

# THE ROUTLEDGE COMPANION TO LIBRARIES, ARCHIVES, AND THE DIGITAL HUMANITIES

*Edited by Isabel Galina Russell and Glen Layne-Worthey*

First published 2025

ISBN: 9781032356259 (hbk)

ISBN: 9781032356280 (pbk)

ISBN: 9781003327738 (ebk)

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DOI: 10.4324/9781003327738-22

The funder for this chapter is University of Victoria.



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## PRESERVING DIGITAL HUMANITIES PROJECTS USING PRINCIPLES OF DIGITAL LONGEVITY

*J. Matthew Huculak and Corey Davis*

UNIVERSITY OF VICTORIA

### Introduction

Academic libraries and archives have a Digital Humanities (DH) problem: on the one hand, there is a great divide between faculty member expectations for preserving DH work, and the actual operational realities of libraries and archives. And on the other, libraries and archives are ill-equipped to preserve and provide access to bespoke software or web-based scholarly communications being produced by DH scholars.

This disconnect among librarians and archivists, faculty, and technologists continues to have a negative effect on the longevity of DH projects. A recent survey found that nearly 25% of global DH projects have completely disappeared from the internet; of those still online, 22% suffer from some sort of software obsolescence that has affected the functionality of the site. This is not surprising given that 54% of DH projects did not have a long-term preservation plan at the outset of the project, and many still do not. These plans are particularly important when it comes to agreed-upon solutions to potential problems that naturally arise in large, collaborative projects.<sup>1</sup> Obstacles to long-term preservation include changes in project leadership, lack of documentation, funding scarcity, and deprecated technologies, all of which have serious implications for project longevity.<sup>2</sup> These issues are extremely important for academic libraries and archives to address as more public funding agencies around the world require preservation plans as part of DH funding.<sup>3</sup>

Libraries and archives, however, are not evenly prepared to preserve DH scholarly output, a problem recognized by both librarians<sup>4</sup> and DH practitioners themselves.<sup>5</sup> This is, however, anything but a new issue. In 2002, the Electronic Literature Organization proposed the Preservation, Archiving, and Dissemination (PAD) project, which sought “to maintain accessibility, encourage stability, and ensure availability of electronic works for readers,

institutions, and scholars.”<sup>6</sup> Bethany Nowviskie and Dot Porter’s 2010 work on “Graceful Degradation: Managing Digital Humanities Projects in Times of Transition and Decline”<sup>7</sup> as well as much of Matthew Kirschenbaum’s work<sup>8</sup> speaks to a long engagement in thinking about DH and preservation (among many others).

Notwithstanding this history, the problem of DH project longevity remains, even at institutions with strong DH support, and this problem seems to be global. In order to study the problem of longevity in DH projects, a group of faculty, programmers, librarians, and archivists at the University of Victoria in British Columbia, Canada, formed the Endings Project in order to offer solutions to common problems faced by DH practitioners. This five-year grant funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) sought to do a global survey in English on the longevity of DH work (2018); to conduct intensive one-on-one interviews with DH leaders and collaborators to discuss hindrances to longevity; to hold a symposium inviting participants to share experiences (2020); to collate and process the information and data received; and to create a “longevity tool kit” for DH projects. We will discuss our findings in more detail as the chapter progresses, but in short, what is new about the work of the Endings Project is its focus on bringing together “longevity partners” across an institution and its toolbox for “Endings compliance,” which gives librarians and archivists suggestions on how to help DH scholars frame their work at the beginning of the project for programmers so that it can be preserved by libraries and archives at the end of the project *in a cost-effective way*. Each stakeholder (faculty, programmers, librarians, archivists) in the “preservation circuit” has different professional concerns that may inadvertently hinder project longevity, so our ability to bring together these stakeholders and speak honestly about professional constraints or desires within an interdisciplinary project was an essential aspect of producing the Endings toolkit. Even the differences between librarians and archivists proved to be fruitful discussion points to explore when it comes to the interdisciplinary collaboration of DH work.

In general, librarians – conventionally tasked with collection-building, subject liaison work, and instruction – are moving away from traditional individual subject work towards larger interdisciplinary collaborations on digital scholarship projects. And archivists, still working against large processing backlogs of analog material that predate the rise of digital scholarship, are faced with a deluge of digital materials and limited resources to deal with them.<sup>9</sup> To further complicate matters, these materials do not neatly fit into categories of “collections” (for librarians) and “records” (for archivists). The question, “why won’t you [the library and/or archives] preserve my DH project?” is one that regularly pops up in DH discussion threads, and though there are many cogent answers, few of them offer any consolation to faculty members asking it. In a recent post on the Humanist Discussion list, a scholar expressed profound disappointment that the university library would not commit to fully maintaining the DH web resource he had created over the span of a decade. The faculty member saw this as a refusal by the library to “meet one of [its] basic missions.”<sup>10</sup>

There are, however, few good options for libraries and archives when it comes to preserving complex web applications, especially those relying on third-party APIs and other dependencies, and especially when faculty members come to the library or archive *at the end of the project*. Technology decisions made upfront have a profound impact on the feasibility of preservation. Collaboration between technologists, scholars, and librarians and archivists *throughout a project’s lifecycle* is required.

Our work identifies the crux of the preservation problem as being one of “endings” in DH. Because DH *can*, in principle, go on and on, many projects tend to never end. There are no traditional indicators of completeness, such as sending a finished manuscript off to the publisher, to provide an indicator of “done.”<sup>11</sup> For DH to be sustainable in the long term, projects must envision their ends at their very beginnings. They must anticipate worst-case scenarios (loss of a project partner, loss of funding) and have contingency plans to address these issues from every perspective of the partnership. A Data Management Plan (DMP) may address how data is handled, but what happens when project partners “divorce,” or worse, someone dies? In many ways, every member of the project needs to go through a morbid accounting process in order to think about how the collaborative work will last.

Where do libraries and archives fit into this accounting? Historically, libraries have been the place where a phase of scholarly communication “ends” in the form of a book on the shelf, for example. Additionally, libraries were early adopters of supporting DH work.<sup>12</sup> But there is one place where DH collaborations continue to break down: “hosting.” Although libraries cannot commit to hosting every DH project that comes their way (especially when those projects are built using proprietary software stacks or copious web applications like WordPress), we can reasonably commit to hosting a server on which “flat” (HTML, CSS, and JavaScript) DH projects can be finished, preserved, and backed up according to LOCKSS principles.<sup>13</sup>

As such, effectively tackling longevity issues in DH work requires a whole new way of collaboratively working across professions, expertise, and disciplinary areas. Librarians and archivists, however, have struggled to reimagine professional roles. And while some professionals in libraries and archives were among the first promoters of DH, there remains at least one significant area of misunderstanding and contention: preserving complex DH projects.

### **Why the library won't preserve your DH project**

Writing back in 1998 about the National Archives of Canada's struggle to preserve electronic records, *The Globe and Mail's* Jennifer Ditchburn recounts an apocryphal story of a Roman historian's response when a large new trove of cuneiform tablets in his area of study was discovered: “What terrible news. I'll have to change everything.”<sup>14</sup>

For academic libraries, the preservation of complex online DH projects represents, in many ways, that “terrible news.” The technical challenges in this domain are significant and will be discussed in a later section, but the cultural and organizational challenges that face academic libraries in this area are – arguably – more profound.

While recognizing these two groupings overlap to some extent, let's look at each one in turn.

### **Cultural challenges: libraries and the canon**

It took a century after the invention of the printing press to define new formats for culture. What new formats for the invention and representation of culture will be derived from the computer and the network?<sup>15</sup>

The foundations of modern academic librarianship are centered on the fixed published record. Collectively, large academic libraries in Canada and the United States alone hold

over 3 billion physical volumes.<sup>16</sup> Across the globe, academic libraries lent over 866 million items in 2022.<sup>17</sup> These legacy collections of (mostly) books and bound journals, and their contemporary digital counterparts, exert an enormous gravitational pull on contemporary librarianship.

And yet the world has changed. Authoritative publishers are not responsible for the vast majority of content and user interaction is mediated through complex algorithms that tailor content delivery based on factors unique to an individual. This means that for most information today there is no authoritative version of record to preserve, in the traditional sense. The canonical is meaningless, and for a profession that has dedicated itself for centuries to the canon, the online environment represents more than just a series of technical problems. And while investments in innovative collections and services are growing (spurred in part by COVID lockdowns), research libraries continue to expend a majority of their resources – both human and financial – on managing large and diverse print and online collections of commodity materials.<sup>18</sup> These collections are incredibly important for scholarship, but especially for monographs, their value to the academy is declining. Even with humanists, there is a growing preference for the electronic book over the print monograph.<sup>19</sup> And when it comes to electronic journals, large publishers are increasingly looking to disintermediate libraries by working with research offices or faculty members directly through the bundling of scholarly content with research workflow tools.<sup>20</sup>

These trends, both within libraries and for information production and dissemination generally, represent myriad cultural challenges that strike at the very heart of academic librarianship and the unconscionable amount of professional inertia that is carrying us slipshod through this transformative digital age. This was recognized in a recent joint publication from the Association of Research Libraries (ARL) and the Canadian Association of Research Libraries (CARL) that calls for a greater focus on innovative scholarly communications practices “fit to purpose,” as well as an increasing focus on distinctive collections.<sup>21</sup> Nothing could be more “fit to purpose” and distinctive than online DH projects. And while it’s not uncommon for university leadership to have relatively modest expectations of the library, there are many administrators who are dismayed by the pace of change:

One university leader expressed their disbelief that the library, widely beloved on their campus, should need hundreds of employees “to staff a study hall.” This particular leader felt that substantially all digital functions should be offered at the cross-institutional level and that half the existing library staff should be redeployed into research data management roles. Such leaders tend to believe that their library director is not doing enough to innovate within their existing budget and staffing allocation.<sup>22</sup>

Those who do see the library as an innovative partner increasingly value “new services of one type or another. Many of these services...are driven by successful efforts to redirect the workforce towards new priorities.”<sup>23</sup> Unfortunately, many choices in today’s budgetary environment will be inherently zero-sum. When so much of our identity is wrapped up in legacy collections, how can we effectively position ourselves more meaningfully within the research process, where new forms of knowledge creation require new engagements across the research lifecycle (not simply at the end).<sup>24</sup>

Whether because of a lack of collaboration with information technologists or because funding for preservation is not guaranteed for digital projects, preservation is often an afterthought in digital scholarship, leading to orphaned works and broken links. The digital humanities will have a greater chance of survival if preservation becomes a priority up front.<sup>25</sup>

Until more resources and intellectual energy are dedicated to the protean digital world inhabited by most DH scholars, we will make little progress in meeting their needs. We have known for a long time that we need to “recast [our] identities in relation to the changing modes of knowledge creation and dissemination,”<sup>26</sup> but without the external pressure of scholars demanding more from our profession, we will continue our listless journey in the same ruts.

### **Organizational challenges: archives ignored**

Archivists and librarians – even when situated within the same organization – tend to work in relative isolation. This is particularly problematic because, as mentioned above, DH project materials do not fit neatly into categories based on librarian concepts of “collections” or archival concepts of “records.” Expertise from both domains is required to effectively tackle DH preservation issues.

In fact, archivists were well ahead of librarians in waking to the challenges of digital preservation. For example, the Public Archives of Canada established a Machine Readable Archives Division back in 1973, recognizing that “fresh approaches, procedures, and policies” were required to deal with electronic information.<sup>27</sup> It wasn’t until the late 1990s – more than 20 years later – that librarians began to think in earnest about digital preservation, with publications like *Preserving Digital Information: Report of the Task Force on Archiving of Digital Information* in 1996,<sup>28</sup> and *Digital Preservation: A Time Bomb for Digital Libraries in 1997*.<sup>29</sup>

In addition to an unmatched depth of digital preservation experience, handling archival materials requires expertise in areas critical for the preservation of complex online environments. For example, librarians have traditionally had little direct contact with knowledge creators and instead deal with publishers, jobbers, and consortia to acquire the vast majority of materials. But as we’ve emphasized, DH project preservation requires building relationships with knowledge creators and technical staff before a project is finished. Archivists work with records creators as a matter of course, and their expertise in donor relations, negotiating copyright, understanding the contexts of creation and use, and transfers of custody, are invaluable skills in the born-digital environment.<sup>30</sup>

In our experience, however, there can be a great deal of mistrust between librarians and archivists in the digital realm. Archivists often see librarians – who have always had significantly more resources in the academic environment – blindly stepping into the born-digital and digital preservation environment without an adequate acknowledgment of archival precedent and expertise. Librarians often perceive archival practice as too ponderous and inwardly focused to meet patron demand for digital access to everything possible, right now. Perhaps these misunderstandings arise because we are “trained in relatively separate traditions within programs at educational institutions that are slow to embrace change,” or the tendency for all professions to “retreat to their own affinity groups for answers to professional quandaries.”<sup>31</sup>

As Tom Hickerson, formerly of the University of Calgary, states that “the greatest challenges of convergence are connected to professional identity, which in many ways connects to professional expertise.”<sup>32</sup>

Either way, “digital access to information has...reduced user tolerance for the boundaries that have traditionally defined libraries [and] archives.”<sup>33</sup> Moving forward, we need to work across organizational silos to be successful because “good practice for managing digital content and collections for the long-term increasingly brings domains together in new and/or unfamiliar ways.”<sup>34</sup> This was recognized early on by Internet Archive flounder Brewster Kahle, when he wrote – along with Peter Lyman of Berkley – that metaphors of libraries and archives, when applied to the web, are “useful but limited!”

A library provides the user with catalog technologies and services to search collections. And yet, most of the guide services through the Web are not digital libraries, because they fail to describe its totality, having adapted the model of library catalogs designed to index the intellectual world of a century ago. An archive has the mission of preserving primary documents, generally associated with the history of a particular institution, and often requires specialist knowledge to search. But the Web, of course, is not a true library collection, one selected specifically to meet the information needs of a given community, nor is it an archive, preserving the historical memory of a given institution.<sup>35</sup>

This holds as true today as it did in 1998 when it was written. And the Internet Archive shows us what a true convergence of libraries and archives might look like, where professionals from across domains come together under one roof to tackle disparate but interrelated challenges.

### **Radical collaboration: bridging the divide**

Efforts to tackle DH preservation challenges will have to be “inherently collaborative and interdisciplinary”<sup>36</sup> if librarians and archivists are to meet their responsibilities as preservers of knowledge for future generations. A key concept that has emerged in libraries and archives working to bring together disparate domains is “radical collaboration.” As defined by former MIT Archivist Nancy McGovern, radical collaboration means:

coming together across disparate, but engaged, domains in ways that are often unfamiliar or possibly uncomfortable to member organizations and individuals in order to identify and solve problems together, to achieve more together than we could separately.<sup>37</sup>

Radical collaboration requires more than just bringing together technical and professional expertise: it also requires looking at underlying cultural and organizational issues that limit specific groups from working together across professional domains, especially where “the library community far outnumber archives and archivists,” which can lead to archivist sidelining in favor of library-centric approaches to preservation.

To be clear, radical collaboration requires that archivists, librarians, technologists, and research faculty participate in projects in new ways. It does not simply mean



basic information sharing that has no measurable impact; letting a purported partner know what you did after you did it; and/or, simply allowing someone to be present or to observe without providing them with the means to inform and influence what happens.<sup>38</sup>

### **Examples of what collaboration might look like**

What might new collaborative approaches look like in libraries and archives, as these organizations work with limited resources to support the preservation of new modes of scholarly communications? First, libraries can enhance existing extra-institutional efforts to undertake more traditional collection-building activities. More and more traditional collecting activities are being done through regional and national organizations, which in Canada includes regional consortia like the Council of Prairie and Pacific University Libraries (COPPUL)<sup>39</sup> as well as nationally through organizations like the Canadian Research Knowledge Network (CRKN).<sup>40</sup> Publishers are also offering more demand-driven acquisitions – such as Evidence-Based Acquisitions (EBA) plans – for both books and journals, which means librarians are not spending the same amount of time “collecting” that they once did.<sup>41</sup> At the same time, organizations like CARL and LAC are working with regional library consortia through the Project North/Nord to develop shared print strategies that will enable, through shared collection management and inter-library loan – individual institutions to reduce their print collection footprints and free up local resources for other projects.<sup>42</sup>

At the same time, libraries and archives can focus on shared infrastructure where appropriate: collectively building infrastructure for access and preservation is key here. In the Canadian context, examples include regional and national repository services like Arca from BC ELN,<sup>43</sup> a hosted multi-tenant instance of the Islandora repository, and Borealis, a national Dataverse service offered by Scholars Portal at the University of Toronto.<sup>44</sup> Examples of preservation processing services include Archivematica-as-a-Service from COPPUL<sup>45</sup> and DuraCloud Canada, part of the Ontario Libraries Research Cloud (OLRC), offered by Scholars Portal.<sup>46</sup> These services enable research libraries to piece together workflows in support of access and preservation without having to host or manage local infrastructure, freeing up local resources for more engagement with research projects holistically considered.

By transitioning, where appropriate, significant elements of collection development and management to the network level, more resources can be used to develop services to support innovative scholarly communications practices. Examples include:

- Libraries, in partnership with technologists and special collections and archives staff, become a place on campus where scholars and students seek assistance in identifying external funds to realize new projects and activities.
- Librarians and archivists have a clearly articulated menu of expertise and services that can be easily incorporated into DH funding proposals. A good example of this, although in limited form, is the University of Victoria Libraries’ *Library Services for Grant-Funded Research Projects*.<sup>47</sup>
- Funding proposals are jointly crafted by research faculty, librarians, and archivists – not in order to strategically place librarians and archivists on a par with research faculty, but in order to strengthen a project’s overall sustainability.

- Librarians, archivists, and research faculty work with research computing experts to develop preservation processing and storage infrastructure to support DH researchers' needs.

### **Starting with the end(ings)**

As an example of what radical collaboration might look like, in 2012 Dr. Laura Estill, then a postdoctoral fellow at the Electronic Textual Cultures Laboratory (ETCL) at the University of Victoria (UVic), organized a discussion forum with the university library called “Why the Library Won’t Archive Your DH Project.”<sup>48</sup> The event brought humanists, programmers, librarians, and archivists together to discuss major challenges facing libraries when it comes to DH tool creation. UVic is home to two major DH centers: the ETCL and the Humanities Computing and Media Centre (HCMC), as well as the Digital Humanities Summer Institute (DHSI), an annual teaching and learning event that brings in hundreds of DH practitioners from around the world; as such, the university was well situated to bring these different communities together to discuss the major problem of archiving unique DH projects.

The discussions revealed a number of assumptions on the part of the parties involved. For faculty and developers on campus, there was an assumption that the library should and could preserve all the DH work that was being created. Librarians and archivists argued that the costs to fully preserve DH projects were simply too high – especially when there was little involvement by librarians and archivists in initial project planning. As our various units began to learn from one another, we started to see a common problem: “standard” or widely accepted technical solutions to DH work proved difficult to maintain during the course of the project, much less over the long term. For example, a project that relies on a Google Maps API simply stops working when the API is shut down or changed on short notice. Databases need periodic upgrading, which can break entire applications. Multiply these problems by the number of projects involved, and it becomes quickly apparent why long-term preservation in a resource-constrained environment is so difficult.

In 2016, the HCMC and ETCL were invited to physically relocate into the main UVic Libraries building in a newly created Digital Scholarship Commons (DSC). A team of programmers, librarians, faculty, and students formed to propose “Project Endings,” a five-year grant to study the longevity of DH projects and to make and test recommendations for future-proofing DH work. Working collaboratively, each professional sector brought their individual expertise to bear to solve the problem of preservation. In 2017, the Endings project was funded and a global survey on the state of DH longevity began.

### **The Endings Project survey**

The Endings Project undertook a survey and interviews of DH project participants in 2017 and 2018 based on a global call in English sent through professional DH listservs. The survey consisted of 30 questions about the participant’s project; questions ranged from the career stage of the participant to the type of technologies and formats used in the creation of their DH project. A total of 127 members of the global community answered our call to participate, and DH project experience ranged from the 1980s to 2016. Out of the group who responded, 25 were chosen for detailed interviews conducted by the team for a detailed qualitative analysis. Survey results are presented in Figure 18.1 and described below.

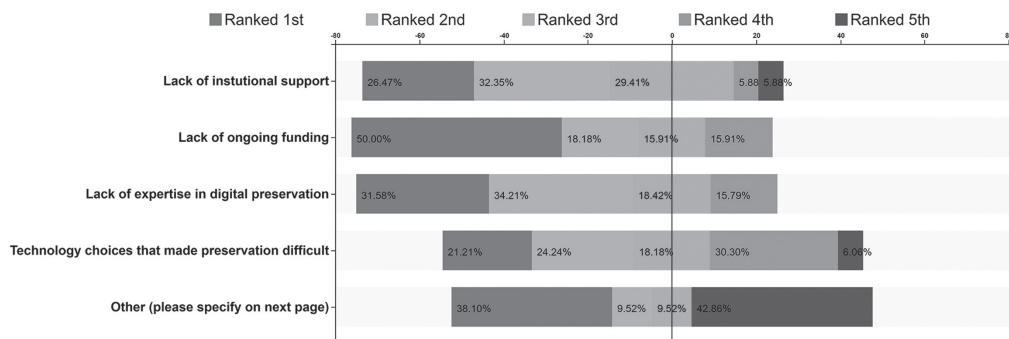


Figure 18.1 Table of results from the Endings Project Survey.

### Results of the Survey<sup>49</sup>

Only 40% of respondents said they had a precise timeline for accomplishing the project from the outset, and out of that group, fewer than half were able to stick to the timeline. When asked if their project was “complete,” only 35% of respondents answered “yes,” and out of those respondents, only 40% had a projected endpoint. Moreover, 54% of digital humanists did not have a long-term preservation plan at the beginning of their projects. In the face-to-face interviews, interviewees talked about the pressure to complete grant applications without having a full picture of the technical requirements needed to complete their project. Many talked about learning on the job and needing to rely on and trust the recommendations of outside programmers to build their sites; in short, most DH projects benefit or would have benefited from having a team-based approach in which all parties could explicitly share their expectations and achievable goals. For librarians and archivists, those tend to focus on preservation, but there are other opportunity areas as well. Based on the results of this survey, the Endings Project has identified four main areas in which librarians and archivists can have maximal impact on ensuring the longevity of DH projects: Grant support, data modeling, copyright, and preservation.

### Technical Challenges Facing Preservationists

There are various ways in which to approach the preservation of complex digital environments, ranging from format migration and software emulation to even more novel approaches that are “deeply rooted in historical methods of anthropology, sociology, political science, ethnography and related humanistic and social science disciplines that seek to document behaviors that are essentially not captured in artifacts,” such as using synthetic populations of “robotic witnesses” to simulate human interaction online, and record these “experiences” rather than attempting to comprehensively capture “documents.”<sup>50</sup>

For the current work being done at the UVic Libraries, we have been exploring the use of web archiving to capture DH projects. Web archiving uses crawlers and other capture technology to create digital collections of web-based materials. Crawlers, such as Heritrix, developed and deployed by the Internet Archive, essentially make copies of web-based content by following links. Heritrix is a key element in the Archive-It service, used by the Libraries

since 2012.<sup>51</sup> Archive-It developers have further extended Heritrix with a technology called Umbra, which gives Heritrix some ability to imitate human interaction. A technology called Brozzler has also been deployed, which “instead of following hyperlinks and downloading files, records interactions between servers and web browsers as they occur, more closely resembling how a human user would experience the web.”<sup>52</sup>

Heritrix, Umbra, and Brozzler attempt to deal with the biggest technical challenges facing web archiving technology today, namely *dynamic content*. Dynamic content is anything that depends on human interaction – which may be as simple as accessing certain content on a particular device at a particular time and place – usually through a click and the invocation of JavaScript. Examples include menus, pagination, zoom, downloads, and play buttons.<sup>53</sup> Dynamic content can also include “[e]lements that require a user’s input, like a form or search box.”<sup>54</sup> Capturing this type of content using Archive-It is not impossible, but if sites contain lots of complex dynamic elements, it can be very time-consuming.<sup>55</sup>

Moreover, the content captured by crawlers (dynamic or static) still needs to be described in meaningful ways by metadata librarians, especially if those resources are exposed in the library’s finding aid. Once the technical challenges are overcome capturing a website, pre-existing professional boundaries present new challenges to libraries.

### *Metadata and discovery*

There are two significant and interrelated issues in the areas of metadata and discovery. One echoes some of the discussion above related to organizational challenges, that “metadata practitioners feel a need to bridge bibliographic and archival approaches to description” which can be “problematic to practitioners with deep experience in a single standards context.”<sup>56</sup> The descriptive practices prevalent in libraries and archives differ in many ways. At the most basic level, each community has its own set of standards for both description and data structure. Metadata for web content is created in various organizational units depending on where responsibility for metadata and/or custody of materials is situated.<sup>57</sup> Additionally – even when a descriptive standard can be agreed upon – ensuring that metadata is applied at a level appropriate to discovery is a time-intensive process. Even then, discovery is particularly problematic because “archived” versions of websites are not normally indexed by search engines and therefore are all but invisible to users.

### *Versioning*

Web archiving is meant to be incremental and ongoing. How do we adequately capture digital editions or crawl at appropriate times for accurate temporal representation?

### *Rights*

DH projects can include complex mashups of content from many sources. Not only might there be rights issues associated with the content itself, but the act of making copies for web archiving, and then making those copies publicly accessible via a service like Archive-It, falls in a legal gray area. This is especially true because Archive-It hosts content in the United States, so jurisdictional issues add to the complexity of the rights landscape.

### *Preservation of web archive files*

Capturing a website using Archive-It no more ensures long-term preservation than does digitizing analog materials ensure their preservation. In both cases, digital surrogates are created that themselves require resources to manage over the long term.

### *Endings Principles for Digital Longevity*

Programmers from the Endings Project worked closely with librarians to test several DH project websites developed at the University of Victoria against the ability of Archive-It to render them as accurately as possible.<sup>58</sup> This led to the creation of the *Endings Principles for Digital Longevity*. These principles have clear recommendations for what the product of scholarship on the web should look like to make it more amenable to web archiving:<sup>59</sup>

- Do not depend on server-side software; instead, build a static website without databases, PHP, and Python.
- Do not use “boutique or fashionable technologies” and focus on widely supported standards such as HTML5, JavaScript, and CSS.
- Do not depend on external libraries or services such as jQuery, AngularJS, Bootstrap, and Google Search.
- Do not use query strings and ensure that every entity has a unique page with a simple URL.
- Every site should include a documented copy of the source data.
- Every page should contain all the components it needs, so that it will function without the rest of the site, if necessary, even though this means duplicating information across the site.
- Every page should still function effectively even in the absence of JavaScript or CSS support.

It is, of course, sometimes difficult to reconcile creative expression with technical principles. For example, interactivity is difficult to preserve but can help engage “readers” more meaningfully with the materials at hand. Therefore, the above list is tempered by the following:

- Once a fully working static site is achieved, it may be enhanced by the use of other services, such as a server-side indexing tool, to support searching and similar functionality.
- The use of an external library may be necessary to support a specific function which is too complex to be coded locally (such as mapping or cryptography). If using external libraries, they should be non-proprietary and widely used and must not themselves have dependencies.

There is more to a web-based project than the user interface in a browser. As such, the *Principles* also address several sustainability challenges by recommending the following<sup>60</sup>:

- Store related data in formats which conform to open standards and which are amenable to processing (TEI XML, GML, ODF, TXT).

- Subject data to version control (Subversion, Git).
- Data models, including field names, descriptions, and controlled values, should be clearly documented in a document that is maintained with the data and forms part of the products (e.g., a README file on GitHub).
- Releases should be periodical and carefully planned. The “rolling release” model should be avoided. A release should only be made when the entire product set is coherent, consistent, and complete (passing all validation and diagnostic tests).
- Web resources should include detailed instructions for citation, so that end-users can unambiguously cite a specific page from a specific edition.
- URLs for individual resources within a digital publication should persist across editions. Any moved, retired, or deleted resources no longer available at a previously accessible URL should be redirected appropriately.

Given the nature of DH work, the uniqueness and interactivity of a site is a feature rather than a bug to be overcome, so it cannot be overstated how important this fore-planning is for all digital humanists to think through for long-term preservation.

### **Practical preservation services made possible by the Endings Project**

At the UVic Libraries, Archive-It is the primary tool used to capture, preserve, and provide access to digital scholarship websites. Implementing the Endings Principles for Digital Longevity in several DH projects has increased the Libraries’ ability to capture and preserve web-based projects. For example, the Robert Graves Diary project (<https://graves.uvic.ca/>), a collaboration between the HCMC and the Libraries started in 2003, proved exceedingly difficult to capture when first using Archive-It against the site in 2014 (see Figure 18.2), when it consisted mainly of a search feature to access scanned images and other media (Figure 18.3). This had been powered by an interactive web application based on an early version of the eXist XML Database engine, which was subsequently



University of Victoria Digital Scholarship Websites, archived by University of Victoria



**This page has not been archived here**

**Why might this happen?**

- This page might not have been included in this organization's collecting plan.
- This page might have prevented Archive-It from collecting it.
- This page may have been collected but needs more time to appear in Wayback. If you just collected this page, please wait 24 hours for storage and indexing.

**What can you do?**

- Click to see other pages from <http://graves.uvic.ca/graves/site/>.
- You can also try searching for <http://graves.uvic.ca/graves/site/xbrowse.xq?qu...> on the [live web](#), in other [Archive-It collections](#), and the [Global Wayback Service](#).

[Archive-It](#) | [Internet Archive](#)

*Figure 18.2* The homepage of the Robert Graves Diary project as captured by Archive-It on August 12, 2014.

**Diary of Robert Graves 1935-39 and ancillary material**  
Copyright St John's College Robert Graves Trust

**Search Graves Diary Collection**

Search for: (Enter Keywords separated by spaces)

Special characters

Match:  ALL Keywords  ANY Keyword

10 Returns/Page

date Sort By

ascending Order By

**Date Range:**

Day:	Month:	Year:
Begin Search: 22	February	1935
End Search: 6	May	1939

**Include:**

- Abstracts
- Diary Entries
- Enclosures
- Log Entries

**Browse Diary Entries**

Select Diary Entry Date

Day: 22

Month: February

Year: 1937

---

**Browse Abstracts**

Select Abstract Month

Month: February

Year: 1935

© 2003 HCMC · University of Victoria · XML-Markup · About this Publication

Figure 18.3 The homepage of the Robert Graves Diary project as captured by the Heretrix Crawler, to which dynamically created content was inaccessible.

ported in 2010–2011 to a new platform based on newer versions of the Cocoon and eXist software packages).<sup>61</sup>

As part of the Endings Project, Martin Holmes and Joey Takeda from HCMC rewrote the entire project to create a portable, static web application suitable for long-term archiving based on the *Endings Principles for Digital Longevity*. The results in terms of web archiving were dramatic (as can be seen in Figures 18.4, 18.5, and 18.6). Whereas before the entire site was unavailable via Archive-It, all content can now be easily accessed. Additionally, because the site is optimized for capture and preservation, troubleshooting and quality assurance of the captured material in Archive-It now takes almost no time.

The creation of a capture- and preservation-friendly site has also led to other approaches to ensuring longevity. In 2021, the Libraries launched an innovative service to host DH sites once they had wrapped up. This would not have been possible for the Graves site in 2014, when it consisted of a complex web application that would have required ongoing and labor-intensive maintenance (updating database software, for example). The new site is static, based on HTML5, CSS, and JavaScript, which means it is simple to host and easy to maintain.

The Graves site is now being hosted by the Libraries on its servers and will be maintained indefinitely based on an agreement between the creators and the Libraries that was drafted in consultation with the University Archives.

Only days after this transfer from HCMC to the Libraries, the benefits of the Endings approach became very clear when a major security issue impacted sites across the globe:

Another benefit of static-izing projects became evident this past week. You may or may not have heard of a global-scale security issue due to a vulnerability in a very widely used bit of software called Log4j. Previous incarnations of projects we've worked on (including Graves) depended on a software stack that included Log4j and so would have been shut down due to this issue until reliable patches etc. were created and implemented, and possibly additional work to update the code in those sites as well. The static versions of the sites are not dependent on a complex stack of software and are not affected.<sup>62</sup>

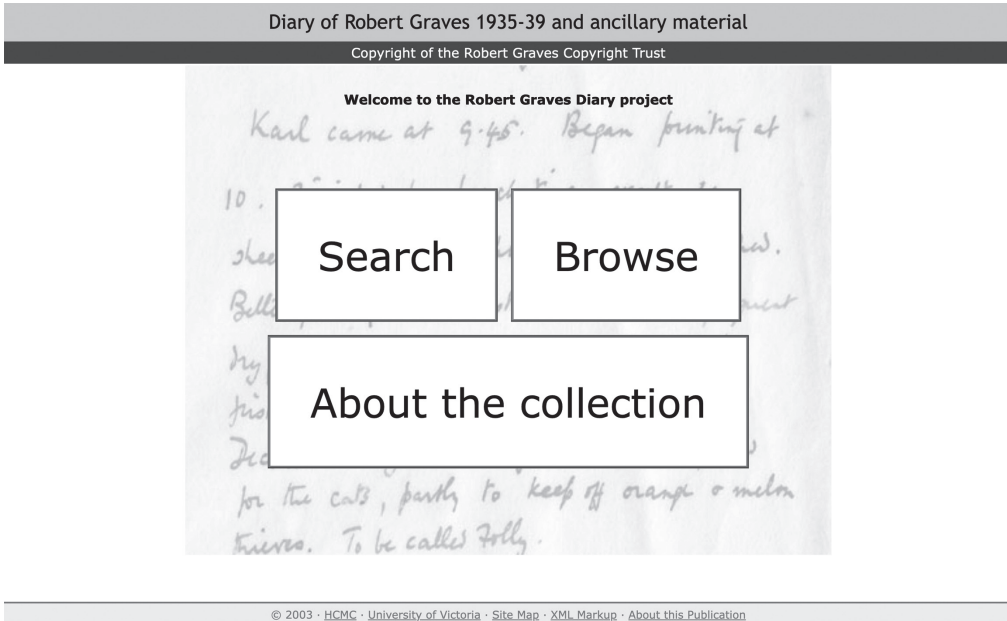


Figure 18.4 The homepage of the Robert Graves Diary project as captured by Archive-It on August 18, 2022. The new version of the site has a homepage that allows for browsing all content where individual items resolve to static, simple URLs.

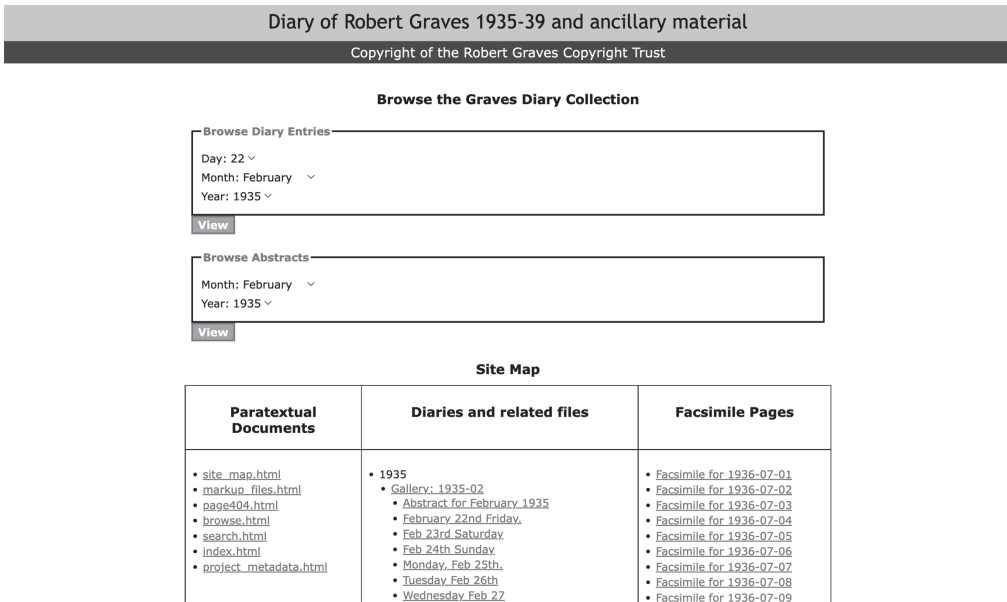


Figure 18.5 When users click on “browse,” they are taken to a list of static URLs representing all content on the site.



Diary of Robert Graves 1935-39 and ancillary material

Copyright of the Robert Graves Copyright Trust

July 1 Wednesday.

Annotated markup

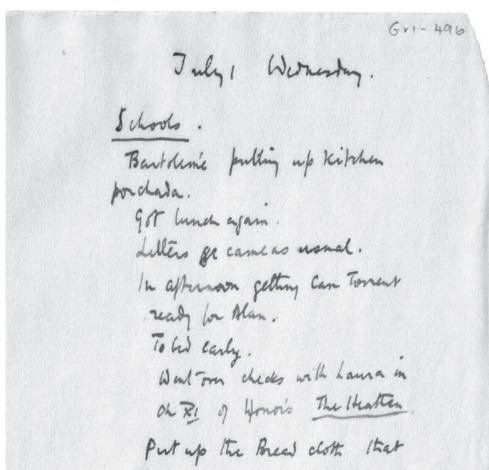


Figure 18.6 All digitized material is available at a predictable, simple URL. Here is an example of an image of the Graves Diary from July 1, 1936.

As the Graves example shows, when librarians, archivists, technologists, and scholars work together, a sustainable way forward to preserving DH projects is feasible.

### Conclusion

The ways and means of conducting scholarly inquiry are experiencing fundamental change, with consequences for scholarly communication and ultimately, the scholarly record.<sup>63</sup>

Libraries and archives have played a critical role in making sure the scholarly record and societies' documentary heritage are preserved for future generations. In the past, each profession had the luxury of framing their respective efforts based on deep professional identities. Today, DH scholarship represents not only significant technical preservation challenges, but also the changing nature of scholarly expression challenges assumptions underlying both library and archive theory and praxis, necessitating a rethink outside professional silos. By working together in meaningfully collaborative ventures with scholars and technologists, there's a chance that in the future, faculty won't be asking why the library or archive can't preserve their DH project, but rather how they can work together from the start.

### Notes

- 1 "Endings Project Survey Results: Building Sustainable Digital Humanities Projects," accessed January 24, 2023, <https://endings.uvic.ca/survey.html>
- 2 Although granting agencies have tended to fund "new" work, there is generally no money allotted to the preservation of such work once it's created.

- 3 For a US example, see “Data Management Plans for NEH Office of Digital Humanities Proposals and Awards,” National Endowment of the Humanities Office of Digital Humanities, accessed January 24, 2023, [www.neh.gov/sites/default/files/2018-06/data\\_management\\_plans\\_2018.pdf](http://www.neh.gov/sites/default/files/2018-06/data_management_plans_2018.pdf). This chapter focuses primarily on the Canadian and US contexts with which we are most familiar, but we are aware of a considerable amount of related activity elsewhere in the world.
- 4 Robert D. Montoya, “Advocating for sustainability: Scaling-down library digital infrastructure.” *Journal of Library Administration* 56, no. 5 (2016).
- 5 Grant Wythoff, “Ensuring Minimal Computing Serves Maximal Connection.” *DHQ: Digital Humanities Quarterly* 16, no. 2 (2022).
- 6 “Publishing Activities,” Electronic Literature Organization, accessed January 24, 2023, <https://eliterature.org/programs/pad/>
- 7 Bethany Nowwiske and Dot Porter, “The Graceful Degradation Survey: Managing Digital Humanities Projects Through Times of Transition and Decline,” *Digital Humanities 2010* (London: Kings College, 2010), 192–193, accessed January 24, 2023, <https://dh2010.cch.kcl.ac.uk/academic-programme/abstracts/papers/pdf/ab-722.pdf>
- 8 See, for example, Matthew G. Kirschenbaum, “Done: finishing projects in the digital humanities,” *Digital Humanities Quarterly* 3, no. 2 (2009).
- 9 Mark Greene and Dennis Meissner, “More Product, Less Process: Revamping Traditional Archival Processing,” *The American Archivist* 68, no. 2 (Fall/Winter 2005), <https://doi.org/10.17723/aarc.68.2.c741823776k65863>
- 10 John Wall, “Institutional Support for DH Websites?,” Humanist Discussion Group 35, no. 241, 2021, accessed January 24, 2023, <https://dhhumanist.org/volume/35/241/>
- 11 See Matthew G. Kirschenbaum, “Done.”
- 12 Lydia Bello, Madelynn Dickerson, Margaret Hogarth, and Ashley Sanders, “Librarians doing DH: A Team and Project-based Approach to Digital Humanities in the Library,” *Collaborative Librarianship* 9, no. 2 (2017): 6.
- 13 The idea that *Lots of Copies Keeps Stuff Safe* (i.e. LOCKSS) was first articulated in the digital realm by Reich and Rosenthal in, for example, Vicky Reich and David SH Rosenthal, “LOCKSS: A Permanent Web Publishing and Access System,” *D-Lib Magazine* 7, no. 6 (2001).
- 14 Jennifer Ditchburn, “If the Medium is the Message, Pity the Archivists,” *The Globe and Mail* (Toronto), Aug, 15, 1998.
- 15 Peter Lyman and Brewster Kahle, “Archiving Digital Cultural Artifacts.” *D-lib Magazine* 4, no. 7 (1998), accessed August 16, 2022, <http://mirror.dlib.org/dlib/july98/07lyman.html>
- 16 “ARL Statistics 2018-2019,” Association of Research Libraries, accessed September 6, 2022, <https://publications.arl.org/ARL-Statistics-2018-2019/>
- 17 “Library Map of the World,” International Federation of Library Associations and Institutions, accessed January 4, 2023, <https://librarymap.ifa.org/map/Metric/Number-of-libraries/LibraryType/Academic-Libraries/Weight/Totals-by-Country>
- 18 “ARL Statistics 2018-2019.”
- 19 Melissa Blankstein, “Ithaka S+R US Faculty Survey 2021,” accessed January 10, 2023 <https://sr.ithaka.org/publications/ithaka-sr-us-faculty-survey-2021/>
- 20 “For these companies [Elsevier and EBSCO], the researcher workflows are especially important because they will generate a far more robust direct relationship with the end-user – the student or scholar. This is already proving to be a boon for analytics and personalization. Over time, the provision of researcher workflows might even result in direct to consumer business models, offering either a complete solution for unaffiliated users, added value sales to users with institutional affiliations, or ultimately a complete solution. As for the business process products, some of them are already finding substantial sales on campus beyond the library, a trend worth watching carefully.” Roger C. Schonfeld, “Revisiting: When is a Publisher not a Publisher? Cobbling Together the Pieces to Build a Workflow Business,” *The Scholarly Kitchen*, accessed January 10, 2023, <https://scholarlykitchen.sspnet.org/2022/06/09/revisiting-when-is-a-publisher-not-a-publisher-cobbling-together-the-pieces-to-build-a-workflow-business/>
- 21 Danielle Cooper, Catherine Bond Hill, and Roger C. Schonfeld, “Aligning the Research Library to Organizational Strategy,” Association of Research Libraries, Canadian Association of Research Libraries, and Ithaka S+R, 2022, accessed September 6, 2022, <https://sr.ithaka.org/wp-content/uploads/2022/04/ARL-CARL-SR-Report-Aligning-the-Research-Library-to-Organizational-Strategy-04122022.pdf>

- 22 *ibid.*
- 23 *ibid.*
- 24 This can be as simple as recommending that something like Flash and other proprietary display formats not be used for online DH scholarship projects because of sustainability and security issues, all the way up to negotiating intellectual property issues, recommending and applying metadata standards, provisioning applicable repositories, preservation processing, and storage infrastructure. For more on the Flash issue in particular, see Khee Hoon Chan, “Tracing the Sprawling Roots of Flash Preservation,” *Vice*, March 18, 2021, accessed January 10, 2023, [www.vice.com/en/article/wx8y5y/tracing-the-sprawling-roots-of-flash-preservation](https://www.vice.com/en/article/wx8y5y/tracing-the-sprawling-roots-of-flash-preservation)
- 25 A. Miller and Molly Taylor-Poleskey, “A Conversation for Developing Sustainable Digital Projects,” in *Transformative Digital Humanities: Challenges and Opportunities*, eds. Mary McAleer Balkun and Marta Mestrovic Deyrup (London: Routledge, 2020), 103, accessed January 10, 2023, [www.taylorfrancis.com/chapters/edit/10.4324/9780429399923-12/digital-humanities-preservation-miller-molly-taylor-poleskey](https://www.taylorfrancis.com/chapters/edit/10.4324/9780429399923-12/digital-humanities-preservation-miller-molly-taylor-poleskey)
- 26 Association of College and Research Libraries, “Changing Roles of Academic and Research Libraries,” accessed January 10, 2023, [www.ala.org/acrl/issues/value/changingroles](https://www.ala.org/acrl/issues/value/changingroles).
- 27 Harold Naugler, “FOCUS: The Machine Readable Archives Division of the Public Archives of Canada,” *Archivaria* (1978).
- 28 Donald Waters and John Garrett. *Preserving Digital Information. Report of the Task Force on Archiving of Digital Information*. The Commission on Preservation and Access, Washington, DC, 1996.
- 29 Margaret Hedstrom, “Digital Preservation: A Time Bomb for Digital Libraries,” *Computers and the Humanities* 31, no. 3 (1997): 189–202.
- 30 Jackie Dooley. *The Archival Advantage: Integrating Archival Expertise into Management of Born-digital Library Materials*, (Dublin, OH: OCLC Research, 2015).
- 31 Eric Willey, “An Examination of the Convergence of Theory in Libraries and Archives.” *Archival Issues* 38, no. 2 (2017), 8–12.
- 32 *ibid.*, 4.
- 33 Robert VanderBerg, “Converging Libraries, Archives and Museums: Overcoming Distinctions, But for What Gain?,” *Archives and Manuscripts* 40, no. 3 (2012), 136.
- 34 Nancy Y. McGovern, “Radical Collaboration and Research Data Management: An Introduction,” *Research Library Issues* 296 (2018), 6.
- 35 Lyman and Kahle, “Archiving digital cultural artifacts.”
- 36 Nicky Priaux and Martin Weinel, “Connective Knowledge: What We Need to Know About Other Fields to Envision Cross-disciplinary Collaboration,” *European Journal of Futures Research* 6, no. 1 (2018).
- 37 Nancy Y. McGovern, “Radical Collaboration and Research Data management: An Introduction,” *Research Library Issues* 296, no. 2018 (2018): 6.
- 38 McGovern, “Radical Collaboration and Research Data management: An Introduction,” 8.
- 39 “Collective Collections,” Council of Prairie and Pacific University Libraries, accessed September 7, 2022, <https://coppul.ca/strategic-goal/collections/>
- 40 See “CRKN Licensing Principle,” Canadian Research Knowledge Network, accessed September 7, 2022, [www.crkn-rcdr.ca/en/crkn-licensing-principles](https://www.crkn-rcdr.ca/en/crkn-licensing-principles), which emphasizes “working collaboratively, at the national and international level, to actively transform the scholarly and scientific communication system toward open scholarship, open science, and open access.”
- 41 See, for example, Edward A. Goedeken and Karen Lawson, “The Past, Present, and Future of Demand-driven Acquisitions in Academic Libraries,” *College & Research Libraries* 76, no. 2 (2015): 205–221.
- 42 “North/Nord Coordinates Shared Print Initiatives of National Significance Across Canadian Public, Academic, and Government Libraries,” North: The Canadian Shared Print Network/ Nord: Réseau canadien de conservation partagée des documents imprimés, accessed September 7, 2022, <https://northnordsharedprint.ca/>
- 43 “Arca,” BC ELN, accessed September 7, 2022, <https://bceln.ca/services/shared-services/arca-digital-repository>
- 44 “Borealis,” Scholars Portal, accessed September 7, 2022, <https://borealisdata.ca/>
- 45 “Archivemata-as-a-Service,” Council of Prairie and Pacific University Libraries, accessed September 7, 2022, <https://coppul.ca/preservation/archivemata-as-a-service/>

- 46 “DuraCloud,” Scholars Portal, accessed September 7, 2022, <https://learn.scholarsportal.info/all-guides/cloud/duracloud/>
- 47 “Library Services for Grant-Funded Research Projects,” University of Victoria Libraries, accessed September 7, 2022, [www.uvic.ca/library/research-teaching/research-grant-support/grants.php](http://www.uvic.ca/library/research-teaching/research-grant-support/grants.php)
- 48 “Nuts & Bolts Discussion: 21 Nov, 4pm, UC,” Electronic Textual Cultures Lab, accessed September 6, 2022, <https://etcl.uvic.ca/2012/10/15/nuts-bolts-discussion-21-nov-4pm-uc/>
- 49 “Endings Project Survey Results: Building Sustainable Digital Humanities Projects.”
- 50 Clifford Lynch, “Stewardship in the ‘Age of Algorithms,’” *First Monday* (2017).
- 51 <https://archive-it.org/>
- 52 Sylvia Rollason-Cass, “What is Brozzler,” accessed September 6, 2022, <https://support.archive-it.org/hc/en-us/articles/360000343186-What-is-Brozzler>
- 53 Jillian Lohndorf, “Known Web Archiving Challenges,” accessed September 6, 2022, <https://support.archive-it.org/hc/en-us/articles/209637043-Known-Web-Archiving-Challenges>
- 54 *ibid.*
- 55 Kirsta Stapelfeldt, Sukhvir Khara, Natkeeran Ledchumykanthan, Lara Gomez, Erin Liu, and Sonia Dhaliwal, “Strategies for Preserving Digital Scholarship/Humanities Projects,” *Code4Lib Journal* 53 (2022).
- 56 Jackie Dooley, and Kate Bowers, *Descriptive Metadata for Web Archiving: Recommendations of the OCLC Research Library Partnership Web Archiving Metadata Working Group*, OCLC Research, 2018: 8.
- 57 Dooley and Bowers, *Descriptive Metadata for Web Archiving*, 8.
- 58 Claire Carlin, “Endings: Concluding, Archiving, and Preserving Digital Projects for Long-Term Usability,” *KULA: Knowledge Creation, Dissemination, and Preservation Studies* 2, no. 1 (2018).
- 59 “Endings Principles for Digital Longevity, Version 2.2, 2022-08-31,” accessed September 6, 2022, <https://endings.uvic.ca/principles.html>
- 60 “Endings Principles for Digital Longevity, Version 2.2, 2022-08-31.”
- 61 “About the Robert Graves Diary Project,” accessed September 6, 2022, [https://graves.uvic.ca/project\\_metadata.html](https://graves.uvic.ca/project_metadata.html)
- 62 Stewart Arneil, email to authors, December 15, 2021.
- 63 Brian Lavoie, Eric Childress, Ricky Erway, Ixchel Faniel, Constance Malpas, Jennifer Schaffner, and Titia Van der Werf, *The Evolving Scholarly Record* (Dublin, OH: OCLC Online Computer Library Center, 2014), 6.

## References

- “About the Robert Graves Diary Project.” Accessed September 6, 2022. [https://graves.uvic.ca/project\\_metadata.html](https://graves.uvic.ca/project_metadata.html)
- Arneil, Stewart. Email to authors, December 15, 2021.
- Association of College and Research Libraries. “Changing Roles of Academic and Research Libraries.” Accessed September 7, 2022. [www.ala.org/acrl/issues/value/changingroles](http://www.ala.org/acrl/issues/value/changingroles)
- Association of Research Libraries. “ARL Statistics 2018-2019.” Accessed September 6, 2022. <https://publications.arl.org/ARL-Statistics-2018-2019/>
- BC ELN. “Arca.” Accessed September 7, 2022. <https://bceln.ca/services/shared-services/arca-digital-repository>
- Bello, Lydia, Madelynn Dickerson, Margaret Hogarth, and Ashley Sanders. “Librarians Doing DH: A Team and Project-Based Approach to Digital Humanities in the Library.” *Collaborative Librarianship* 9, no. 2, article 6 (2017).
- Blankstein, Melissa. “Ithaka S+R US Faculty Survey 2021.” Accessed January 10, 2023. <https://sr.ithaka.org/publications/ithaka-sr-us-faculty-survey-2021/>
- Ditchburn, Jennifer. “If the Medium is the Message, Pity the Archivists.” *The Globe and Mail*, August 15, 1998.
- Electronic Literature Organization. “Publishing Activities.” Accessed January 24, 2023. <https://eliterature.org/programs/pad/>

- “Endings Principles for Digital Longevity, Version 2.2, 2022-08-31.” Accessed September 6, 2022. <https://endings.uvic.ca/principles.html>
- “Endings Project Survey Results: Building Sustainable Digital Humanities Projects.” Accessed January 24, 2023. <https://endings.uvic.ca/survey.html>
- Canadian Research Knowledge Network. “CRKN Licensing Principle.” Accessed September 7, 2022. [www.crkn-rckd.ca/en/crkn-licensing-principles](http://www.crkn-rckd.ca/en/crkn-licensing-principles)
- Carlin, Claire. “Endings: Concluding, Archiving, and Preserving Digital Projects for Long-Term Usability.” *KULA: Knowledge Creation, Dissemination, and Preservation Studies* 2, no. 1 (2018): 1–4.
- Chan, Khee Hoon. “Tracing the Sprawling Roots of Flash Preservation.” *Vice*, March 18, 2021. Accessed January 10, 2023. [www.vice.com/en/article/wx8y5y/tracing-the-sprawling-roots-of-flash-preservation](http://www.vice.com/en/article/wx8y5y/tracing-the-sprawling-roots-of-flash-preservation)
- Cooper, Danielle, Catherine Bond Hill, and Roger C. Schonfeld. (2022.) “Aligning the Research Library to Organizational Strategy,” Association of Research Libraries, Canadian Association of Research Libraries, and Ithaka S+R. Accessed September 6, 2022. <https://sr.ithaka.org/wp-content/uploads/2022/04/ARL-CARL-SR-Report-Aligning-the-Research-Library-to-Organizational-Strategy-04122022.pdf>
- Council of Prairie and Pacific University Libraries. “Archivematica-as-a-Service.” Accessed September 7, 2022. <https://coppul.ca/preservation/archivematica-as-a-service/>
- Council of Prairie and Pacific University Libraries. “Collective Collections.” Accessed September 7, 2022. <https://coppul.ca/strategic-goal/collections/>
- Dooley, Jackie. *The Archival Advantage: Integrating Archival Expertise into Management of Born-Digital Library Materials*. Dublin, OH: OCLC Research, 2015.
- Dooley, Jackie, and Kate Bowers. *Descriptive Metadata for Web Archiving: Recommendations of the OCLC Research Library Partnership Web Archiving Metadata Working Group*. Dublin, OH: OCLC Research, 2018.
- Electronic Textual Cultures Lab. “Nuts & Bolts Discussion: 21 Nov, 4pm, UC.” Accessed September 6, 2022. <https://etcl.uvic.ca/2012/10/15/nuts-bolts-discussion-21-nov-4pm-uc/>
- Goedeken, Edward A., and Karen Lawson. “The Past, Present, and Future of Demand-driven Acquisitions in Academic Libraries.” *College & Research Libraries* 76, no. 2 (2015): 205–221.
- Greene, Mark and Dennis Meissner. “More Product, Less Process: Revamping Traditional Archival Processing.” *The American Archivist* 68, no. 2 (Fall/Winter 2005). <https://doi.org/10.17723/aarc.68.2.c741823776k65863>
- Hedstrom, Margaret. “Digital Preservation: A Time Bomb for Digital Libraries.” *Computers and the Humanities* 31, no. 3 (1997): 189–202.
- International Federation of Library Associations and Institutions. “Library Map of the World.” Accessed January 4, 2023. <https://librarymap.ifa.org/map/Metric/Number-of-libraries/LibraryType/Academic-Libraries/Weight/Totals-by-Country>
- Kirschenbaum, Matthew G. “Done: Finishing Projects in the Digital Humanities.” *Digital Humanities Quarterly* 3, no. 2 (2009). <http://digitalhumanities.org/dhq/vol/3/2/000037/000037.html>
- Lavoie, Brian, Eric Childress, Ricky Erway, Ixchel Faniel, Constance Malpas, Jennifer Schaffner, and Titia Van der Werf. *The Evolving Scholarly Record*. Dublin, OH: OCLC Online Computer Library Center, 2014.
- “Library Services for Grant-Funded Research Projects,” University of Victoria Libraries, accessed September 7, 2022. [www.uvic.ca/library/research-teaching/research-grant-support/grants.php](http://www.uvic.ca/library/research-teaching/research-grant-support/grants.php)
- Lohndorf, Jillian. “Known Web Archiving Challenges.” Accessed September 6, 2022. <https://support.archive-it.org/hc/en-us/articles/209637043-Known-Web-Archiving-Challenges>
- Lyman, Peter and Brewster Kahle. “Archiving Digital Cultural Artifacts.” *D-lib Magazine* 4, no. 7 (1998). Accessed August 16, 2022, <http://mirror.dlib.org/dlib/july98/07lyman.html>
- Lynch, Clifford. “Stewardship in the ‘Age of Algorithms.’” *First Monday* 22, no. 12 (2017). <https://doi.org/10.5210/fm.v22i12.8097>
- McGovern, Nancy Y. “Radical Collaboration and Research Data management: An Introduction.” *Research Library Issues* 296, no. 2018 (2018): 6–22.
- Miller, A. and Molly Taylor-Poleskey, “A Conversation for Developing Sustainable Digital Projects.” In *Transformative Digital Humanities: Challenges and Opportunities*, edited by Mary McAleer Balkun and Marta Mestrovic Deyrup. London: Routledge, 2020. Accessed January 10, 2023.

- www.taylorfrancis.com/chapters/edit/10.4324/9780429399923-12/digital-humanities-preservation-miller-molly-taylor-poleskey
- Montoya, Robert D. "Advocating for Sustainability: Scaling-Down Library Digital Infrastructure." *Journal of Library Administration* 56, no. 5 (2016): 603–620.
- National Endowment of the Humanities Office of Digital Humanities. "Data Management Plans for NEH Office of Digital Humanities Proposals and Awards." Accessed January 24, 2023. [www.neh.gov/sites/default/files/2018-06/data\\_management\\_plans\\_2018.pdf](http://www.neh.gov/sites/default/files/2018-06/data_management_plans_2018.pdf)
- Naugler, Harold. "FOCUS: The Machine Readable Archives Division of the Public Archives of Canada." *Archivaria* 6 (1978): 176–180. <https://archivaria.ca/index.php/archivaria/article/view/10649>
- North: The Canadian Shared Print Network/ Nord: Réseau canadien de conservation partagée des documents imprimés. "North/Nord Coordinates Shared Print Initiatives of National Significance Across Canadian Public, Academic, and Government Libraries." Accessed September 7, 2022. <https://northnordsharedprint.ca/>
- Nowvieskie, Bethany and Dot Porter. "The Graceful Degradation Survey: Managing Digital Humanities Projects through Times of Transition and Decline." In *Digital Humanities 2010*. London: Kings College, 2010. Accessed January 24, 2023, <https://dh2010.cch.kcl.ac.uk/academic-programme/abstracts/papers/pdf/ab-722.pdf>
- Priault, Nicky and Martin Weinel. "Connective Knowledge: What We Need to Know about Other Fields to Envision Cross-Disciplinary Collaboration." *European Journal of Futures Research* 6, no. 1 (2018): 1–18.
- Reich, Vicky and David SH Rosenthal. "LOCKSS: A Permanent Web Publishing and Access System." *D-Lib Magazine* 7, no. 6 (2001). <https://dlib.org/dlib/june01/reich/06reich.html>
- Rollason-Cass, Sylvia. "What is Brozzler." Accessed September 6, 2022. <https://support.archive-it.org/hc/en-us/articles/360000343186-What-is-Brozzler>
- Scholars Portal. "Borealis." Accessed September 7, 2022. <https://borealisdata.ca/>
- Scholars Portal. "DuraCloud." Accessed September 7, 2022. <https://learn.scholarsportal.info/all-guides/cloud/duracloud/>
- Schonfeld, Roger C. "Revisiting: When Is a Publisher Not a Publisher? Cobbling Together the Pieces to Build a Workflow Business." *The Scholarly Kitchen*. Accessed January 10, 2023. <https://scholarlykitchen.sspnet.org/2022/06/09/revisiting-when-is-a-publisher-not-a-publisher-cobbling-together-the-pieces-to-build-a-workflow-business/>
- Stapelfeldt, Kirsta, Sukhvir Khera, Natkeeran Ledchumykanthan, Lara Gomez, Erin Liu, and Sonia Dhaliwal. "Strategies for Preserving Digital Scholarship/Humanities Projects." *Code4Lib Journal* 53 (2022). <https://journal.code4lib.org/articles/16370>
- VanderBerg, Robert. "Converging Libraries, Archives and Museums: Overcoming Distinctions, But for What Gain?" *Archives and Manuscripts* 40, no. 3 (2012): 136–146.
- Wall, John. "Institutional Support for DH Websites?" *Humanist Discussion Group* 35, no. 241 (2021). Accessed January 24, 2023, <https://dhhumanist.org/volume/35/241/>
- Waters, Donald and John Garrett. *Preserving Digital Information. Report of the Task Force on Archiving of Digital Information*. Washington, DC: The Commission on Preservation and Access, 1996.
- Wiley, Eric. "An Examination of the Convergence of Theory in Libraries and Archives." *Archival Issues* 38, no. 2 (2017): 8–12.
- Wythoff, Grant. "Ensuring Minimal Computing Serves Maximal Connection." *DHQ: Digital Humanities Quarterly* 16, no. 2 (2022). <https://digitalhumanities.org/dhq/vol/16/2/000596/000596.html>