
Outside the Four Corners: Exploring Non-Traditional Scholarly Communication

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Abstract

Traditional outputs of scholarly communication, such as monographs and journal articles are being supplemented by new forms of scholarship, particularly in fields such as digital humanities. Canadian university libraries have long played a role supporting the creation, distribution, and preservation of scholarly objects. That support must be extended to include new formats and modes of scholarly work, such as digital portfolios, non-linear narratives, social media, scholarly video journals, etc. As the means of production and forms of scholarly output diversify, libraries will need to understand the impact of these digital shifts and identify areas where library efforts can have the most influence. This article examines developing areas of non-traditional scholarly communication and discusses implications for members of the Canadian Association of Research Libraries (CARL).

Keywords

Libraries; Scholarly communication; Non-traditional scholarship; Digital humanities; Data sets; Visualization; Scholarly video; Social media

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Introduction

We are all familiar with the traditional outputs of scholarly communication (SC), such as the monograph and the journal article. However, the development of new forms of scholarship and the emergence of new fields, such as the digital humanities, are generating new scholarly objects: scholarly videos and video journals, digital portfolios, non-linear digital narratives, and more. Canadian university libraries have always played a role supporting the creation, distribution, and preservation of scholarly objects, and must continue to do so with these new formats. As the means of production of scholarly output increase in diversity and accessibility, libraries will need to understand a broader range of user needs and identify the trends and areas where their efforts can have the most impact on enabling and preserving this next generation of scholarship. This article investigates some new, exciting technologies and types of SC, and highlights promising venues in which libraries can engage local communities around the topic of non-traditional SC.

Understanding non-traditional SC and the roles that libraries play in the creation, distribution, and preservation of these materials is a large and complex endeavour. For example, what exactly constitutes "non-traditional SC?" What forms does it take? Who is engaging in it? And what are academic attitudes toward it? By better understanding the landscape of non-traditional scholarly communication (NTSC), we hope to document, promote, and raise awareness about the emerging forms of digital scholarship and scholarly communication that our faculty engage in. Further, we hope to suggest the kinds of supporting roles members of the Canadian Association of Research Libraries (CARL) can play in this endeavour.

Digital humanities research environments

New modes of knowledge production in the digital humanities (DH) emphasize collaboration, scale, and interdisciplinarity. These changes have driven the growth of collaborative authoring and research environments in which library resources are leveraged in atypical ways to produce non-traditional research outputs. Examples of such DH research environments include Aus-e-Lit (ITEE eResearch, 2011), a platform to support the aggregation and collaborative semantic annotation of Australian literature and print culture; the Canadian Writing Research Collaboratory (CWRC), a platform to support the collaborative exploration and annotation of literary texts; CULTURA, an environment for the semantic annotation and analysis of historical texts; and the Discovery Project, which aims to aggregate philosophy texts for collaborative semantic annotation.

Emerging humanities research environments share several features that fundamentally alter the ways in which humanist research is undertaken. These changes present significant challenges to how libraries procure and organize their resources. Traditional institution-based licensing models are problematic in collaborative environments that bring together researchers from many different organizations. The formats in which libraries acquire resources are incompatible with the easy ingestion and annotation of massive amounts of textual, image, or numerical data. The research outputs and framework technologies of the environments may be incompatible with existing library digital preservation systems and strategies.

Rights management

From the library perspective, rights management is the most immediate and difficult challenge. DH research environments enable researchers from across institutions and countries to work together to integrate and interpret large text stores that are well beyond the scope of any individual researcher. There is enormous promise in this ability to work on such a large scale, but library-provided articles, e-books, indexes, and databases are subject to licenses that restrict use to the students, faculty, and staff of a single institution. Because of copyright restrictions, the vast majority of material published during the twentieth century cannot be ingested, integrated, annotated, or explored within shared research environments. Furthermore, the conditions of usage around these materials are subject to change as library contracts are renegotiated on a three to five year cycle. This uncertainty about future rights threatens the stability of highly interconnected discovery environments. The removal of several major texts from an aggregated resource due to licensing changes could orphan other resources and remove the context of annotations.

Libraries have several strategies to combat use restrictions on resources. Open access (OA) journals and monographs allow libraries to pay one-time publishing costs in order to make books and articles free to the entire world in perpetuity. In recent years, many libraries have started their own OA journal hosting platforms, and libraries are often involved in open monograph and textbook initiatives as both funders and technology partners. The OA movement has produced a large amount of textual material that can be used with very little restriction. Open education and open data are related movements that aim to make teaching objects and data sets available for unrestricted reuse. Although libraries can be proud of this accomplishment, it is still the case that less than 20 percent of journals currently use the OA model (Laasko & Björk, 2012) and only a handful of open monograph publishers exist (Morrison, 2014). Despite the efforts of libraries, most of the research produced over the last seventy years is still gated and will be unavailable for utilization into research environments for some time to come.

Long-term hosting and preservation¹

Preservation of DH research environments and their outputs is another major concern for academic libraries. Along with traditional papers and presentations, DH research outputs include metadata, semantic links, multiple versions of heavily annotated texts, XML, RDF triples, ontologies, algorithms, applications, and visualizations. While library research and data repositories can ingest some of these outputs individually, it is often difficult to package non-traditional outputs for easy ingestion into a repository, and it can be difficult to read or understand that data outside of the original context and platform. Libraries would ideally archive DH projects in their entirety, but this provokes questions about the technology hosting capacity of libraries. Each project has a unique technology stack, and large DH research environments usually incorporate many different types of software. These may rely on specific versions of operating systems, script engines, database management systems, indexing software, triple stores, content management systems, and applications. The CWRC, for example is built on the Fedora platform (Canadian Writing Research Collaboratory, 2010) and incorporates

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elements of Islandora (Brown, 2012). Nines uses Collex (NINES, n.d.), an open source collections and exhibits builder. Preservation can be particularly challenging when projects use technology that is not already in use and which is unfamiliar to library information technology (IT) staff.

If libraries are to archive complex DH research environments then they should become involved in project design at the earliest stages, and lobby to be involved during the initial phase when relevant technologies are chosen. Ideally software will be open source, well documented with open standards, and widely deployed. Implementation and configuration should be documented, install packages and virtual machines should be created wherever possible, and copies of applications (along with their documentation) should be archived. Source code produced by the project should be made available through code hosting services such as Github to help manage distributed revision control and to ensure that a complete record of development is available. Metadata standards such as the PREMIS Data Dictionary for Preservation Metadata² should inform file and object descriptions to ensure that content is subject to best preservation practices. Libraries will also have to consider diverting funds toward the long-term hosting and preservation of these projects. Appropriate staffing is critical and would ideally include a librarian or staff member who is involved with the project over its entire lifespan, as well as technical staff to manage day-to-day troubleshooting, virtualization, integrity checks, format migrations, hardware infrastructure, and back ups.

Licensing and preservation are just two of the many ways in which emerging DH research environments will challenge academic libraries to re-engineer the delivery of resources and services. Libraries must continue to support OA models wherever possible in order to ensure that resources can be shared in open or multi-institutional platforms. The earlier the library is involved in a DH project, the better it will be able to identify project needs and respond to them. Libraries must market themselves as DH project partners, and must ensure they are sufficiently staffed and have enough resources to make significant and useful contributions to these projects over time.

Publishing data sets and visualizations

As noted above, digital scholarship relies on the availability of open, machine-readable, and actionable content. Libraries and researchers need to ensure that the content collected, licensed, and created is available for textual and meta-analysis. Sections of this article touch on how OA and open source projects serve as both catalysts and facilitators for expanding scholarship. Shared and open data have a similar role to play, and have similar challenges to explore when we consider data and visualizations as publishable outputs of research.

In many disciplines, research data has always been fundamental to the discourse, and small subsets of data have been included in standard publications for many years. What has changed with the growth of e-publication and e-scholarship is the capability and willingness of journals to include data on a larger scale, the ability to link to archived datasets external to the formal publication, and the expectation that data and digital corpora will be made available as part of the process.

New models and methods of research are being driven by this greater availability of digital content (including data), the relative ease of sharing digital objects, and the increased appreciation of the potential of data mining and meta-research, what Jim Gray (2009) characterized as the “fourth paradigm” of data-intensive enquiry. “As in the sciences, digital humanities projects often use data, tools and methods to examine particular questions, but the works support interpretation and exploration” (Spiro, 2012, p. 28).

As the methods change, so too do the outputs of that research. Traditional publications are straining to fully capture the richness of the new scholarship. And digital scholars are exploring new ways to capture and expose their research, of which data publication is one option.

At the most general level, the publication of data³ takes three major forms: specific data as an annex to a traditional publication; datasets as standalone objects; and major data collections as research corpora. The authors will address some of the principles that apply to data publication in general, with emphasis on decisions to be made at the project and researcher levels.

A fundamental underpinning of sharing data in any form is the decision to preserve it – this is a key consideration in preparing data for sharing. Excellent progress has been made in the research data management (RDM) community⁴ to develop concepts, standards, and practices that lead to managed, shareable, and preservable data objects.⁵ While acceptance of these concepts is manifest in the inclusion of RDM plans as a requirement of proposals and grant applications, the implementation of infrastructure and supporting resources is not as fully developed as the models.

There are many projects in place that explore data archiving and sharing – from large-scale, collaborative project, such as the Open Data Commons⁶ or DataONE, to more regional and local initiatives, such as odesi,⁷ and data archiving in institutional repositories.⁸ There are also projects such as the DATAVERSE network, B2Share, and Zenodo – which provide open source tools for capturing, describing, and managing data collections and collaborative infrastructure for the networking of data repositories – and more dissemination and collaboration focused projects such as Figshare and OpenAire .

These projects provide a good framework for preservation, but publication is different from archiving. It may be a nuanced distinction, but publication is an act of distribution, an entry into the research record, which “first and foremost ... is intended to communicate findings, hypotheses, and insights from one person to another, across space and across time. It is intended to organize ... to connect related work and to develop discipline” (Lynch, 2009, p.178). It presupposes the ability to explore, reuse, and reinterpret the data.

Publication of data therefore requires a series of decisions around the selection, description, and attribution of the work.

SELECTION

What to publish or share? While this seems self-evident, there are underlying questions about whether the data should be shared in its raw form, at its various analytical stages, or post analysis; whether summaries, specific sub-sets, or all of the data is included; and by extension, whether methods, tools, and systems developed for interpretation and analysis are part of the published object.

Where research involves human subjects, or the output of human discourse, considerations of privacy, informed consent, regulations, ethical standards, and risk of harm (likelihood and impact) must also be factored into data sharing and publication decisions.

DESCRIPTION

The next question is how to describe the data. As in the textual realm, multiple schema exist for description. Metadata can focus on the content and context of the data. There may be multiple layers of description, particularly in large data sets and collections. The selection of description frameworks may be influenced by disciplinary practices, methodological considerations, and intended use cases. There will also be metadata on the technical components of file creation, preservation, and transmission – such as PREMIS² and Metadata Encoding & Transmission Standard (METS)⁹ – some of which are incorporated in the research data management lifecycle.

The richer the description, the more easily the data can be discovered and reused. The challenge is finding the right level of effort to invest in data description in order to facilitate discovery and reuse.

ATTRIBUTION

Another factor to consider is how the data objects will be cited. Citation is a core concept in academic research. It supports the ability to trace the growth and progress of ideas. Giving proper credit for the development of those ideas is vital. The significance of citation is amplified by increasing the emphasis on *research impact measurements*, which are based on citation frequency and distribution.

The Joint Declaration of Data Citation Principles (Martone, 2014) lists eight components of data citation practice: importance (data citations are due similar weight to those of other research objects); credit and attribution; evidence; unique identification; access; persistence; specificity and verifiability; and interoperability and flexibility.

Endorsement of these principles comes from across the full range of international, disciplinary, academic, governmental, open standard, and commercial research communities.

With the involvement of key players such as the World Wide Web Consortium (W₃C), the Public Library of Science (PLOS), the European Organization for Nuclear Research (CERN), the Data Observation Network for Earth (DataONE), ORCID, the Committee

for Data on Science and Technology (CODATA), DataCite, and Elsevier, the likelihood of its adoption in the research community is high.

Knowing who gathered data and how it was collected and analyzed can inform the reliability, applicability, and appropriateness of research data for use in further study (Van De Sompel & Lagoze, 2009), and can influence the methodological choice for subsequent research based on the original sets.

ROLE OF LIBRARIES IN DATA PUBLICATION AND PRESERVATION

How can libraries and librarians contribute? As Ryan Heuser and Long Le-Khac (2011) suggest, “In facing a radically new kind of text, a different kind of evidence, tremendous excitement and real anxiety mix” (p. 79).

Librarianship is a discipline that focuses on the organization and description of information and access to it. It seems only natural that libraries have a contribution to make in supporting these new research endeavours and participating in the discourse and activities that comprise them.

Libraries can engage in information management in ways that are both an extension of and a departure from traditional library roles in order to help colleagues “organizing their digital research materials” (Humphrey, 2014). This may include the exploration, selection, and application of appropriate descriptive frameworks and schema to make the data discoverable and usable.

Libraries can continue to provide support for the digitization and preservation of objects by working with researchers to explore preservation models that address new forms of research output, and by offering meaningful ways to support the discoverability and reuse of those research objects. Libraries can also support self-managed storage spaces, “collaboratories,” and maker spaces, in both virtual and physical contexts.

Libraries can contribute to the development of standards and practices that bridge the needs of the full spectrum of research stakeholders, including users, producers, planners, funders, evaluators, and knowledge developers (Sundgren, 2011).

Libraries can explore the relationship between content, actions (analytics, methods, etc.), and representations (selection, sub-setting, format), and what the interplay of those elements means for the ongoing preservation of the scholarly record.

And finally, libraries can work with researchers, students, and colleagues to expand information instruction and competencies to include data fluency, visual and representational “literacies,” and analytical skills that underpin the new research.

Scholarly videos

In 2009, marine biologist and filmmaker Randy Olson published *Don't Be Such a Scientist: Talking Substance in an Age of Style* and encouraged scientists to take greater responsibility for promoting and explaining science to civil society. His message echoes

a broader movement that advocates that scholarly authors be more accountable by making their work more broadly accessible. Efforts have included knowledge mobilization and knowledge translation strategies, such as plain language summaries, popular science articles, blogs, storytelling, experimental exhibitions and science shows, theatre and café scientific talks or presentations, science and art blending, games, songs, dance, and scholarly videos.

Scholarly videos are just one example of the new tools the research community is using to communicate with each other and for scientific demonstration, education, and public dissemination. Thommy Eriksson and Inge Ejby Sørensen (2012) recommend that scholarly videos distinguish themselves by ensuring the inclusion of the traditional academic standards of scholarly discourse and dissemination. Framed within an existing body of knowledge, they should acknowledge previous knowledge, insights, or theories and demonstrate how they have built on the ideas of others and explain how they are adding to the existing body of knowledge in a meaningful way. Scholarly videos should also credit sources and include references (Eriksson & Sørensen, 2012).

With the inherent audio and visual presentation they offer, videos allow scientists to share complex information in ways that simply cannot be done with text or images. The dynamic display of visual imagery and sound in non-linear, non-textual ways brings research to life and adds a level of personalization and connection to scholars and their voices; this different user perspective strengthens the value of videos as tools for teaching.

The arrival of video journals, many of which include a level of peer review, has shown that videos may be used to replace the linear, text-based journal altogether. The first peer reviewed scientific video journal was JoVE, which began in 2006 (Brynko, 2011). Since then, a small number of video journals have emerged in various disciplines.

Jacob Berkowitz (2013) sees a “gaping video divide opened between the physical sciences and the social sciences and humanities.” Science, technology, engineering, and mathematics (STEM) disciplines have been most ready to embrace the scholarly video as a vehicle for science communication. There is, however, slow and steady evidence that the practice is growing across the social sciences and humanities (SSH) and publishers in these disciplines are also beginning to offer video options to their submission criteria.

An increasing number of manuscript-based publishers (e.g., Elsevier, Taylor & Francis, and Wiley) are encouraging authors to include supplemental video abstracts with their manuscript submissions. Two examples, one of a Canadian journal and one of a Canadian publisher, are *Physiotherapy Canada* (University of Toronto Press Journals, 1992-2015) and NRC Research Press (NRC Research Press, 2014). Some publishers are using video to disseminate information in new places and in new ways. *Nature* (Nature Publishing Group, 2015), for instance, includes video interviews with authors and editors outside of the journal format by placing them on YouTube (Thelwall, Kousha, Weller, & Puschmann, 2012).

Considered as the movie trailer of research findings by Stacy Konkiel (2014) on the *impactstory blog*, video abstracts drive readers to the full-text article. For those who publish videos as OA and in accessible formats, such as compliant with the Accessibility for Ontarians with Disabilities Act (AODA), there is the additional benefit in knowing their videos will be promoted across social media channels, thus increasing visibility. Open environments facilitate the capturing of alternative metric¹⁰ usage data (tweets, blog posts, news stories, and other content that mention scholarly work) allowing scholars to build an impact story of their research. According to a video produced by open access publisher Cogent OA (2014), “An article with a video attached to it may be accessed up to ten times more than one without.” It is worth noting that an increasing number of studies (e.g., Gargouri, Hajjem, Larivière, Gingras, Carr, Brody, & Harnad, 2010) also find that publishing in OA increases visibility *and* citation rates.

Motivated to mobilize and translate their discoveries, but unable to include video in most traditional publisher and journal submission options, many authors are independently submitting their videos to places such as YouTube (e.g., Gardiner, 2014; Kraftl, 2012). They do so because they realize that when videos are uploaded to popular sites such as YouTube or discoverable in OA formats, they reach a broad, diverse, and even an unintended audience. Videos are often poorly described and not given digital object identifiers (DOIs), which can affect rights management, resource discovery, and long-term care.

Early career researchers are taking advantage of the video medium to communicate about their research. While still requiring the traditional text-based thesis submission, the adoption of a repository for ETD management, along with changes in institutional policies, has meant that students can include supplemental videos with their submissions. The video presentations of Kurtis Baute’s (2014) MSc Thesis and Rebecca Zak’s (2013, 2014) PhD dissertation, both on YouTube, are Canadian examples.

Karen McKee (2012), author of the *Scientific Videographer* thinks that video submissions will become a new norm in the scholarly discourse, and an expected form of scholarly dissemination. “Videography skills,” she writes, “will become increasingly important for the scientist of the future to keep pace with the rapid changes in communications technology and electronic publishing. . . . 21st century consumers of scientific information, both technical and non-technical, will expect media-rich content, and scientists must be prepared to provide it” (n.p.).

ROLE OF LIBRARIES IN SUPPORTING SCHOLARLY VIDEOS

Like so much material on the Web, scientific videos are at risk of vanishing, creating a black hole for research over time. Archiving and preserving the video output of scholars will ensure the persistence and integrity of materials over time. Libraries that develop a greater understanding of the usages of the video abstract as a medium, and monitor its usage within their own community of researchers, will be in an excellent place to provide support. In gaining a sense for how videos are being promoted outside of the traditionally recognized SC channel in locations such as YouTube, libraries can support their researchers.

Libraries should consider offering services to support accessible video production of the scholarly research dissemination on their campuses. Libraries should be designing their spaces to include production support technology and services that allow and assist authors in creating accessible videos for publication. Libraries should be offering expertise in description (via meta-tagging), archiving, and rights management. Libraries that host journals and have ETD programs must be encouraged to provide options for thesis video submissions (Spicer, 2014).

Social media

Social media, defined as technology that allow users to easily create and share content through social networks (Gruzd, Staves, & Wilk, 2011), is of increasing importance to the scholarly endeavour. While social media can at first be dismissed as trivial or irrelevant to scholarship, it is increasingly becoming of interest and importance to scholars, and is, due to its very nature as an open communication channel, inherently under the open access umbrella. While serious scholarship has long been the domain of the peer reviewed journal, new methods of finding, sharing, and creating scholarship are opening the possibility for social media to serve as a new and exciting element of the scholarly process. Given the new and non-traditional nature of this endeavour, there are real opportunities for libraries to identify areas in which they can enable and participate in this developing area of scholarship, both at the outset by engaging with social media and empowering others to do so, but also, and perhaps more significantly, in the archiving, preservation, and transformation of social media.

There are currently two main ways that social media is part of the scholarly communications ecosystem. The first is in the discussion and dissemination of more traditional forms of scholarship. There are many ways that this behaviour occurs; RSS feeds, Twitter, Facebook, academia.edu, etc., people find things of interest by following people they find interesting in order to stay current in their disciplines (Gruzd, Goertzen, & Mai, 2012). Furthermore, altmetrics, shares, likes, tweets, and other indicia of a work's relevance can be useful in evaluating the value of a piece of scholarship.¹¹ There is value in accessibility, perhaps its value is even beginning to approach traditional scholarly venues: in the words of mathematician Jordan Ellenberg (2014), "Twitter is the new peer review."

But this is only part of social media's relevance in scholarly discourse. Increasingly, social media itself is the actual venue for scholarship, not just for finding, disseminating, and evaluating that scholarship. For example, "backchannels" are increasingly common, if controversial, at conferences and other academic events. Backchannels are discussions that occur on social media, commonly Twitter, during a talk or presentation, allowing participants to engage the material in real time. Opinions vary on the ethics of backchannels, some see them as an invasion of privacy and others see them as a democratizing force in academia (see Kolowich, 2012b). As institutions trusted to guide users through the intricacies of various forms of scholarly resources, libraries have a role in this policy discussion; what ethical perspectives can libraries encourage around engagement with a democratic and often wild form of scholarly communication?

The democratizing role of social media can be seen in other aspects of the scholarly communications ecosystem. While some disciplines are more sensitive to the levelling of the playing field brought about by the ease of access to knowledge infrastructure that social media offers (Benkler, 2006), other disciplines lend themselves naturally to the format. For example, in the aftermath of the fatal shooting of Michael Brown in Ferguson, Missouri, and the subsequent protests which engulfed the city and the national attention in August of 2014, scholarly discussion (if at times quite heated) on Twitter was part of the process of making sense of the events.¹² The popular/scholarly discussion of current and possibly controversial events is where Twitter truly stands out as a social media venue for scholarship, as it can take place in real time, with a large potential audience, and with a persistent digital record.¹³ But the scholarly discussion is not limited to Twitter. Blogs can be an excellent venue for longer-form academic discourse, and to some extent have become so ubiquitous it is easy to forget their impact and the significant departure from traditional models of scholarly communication they represent (for an excellent discussion on the nature and significance of academic blogging see Walker, 2006). Popular academic blogs can reach tens to hundreds of thousands of viewers per month, and provide an excellent venue for scholarly discussion. Social media venues such as Twitter and blogs provide accessible platforms to broadly discuss academic issues in a democratic rapid response manner. While social media may seem new and uncomfortable to some, there is a clear trend toward it playing an increasingly prominent role in academic discourse (Gruzd & Goertzen, 2013).

ROLE OF LIBRARIES IN SOCIAL MEDIA SCHOLARSHIP

Libraries have an opportunity to assist with and participate in this new and exciting form of scholarship, particularly by both engaging in it and by providing training and consultation to their constituents. Some of the most significant barriers to participation in social media are perceptual; some worry that it is too difficult or it takes too much time, some users are afraid of the privacy implications of their ideas being widely disseminated, and some users are just put off by the technology (Moran, Seaman, & Tinti-Kane, 2011). Breaking down these fears and other concerns is often just a matter of education and outreach. Given that the potential value of engaging in social media scholarship can be readily demonstrated to users, increasing participation in these activities can be encouraged with a reasonable expense of time and energy.¹⁵ Furthermore, encouraging engagement in social media scholarly communications is in line with many established library goals, as participation in social media is also participation in open access, and helps in the dissemination and preservation of the fruits of the academic process. By engaging in and promoting the value of social media as a scholarly endeavour, libraries have the potential to benefit both their users and society at large.

In addition to promoting the creation of social media and empowering users to engage in social media, libraries can play a vital role in the preservation of social media and can make social media discoverable and usable in ways that promote scholarship. One of the key problems with social media as a venue for and subject of scholarship is its potentially ephemeral nature.¹⁶ Because the networks and platforms used to engage in social media are in frequent flux and not designed with preservation and access in

mind, libraries can undertake actions that serve to make these materials more stable and usable.¹⁷ There are many existing tools that allow libraries to undertake first pass preservation and presentation efforts for social media. For example, Archive-It, a tool developed by the Internet Archive allows subscribers to scrape, catalogue, and preserve Web content, and provides tools to manipulate the content to provide enhanced accessibility and presentation (Archive-It, 2014).

This is not to say that libraries should proceed to wholesale scrape social media content without due consideration. There are many potential issues with collecting, preserving, and making available social media content, most particularly legal issues around copyright (Hyvärinen & Saltikoff, 2010) and policy issues around privacy and the right to be forgotten (Humphreys, Gill, & Krishnamurthy, 2010). These issues are compounded by the fact that since social media content can be so readily lost to platform shift or deletion, libraries are often forced to capture first and ask questions later. Even facing these concerns, it is possible for libraries to productively engage in the collection, preservation, and making available of social media. Key to this is the adoption of guidelines around these practices, demonstrating a conscious and thoughtful engagement with the issues.¹⁸ All things considered, libraries have an important role in this emerging and important area of non-traditional scholarly communication.

Conclusion

In this article, the authors have illustrated and provided examples of a vast new ecosystem of non-traditional modes of scholarship. From a broad engagement with the DH to data publications and from video journals to social media, libraries have exciting opportunities to assist in the creation, preservation, and open dissemination of these new forms of scholarly discourse. It is our hope that in the near future libraries will extend their traditions and bring their strengths to new scholarship by engaging in these currently non-traditional endeavours.

Notes

1. This issue is compounded by the fact that many “standard” file formats, such as .pdf, are in fact proprietary, which raises issues about long-term usability.
2. Preservation Metadata: Implementation Strategies (PREMIS) is a data dictionary for metadata to support the preservation of digital objects and ensure their long-term usability, URL: <http://www.loc.gov/standards/premis> .
3. Hereafter the term data will be used as inclusive of data and data sets.
4. It is worth noting that there is great deal of overlap between the research data management and library communities.
5. Two key models of data curation include the Data Curation Lifecycle Model, developed at the Digital Curation Centre (under the UK JISC), visit <http://www.dcc.ac.uk/resources/curation-lifecycle-model>, and the Open Archival Information System (OAIS) framework, visit <http://public.ccsds.org/publications/archive>

/650xob1.pdf . Models such as C. Humphrey's Life Cycle Model of Knowledge Creation, also known as the Knowledge Transfer model (http://preservingresearchdatainCanada.net/2012/12/13/research-data-management-infrastructure-i/researchlifecycle_ch/), and the Inter-university Consortium for Political and Social Research (ICPSR) phased model for planning preservation over the data life cycle (<http://www.icpsr.umich.edu/icpsrweb/content/deposit/guide/#cycle>) are also worth noting.

6. Open Data Commons is an Open Knowledge Foundation project, visit <http://opendatacommons.org>.
7. Ontario Data Documentation, Extraction Service and Infrastructure <odesi> is a digital repository for social science data. The project is part of Scholars Portal of the Ontario Council of University Libraries.
8. A list of institutional repositories in Canada is available at <http://www.carl-abrc.ca/ir.html> .
9. Metadata Encoding and Transmission Standard (METS), URL: <http://www.loc.gov/standards/mets> .
10. See "altmetrics: a manifesto," <http://altmetrics.org/manifesto/> .
11. There may even be a predictive relationship between social media and scholarly impact, see Eysenbach, 2011, however, this study is not without its critics, who say the effect may be overstated, see Kolowich, 2012a.
12. Examples include: <https://twitter.com/knowtheory/status/537725127039782912>, <https://etherpad.mozilla.org/ferguson-links>, and http://college.georgetown.edu/collegenews/the-ferguson-syllabus.html#_ga=1.102162561.1880299505.1418247327 .
13. There are a variety of tools available to enhance and record scholarship on social media, one of the most prominent being Storify, a network service that "helps make sense of what people are saying on social media" (Storify, 2015). However, scholars should be leery of relying on commercial products for preservation of the scholarly record.
14. See <https://www.quantcast.com/scienceblogs.com> .
15. Social media can be used to both disseminate and leverage research. For an excellent example of the value of social media in the scholarly communications process, see Daniels, 2013.
16. This risk of deletion is amplified when the content is sensitive or particularly controversial – almost as if the risk of deletion is corollary to the potential scholarly significance of the work (see Bamman, O'Connor, & Smith, 2012).

17. One survey of scholars working in social media described challenges with proper preservation and record keeping around research, and suggested that libraries and archives step in to meet these needs (see Weller & Kinder-Kurlanda, 2015).
18. See <https://library.stanford.edu/projects/web-archiving/policy>.

Websites

B2Share, <https://b2share.eudat.eu/docs/b2share-about>
Canadian Writing Research Collaboratory, <http://www.cwrc.ca/>
CERN, <http://home.web.cern.ch/>
Codata, <http://www.codata.org/>
Collex, ARC Wiki, <http://wiki.collex.org/index.php/Collex>
CULTURA, <http://www.cultura-strep.eu/home>
Datacite, <https://www.datacite.org/>
DataONE, <https://www.dataone.org/>
Dataverse, <http://dataverse.org/>
Discovery Project, <http://www.discovery-project.eu/>
Elsevier, <http://www.elsevier.com/>
Fedora, <https://getfedora.org/>
Figshare, <http://figshare.com/http://figshare.com/>
GitHub, <https://github.com/>
Islandora, <http://islandora.ca/>
Jove, <http://www.jove.com/>
OpenAIRE, <https://www.openaire.eu/>
Orcid, <http://orcid.org/>
PLOS, <https://www.plos.org/>
W3C, <http://www.w3.org/>
Zenodo, <https://zenodo.org/features>

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