our unit's staff guide at this time, though most of our efforts were concentrated on updating the public-facing guidelines.

Documentation was a key aspect of our training strategy. To update the UVicSpace Guidelines, we revisited our environmental scan, taking inspiration from what other repository administrators shared and making sure we were not missing any important information. For each, we identified the guide's structure, its use of images and videos, and what information was included (e.g., how to deposit, how to search). We moved the updated content into the existing LibGuide on the day the new version of the repository was launched, ensuring that any links to this guide in locations across the university would not be affected.

The soft launch did not reveal any major issues, so we launched the upgraded UVicSpace officially in late February 2024. The only noteworthy issue we encountered at launch was a spike in bot traffic, likely due to the site being reindexed. At times during the first week or so after launch, this bot traffic overloaded the server and made the site inaccessible, but waiting a few minutes and refreshing the page usually solved the problem.

Future Directions

Though the formal upgrade project has concluded, minor upgrades to the site will continue as needed. We hope to implement some additional substantial changes identified during the upgrade in a future iteration of UVicSpace, including some of the more advanced features available in DSpace 7.

One feature we are still exploring is batch metadata importing, exporting, and editing, which allows items to be added and changed in batches rather than one at a time. Although batch editing was possible in DSpace 6, the metadata import and export functions are more easily accessible to site administrators in DSpace 7. This feature has enabled us to expand our content recruitment efforts significantly while improving efficiency. We are now using batch editing to archive defunct journals published by UVic Libraries, ensuring that this content continues to be available to researchers, and to add items as part of our active content recruitment program. In addition, batch editing makes it easier to revise metadata. Batch metadata editing also allows us to improve discoverability by ensuring new and existing metadata is correct and consistent.

As mentioned above, we explored the possibility of enabling some new or improved features in DSpace 7 as part of this upgrade project but decided instead to focus on optimizing other features and capabilities. One of these was Configurable Entities. When the upgrade project began, Configurable Entities in DSpace 7.6.1 were not yet fully developed or widely used. We plan to revisit Entities as part of our next major upgrade project, in part because it will allow full integration with ORCID, including single sign-on using ORCID profiles and authority control. We also plan to implement DOI minting as part of our next major upgrade. Although DSpace's out-of-the-box Handle minting works well, DOIs are the standard PID for digital objects in the scholarly publishing ecosystem, and our environmental scan revealed that several IRs successfully mint DOIs for ETDs. Minting DOIs is especially important for discoverability and for inclusion in bibliometrics and altmetrics. Although our to-do list for the next iteration of UVicSpace is already long, all these features would help support UVic's February 2024 commitment to the San Francisco Declaration on Research Assessment (DORA), and they would support open scholarship in our community more generally.

A final note is that, at the time of writing of this paper, we are in discussions with the team leads at Scholaris, a Canadian shared institutional repository service which uses DSpace software, to determine our transition plan in the next year or two (Scholaris, n.d.). The plan may require an upgrade to DSpace 8, as Scholaris is scheduled to move to version 8 in summer 2025, but the lessons learned in our upgrade to DSpace 7 will, we hope, enable a smooth transition.

Conclusion

Upgrading UVicSpace from DSpace 6.4 to 7.6.1 was a major project, involving many individuals at UVic Libraries and beyond. From the initial project planning stage in the fall of 2023, to the information gathering, development, testing, and training stages, through the official launch of the new site in late February 2024, and into the project wrap-up, this upgrade would not have been possible without the collaboration of our team members and the knowledge gained from the Canadian IR community. The most significant outcome of this upgrade has been an overall improvement in the usability of UVicSpace. In addition to a refreshed look and feel and better security behind the scenes, the more user-friendly submission and review process means that our IR better meets the needs of our user community. The process was not, however, without its hiccups and unexpected complications. Even so, the launch of the upgraded UVicSpace was relatively smooth, and, in our opinions, quite a success. Further changes and upgrades for the IR that were identified during this project provide opportunities for UVicSpace's continued improvement. As we reflect on this project and the work still to come, we are thinking about the future of UVicSpace. We hope that this case study will provide useful information for others who manage and administer IRs and are contemplating the future of their own repositories.

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