Black Hole or Brave New World? Archivists, Historians, and the Challenges of the Digital Age

Sarah Glassford

Word Count (excluding references): 4684

Abstract

Since the late twentieth-century, the popularity and prevalence of digital formats have presented challenges for two groups closely associated with archives: archivists and historians. If archivists cannot fulfill their mandate to preserve our growing digital documentary heritage in the face of rapid technological change, the historians who are one of the core user groups of these records will have very little material with which to reconstruct and analyze the late-twentieth and early-twenty-first centuries. This article explores the benefits and challenges that digitization and digital preservation have brought to archivists, as well as the repercussions of these developments for historians. Although the challenges are significant, there is reason to be optimistic: new archival approaches and technologies are being developed every year, and historians have a tradition of making the most of whatever archivists can preserve.

Keywords: archives; digital preservation; digital records; digitization; historians

Glassford, S. (2018). Black hole or brave new world? Archivists, historians, and the challenges of the digital age. *Emerging Library & Information Perspectives*, 1, 91–110. <https://doi.org.10.5206/elip.v1i1.357>

There is still nothing in the digital world like acid-free paper.

(Brand, 1999, p. 46)

There is real comfort and security (for archivists and historians, at least) in the materiality of paper. Although it is vulnerable to fire, water, or a sharp pair of scissors, when properly cared for it has proven remarkably effective as a means of preserving the written record of human knowledge over hundreds of years. Paper is a technology remarkable for its elegant combination of simplicity, affordability, and durability. What can the digital world offer that rivals this time-tested combination? At the time of writing, and as futurist Stewart Brand suggested in the above quotation, nothing. The convenience and ever-increasing ubiquity of digital formats, however, make it imperative to grapple with the challenges they present. The pride and acumen of the archival profession are at stake, but the problem goes deeper, striking at the heart of the archival purpose. Simply put, the successes and failures of archivists' struggle to acquire, describe, and preserve digital materials will determine the resources available to future users. Of particular concern is the need to enable tomorrow's historians to write the histories of today. If archivists cannot fulfill their mandate to preserve the digital documentary heritage of the late-twentieth and early-twenty-first centuries, historians will have very little with which to reconstruct and analyze these periods. Digital preservation is therefore a pressing concern for both professions.

As Terry Cook (2011) observed in an influential article about the assumptions and practices of historians and archivists at the beginning of the twenty-first century, "the traditional historian-archivist bond has faded" (p. 602), as these two professions "that should be natural allies" have instead drifted apart (p. 601). Archivists have forged

new alliances with records managers, librarians, and other information science professionals, while historians have largely ignored archivists' roles in shaping the archival record. The purpose of this article is to bring together these diverging professional perspectives and consider the implications of the digital turn for both archivists and historians as "co-creators" of society's historical record (Cook, 2011, p. 606). After a brief definition of terms, this article draws on both archival and historical literature to explore the most significant challenges associated with the digital realm that face archivists as they strive to fulfill their roles as appraisers, arrangers, preservers, and providers of access to the historical record; it then goes further to consider the resulting repercussions for the historians who rely on that record to analyze and explain the past. Both bodies of literature leave no doubt that it will be a struggle for archivists and historians to cope with the digital age. Fortunately, the archival and historical communities share traditions of resourcefulness and innovation. As suggested by the evolving approaches briefly examined here, there is every reason to believe both communities are finding, and will continue to find, ways to meet these challenges.

The digital age has brought to archives and archivists two separate but closely related new practices. The first is "digitization," which entails converting existing analog material into a new digital form, such as converting a reel-to-reel audio recording of an early twentieth-century folklorist's field interviews to MP3 or WAV format on a CD or hard drive. Archivists use this process to create a digital version resembling the original as closely as possible, with the ultimate goal of preserving the content more effectively and/or making it more accessible or functional for users. The second new practice is "digital preservation," an umbrella term for the methods used to preserve born-digital or

digitized materials for the long term. This material might range from a collection of floppy disks containing an author's first draft of a famous novel, to the web-based content of a popular twenty-first century blogger. While it can be relatively easy (although neither quick nor cheap) to digitize materials, preserving digital content for the long term presents unavoidable and ongoing challenges (Corti, Van den Eynden, Bishop, & Woollard, 2014).

Even as computers and the Internet complicate the task of preservation, they have been a boon to archives in other ways. As Brown (2006) put it, "The digital age represents an opportunity for the archival world to provide better services to existing users and to reach audiences that have not been reached before" (p. 15). This initially meant archivists converted hard-copy catalogues and finding aids into more easily searchable and remotely accessible digital formats. These early efforts have been followed by ongoing digitization projects within archival collections themselves, usually focused on materials deemed to hold interest for large numbers of existing or potential users, such as photographs or vital statistics records. Although Brown (2006) has argued that such initiatives make demands upon "limited resources in terms of staff, equipment and time" (p. 15), she has also pointed to examples in the British context that suggest such demands must be weighed against the undoubted benefits they reap. For instance, digital catalogues and federated databases of archival holdings have increased both online user traffic and on-site use of archival holdings, in addition to allowing users to do relatively effective searches on their own, without overburdening archives reference staff (Brown, 2006). Another benefit of digitization projects is the fact that functions unique to the digital realm, such as the zoom feature available when

viewing scanned maps and photographs, can reveal new details not visible to the naked eye (Brown, 2006).

Despite the benefits of digitization to users, Brown's (2006) point still stands: digitization projects require significant time, labour, and money. External funding (an increasingly important component of archives' budgets) can often be secured in support of digitization initiatives, but the process of applying for, managing, and reporting back on external grants is time-consuming and labour-intensive. Unfortunately, staff time spent on grantsmanship may be time lost to core archival activities such as reducing processing backlogs or creating new finding aids. Further staff time is required to ensure that digitized materials are presented with sufficient metadata to convey their original context in a physical collection (Brown, 2006). Metadata is necessary to translate the core archival principles of original order, provenance, and *respect des fonds* into the digital environment. However, as Brown (2006) and Millar (2010) have each pointed out, there are risks associated with this well-intended work. If, for instance, too much contextual information is provided, archivists may assume the position of interpreters of the material, instead of serving as relatively objective custodians.

Once newly-digitized materials join their born-digital peers in the archives, new challenges emerge. In her practical guide to digitization and digital archiving, Leggett (2014) outlined four key issues that tax the ingenuity of archivists dealing with digital materials: mutability, binary data encoding, obsolescence, and data decay. Beginning with the first, since "one of the major goals of an archive is to keep things exactly the same" (Leggett, 2014, p. 215), the fact that most digital formats are designed to be endlessly alterable is a major problem. Whether inadvertently or deliberately, users can

potentially alter materials without leaving tangible traces, in contrast to the more readily apparent signs of damage in a print context, such as torn out book pages or vandalized artwork. Similarly, the ease with which digital materials can be deleted by archives staff and users, as well as their vulnerability to unexpected computer hardware or software failures, puts them at perpetual risk. The fact that websites and online forums are regularly updated and altered poses a related issue: how often should such content be archived, and how many versions should be kept? In view of these concerns, archivists need to put in place measures to preserve an unalterable digital master copy of some kind, thus guaranteeing the authenticity of the digital materials accessed by the public. They also need to devise justifiable and feasible plans for how they will archive inherently mutable materials like websites, which then need to be followed consistently (Leggatt, 2014, pp. 176-178).

The next two challenges outlined by Leggatt (2014), binary data encoding and obsolescence, are closely linked. In order to be useful or accessible, digital data requires computers that can read it: although humans *can* read binary code, it is very difficult to do so. While it is unlikely that every computer in the world would break all at once, rendering all digital data ever created inaccessible, unfortunately “the scenario of having data that no computer in the world can read is not implausible at all and has in fact already happened” (Leggatt, 2014, p. 180). Closer to home, it is simply unfeasible for every small archival institution to house and maintain the range of hardware and software necessary to read every file format ever created. Nor do most institutions have the budget to hire specialists to reverse engineer hardware and/or software for each obsolete file format that comes their way.

The thousands of punch cards that remain from the massive, cumbersome, now non-existent computers of the 1940s and 1950s testify to the urgent problem of technological obsolescence. Punch cards are full of data no one can read, and unless steps are taken to avoid the same problem with newer formats, the floppy disks and CD-ROMs of the 1980s and 1990s will follow suit. If even widely popular formats like DVDs run the risk of eventually becoming unreadable, displaced by sleeker, less tangible digital formats, what does that mean for also-ran technologies like Laser Disk? Software and coding languages are also prone to obsolescence, as they are continually replaced by their own subsequent versions or competitors' products in the frantic push to improve and innovate (Leggatt, 2014). As Cox (2011) wrote, "We live in a restless age. Not only does change seem constant, but the concept of change is longed for and lauded" (p. 1). This societal obsession with the latest gadgets and digital tools represents an undeniable threat to archives' ability to make the past accessible to the present. As Leggett (2014) has argued, there is no easy solution to the challenge of obsolescence, "so all that you can really do is to monitor developing technologies and be sure that you don't get caught with something useless and that you move your data before it's too late" (p. 220). For these reasons, as Giaretta (2011) has noted, digital preservation is expensive, and while it may be achievable with steady funding, for archives steady funding is hard to come by (p. 41).

The final challenge highlighted by Leggett (2014) is data decay. All archival materials, digital or otherwise, are vulnerable to destruction or degradation by physical disasters such as fires, floods, earthquakes, and extreme fluctuations in temperature or humidity. Digital materials, however, are additionally vulnerable to spontaneous

technological decay: “Magnetic tapes can lose their magnetization, and so can hard drives. Flash drives can lose their charge, and writable CDs fade” (Leggatt, 2014, p. 183). Bit rot threatens digital data in a truly disconcerting fashion: tiny pieces of data unpredictably vanish from files over time. Depending on which bits disappear, the loss may be relatively insignificant, but it could also completely undermine the functioning of the file as a whole, rendering it corrupt and unreadable. At this early date in the lifespan of most digital formats, any prediction of how long they will last is grounded on nothing but speculation and dubious laboratory simulations of the aging process. As Giaretta (2011) has argued, beyond “some kind of remote access” and “some kind of computers,” it is very unclear what can be relied on to exist decades (let alone centuries) from now (p. 43). The inevitability of data decay means archivists must be vigilant about monitoring the state of their digital holdings, in addition to putting procedures in place for storing backups and dealing with potential digital storage failures (Leggatt, 2014, pp. 182-184).

When taken together, these four challenges (mutability, binary data encoding, obsolescence, and data decay) mean that, as tempting as it might be to save space by discarding tangible items that have been digitized, doing so is ill-advised. The originals may well be needed some day—even some day soon—to verify a digital version’s authenticity, or to be re-digitized in some as yet unknown future format that will render previous versions obsolete (Leggatt, 2014). Given the preponderance of technical issues associated with digital preservation, it is no surprise that much of the literature on archives in the digital age treats it as a set of technical challenges to be overcome. Yet there is more at stake than simply preserving content. Experts like Dame Lynne

Brindley, CEO of the British Library from 2000 to 2012, have warned of the distinct possibility that future researchers will encounter a “black hole” in the late-twentieth and early-twenty-first centuries as a result of various forms of digital lockdown or decay (Roland & Bawden, 2012, p. 222; Brindley, 2009). In other words, vast amounts of archival content will simply not be accessible to researchers. However, the digital age is by no means an unmitigated disaster for historians. For instance, they have benefited from the use of digital resources to help refine their search for primary sources at least as much as, if not more than, any other subset of archives users (Hampshire & Johnson, 2009). Moreover, the historians and archivists interviewed by Lena Roland and David Bawden (2012) disagreed with the dire situation painted by Brindley’s “black hole” prediction. That said, many did see reasons to be concerned, such as the unlikelihood of digital data surviving untouched in an attic for decades, as has always been possible for physical documents, much to the benefit of both archives and historians (Roland & Bawden, 2012).

The nature of archival holdings is changing, which brings with it not merely technical preservation issues, but also fresh challenges of discovery and interpretation. For instance, if historians simply click a link to access a particular digital document, they miss out on the opportunities for browsing and serendipitous discovery that are presented by opening a box of files. Digital content is also easily divorced from its context, whereas physical documents are surrounded by context, in the form of other documents in the file or box. For Hampshire and Johnson (2009), this means that “digitization programmes need to provide not just an effective search tool, but also the easy ability to browse records and prominent links to contextual material wherever

possible” (pp. 402-403). Without this infrastructure, the principle of provenance will not be upheld, and historians’ interpretations will be the poorer for the loss of this contextual data. Hampshire and Johnson (2009) have also pointed out that researchers’ digital search strategies tend to be keyword driven, which will be problematic for historians studying areas of social and cultural history such as gender. The issue here is that such research relies on close readings of documents created for very different purposes, which are therefore described in archival databases in ways uncondusive to that type of keyword searching. This highlights the important role of archivists, both in terms of building thesauri for their search engines that use historical and modern terms, and guiding researchers toward effective keyword searches for their particular research topics (Hampshire & Johnson, 2009).

Although historians may not anticipate a catastrophic “black hole” in late-twentieth and early-twenty-first century archival holdings, they do fear the possibility of significant gaps. The digital age has shifted the ways people communicate, and casual communication forms such as email and text messaging are less likely to find their way to the archives unless deliberate policies are put into place to collect them. This type of content will not only be valuable to historians but is also an important component of the material public archives should collect to fulfill their role in holding governments and politicians accountable (Roland & Bawden, 2012). In the American context, one need only look to the uproar over former Secretary of State Hillary Clinton and members of President Donald Trump’s administration allegedly using private email accounts to conduct government business, to demonstrate this point (Rawlinson & Pengelly, 2017).

On the other hand, the opposite problem is also likely to crop up: too much information. If libraries and archives implement automated archiving of vast amounts of data from digital communication formats, such as the Library of Congress' Twitter archive (Osterberg, 2017), historians will find themselves drowning in a sea of minutiae. Faced with this potential cacophony of voices, historians would need to take advantage of "big data" mining techniques currently being pioneered by digital humanists. Archivists' assistance may also be more badly needed than ever, given their expertise in the behind-the-scenes processing and description work that makes the raw material of the past discoverable, to some extent searchable, and understandable in its context. To quote Cox (2011), "Archivists and records managers serve a particularly important role in society," especially when it comes to "organizing what seems like the chaos generated by this new age" (p. 2). In this context of seemingly limitless information, the traditional, core archival role of appraisal—that is, the intimidating task of deciding what to keep and what to destroy (or simply not to acquire)—will remain central to archival practice in the future. Similar decision-making processes may also bleed into other archival functions, such as preservation. Eventually, the sheer volume of digital material in the archives and limitations on archival resources may force archivists to revisit their earlier appraisals. Determining which materials merit the time and expense required to transfer them to new technological formats or reverse engineer obsolete software or hardware will become the digital equivalents of the hard choices that archivists have long had to make with respect to physical materials (Cook, 2011, p. 606).

Despite the genuine concerns that surround archivists' ability to preserve the digital record in the long term, and the troubling implications for historians, there are

reasons to be optimistic. These reasons go well beyond specific strategies or technologies and are instead rooted in the basic creativity, determination, and innovation of human beings. In his exploration of the Shakespearean archive's evolution over time through the media of print, photography, sound recordings, and modern data, Galey (2014) took issue with "the strong current of historical exceptionalism" running through today's digital humanities and allied fields that deal with the digitization and/or digital preservation of cultural heritage (p. 11). "We are not the first to work through questions of Shakespeare's transmission through new media," he argued, using his monograph to lay out a "critical pre-history" of today's digitization efforts (Galey, 2014, pp. 11-12). The challenges of the digital age are significant, but previous generations have dealt with their own versions of these problems, finding ways to convey the same information (in Galey's work, Shakespeare's seventeenth-century plays) through different media in varied times and places. Such reminders should serve as a timely reassurance to archivists under pressure to come up with solutions (and fast!) to the many challenges of digital preservation. Digitization and digital preservation will change how users and archivists interact with archival materials, but the relationship can go both ways. Namely, the eclectic forms of existing archival materials and the myriad ways they are used may *also* produce new digitization and digital preservation techniques and strategies.

A few examples will suffice to demonstrate how archivists, Information Technology (IT) specialists, and other information professionals are rising to the occasion when it comes to the challenges of bit rot and technological obsolescence. First, emerging concepts and best practices around digital preservation are already

bundled together in Open Archival Information System (OAIS)-compliant software systems and services, such as the open-source, do-it-yourself Archivematica (Artefactual, 2017), and its pricey but full-service proprietary peer, Preservica (Preservica, 2017). Both are forms of software that aim to streamline digital preservation for archivists, from the initial ingest to the creation of metadata, and on to storage, backup, and security. Each package/service incorporates emerging digital preservation best practices like LOCKSS (“lots of copies keeps stuff safe”) and the 3-2-1 rule (at least three copies on two different media, with at least one copy kept off-site). They also integrate a variety of metadata standards, such as Dublin Core or the Rules for Archival Description (RAD), into the process.

Both LOCKSS and the 3-2-1 rule are simple means of dealing with the ever present threat of bit rot. Since there is (as yet) no way to prevent bits from spontaneously deteriorating, the best way to avoid being unable to read a digital object is to replicate the bits. In other words, by making more than one copy, an uncorrupted backup can be accessed if the original becomes unreadable (Giaretta, 2011, p. 41). Having copies in more than one type of media format (e.g., on a hard drive, CD-ROM, USB drive, and/or cloud server) takes this approach to preservation beyond replicating individual files on the same device or server, and attempts instead to protect against damage to the physical container of the digital information. For instance, if a hard drive crashes, copies of the same files are available on a backup server. In this sense, both LOCKSS and the 3-2-1 rule are digital equivalents of keeping a spare key under the doormat, just in case.

One major advantage for archivists struggling to cope with the challenges of preserving digital materials and keeping them accessible in the long run is the fact that other fields of information science are grappling with similar issues. This is producing a community of professionals able to share ideas, innovations, and evolving best practices. The emerging field of research data management, for instance, is concerned with the long term preservation and accessibility of research data for re-use by scholars and researchers other than those who produced it. Like archivists, research data management librarians have a vested interest in developing standard preservation formats for digital materials. For example, TIFF is currently the standard preservation format for image files (while JPEG remains the more accessible, user-facing format), and PDF or PDF/A are the preferred preservation formats for text files (Corti et al., 2014). Granted, archivists are generally not in a position to encourage the creators of digital materials to use specific formats from the moment of document creation, as are research data management librarians working with researchers in university settings. Still, the concept of TIFF or PDF/A files as a preferred preservation format, to which newly acquired digital materials might be converted by archivists, is one that crosses professional boundaries.

While technological solutions and workarounds are being developed and refined, some professionals are exploring more fundamental changes to the roles of archivists and donors as a means to better preserve digital materials. Weisbrod (2016), for instance, has suggested that the personal papers of modern literary figures—which may be scattered across devices, social media, and web servers, some of them requiring passwords—could be made more accessible and preservation-friendly by involving

donors in the acquisition and arrangement processes during the pre-custodial phase. According to Weisbrod, IT-supported self-archiving would enable donors to directly transfer digital materials to a repository supported by the archival institution and/or manage the materials once transferred. These strategies have been tried in settings such as the “Paradigm” project at Oxford University’s Bodleian Library and the “MyArchive” project jointly run by the National Library of Denmark and Copenhagen University Library. As Weisbrod (2016) explained, in both the “Paradigm” project and the “MyArchive” project participants had the opportunity to transfer items to the archival repository and manage them there, but they did not use an archives-hosted cloud as their working environment. This left open the possibility of incomplete self-archiving, and inconsistencies between archived materials and personal working copies. Ideally, an archives-hosted cloud used as the donor/creator’s working environment would mean that the documents contained therein are working originals, not copies. Inconsistency, redundancy, and donor self-selection in what is transferred to the archives could thus be avoided (Weisbrod, 2016).

Despite its advantages in the context Weisbrod examines, this type of pre-custodial relationship between the archives and a donor/creator seems ill-suited to another common form of archival acquisition, namely the personal papers created by so-called “ordinary people.” Unlike the celebrated writers and scientists involved in the projects Weisbrod studied, most ordinary people are by definition largely unknown outside their own communities, and unlikely to be identified and approached by archivists for pre-custodial self-archiving of their papers. It is these ordinary people, however, whose papers (often discovered in attics and basements by later generations)

provide the documentary evidence for social historians studying the lives and experiences of average citizens and minority groups. Weisbrod's solution is therefore valuable for a certain population of public figures, and it could potentially be extended to government records through co-operative efforts by departmental records managers and public archivists. However, it is not a one-size-fits-all solution. Pre-custodial self-archiving therefore offers a useful lesson for archivists dealing with digital materials: just as diverse materials (physical, audiovisual, digital) require different types of processing and storage, so too may distinct categories of donors of digital materials require specifically tailored acquisition, arrangement, and preservation solutions.

If archivists and other information professionals are finding ways to tackle the challenges of the digital age, what of the historians who are the other concern of this article? It will certainly be a great loss if, as a result of the challenges discussed above, archives are unable to retain valuable information known to have once existed in digital form. However, historians have a proud and enduring history of working around gaps in the archival record. Historians of women and gender, for instance, routinely read between the lines and against the grain of documents produced for very different purposes, striving to locate and interpret past assumptions about men and women's roles and abilities (Parr, 1995). Similarly, oral history approaches and storytelling traditions have allowed historical anthropologists, folklorists, and historians of indigenous cultures to uncover the histories of populations who left no written records or whose pasts were deliberately excluded from Euro-centric colonial archives (Anderson, 2011). In light of this tradition of dextrous scholarship, it seems reasonable to assume

that even if there are holes in the digital record of the late-twentieth and early-twenty-first centuries, historians will make the best of what remains.

Returning to the question posed in the title of this article, it seems clear that the future of archives in the digital age is neither an unmitigated “black hole,” nor wholly a “brave new world.” Many of the traditional functions and theoretical approaches of the archival profession continue to be valid, even as the media to which they are applied evolve into new digital forms. It *is* possible to archive the digital documentary heritage, and historians *will* find materials in the archives with which to inform their analyses and construct their narratives. However, as has always been the case with traditional physical archives, what can be saved, organized, and made accessible for generations to come will likely be no more than a small fraction of all that has been produced (Cook, 2011, p. 607).

As Brand (1999) wrote, “We cannot reverse the digitization of everything. What we have to do is convert the design of software from brittle to resilient, from heedlessly headlong to responsible, and from time-corrupted to time-embracing” (p. 47). The intricate dance between humans, their cultures, and the technologies they create has been a factor in the creation and transmission of memory since the days of the first storytellers and cave drawings. Although the volume of information produced and the technologies used to transmit it have become more sophisticated over time, thus far archivists (and before them, librarians and other social memory keepers) have innovatively responded to technological change. At the same time, historians and storytellers have repeatedly proven to be creative users of archival records and memories in all forms. Surely this creativity and determination will continue into the

future, driven by the impulse to preserve at least a fraction of what Pierre Nora once called “the unfathomable collection of things we might one day need to recall” (as cited in Galey, 2014, p. 2). If they remain nimble and creative, archivists and historians are capable of successfully grappling with the undeniable challenges of the digital age, serving together as perpetual co-creators of the present’s understanding of the past.

References

- Anderson, K. (2011). *Life stages and Native women: Memory, teachings, and story medicine*. Winnipeg: University of Manitoba Press.
- Artefactual. (2017). Archivematica: Open source digital preservation system. Retrieved from <https://www.archivematica.org/en/>
- Brand, S. (1999). Escaping the digital dark age. *Library Journal*, 124(2), 46–49. Republished at Rense.com. Retrieved from <http://www.rense.com/general38/escap.htm>
- Brindley, L. (2009). Copyright for education and research. British Library. Retrieved from <http://www.webcitation.org/5vC71E3iU>
- Brown, C. (2006). Digitisation: Opportunities or compromises? In A. C. Holland and K. Manning (Eds.), *Archives and Archivists* (pp. 15-27). Dublin: Four Courts Press.
- Cook, T. (2011). The archive(s) is a foreign country: Historians, archivists, and the changing archival landscape. *American Archivist*, 74(2), 600–632. <https://doi.org/10.17723/aarc.74.2.xm04573740262424>
- Corti, L., Van den Eynden, V., Bishop, L., & Woollard, M. (2014). *Managing and sharing research data: A guide to good practice*. London: SAGE.
- Cox, R. J. (2011). *Archival anxiety and the vocational calling*. Duluth, MN: Litwin Books.
- Galey, A. (2014). *The Shakespearean archive: Experiments in new media from the Renaissance to postmodernity*. Cambridge: Cambridge University Press.
- Giaretta, D. (2011). *Advanced Digital Preservation*. Berlin: Springer.
- Hampshire, E., & Johnson, V. (2009). The digital world and the future of historical

- research. *Twentieth Century British History*, 20(3), 396–414.
<https://doi.org/10.1093/tcbh/hwp036>
- Leggett, E. R. (2014). *Digitization and digital archiving: A practical guide for librarians*. Practical guides for librarians no. 7. New York: Rowan & Littlefield.
- Millar, L. A. (2010). *Archives: Principles and practices*. New York: Neal-Schuman.
- Osterberg, G. (2017). Update on the Twitter archive at the Library of Congress. *Library of Congress blog*. Retrieved from <https://blogs.loc.gov/loc/2013/01/update-on-the-twitter-archive-at-the-library-of-congress/>
- Parr, J. (1995). Gender history and historical practice. *Canadian Historical Review*, 76(3), 354–376. doi:10.3138/CHR-076-03-03
- Preservica. (2017). Preservica active digital preservation. Retrieved from <https://preservica.com/heritage-digital-preservation-services/archives>
- Rawlinson, K., & Pengelly, M. (2017, September 26). “Height of hypocrisy”: Clinton calls out Trump team over private email reports. *The Guardian*. Retrieved from <https://www.theguardian.com/us-news/2017/sep/26/ivanka-trump-jared-kushner-staff-private-email-official-white-house-work>
- Roland, L., & Bawden, D. (2012). The future of history: Investigating the preservation of information in the digital age. *Library and Information History*, 28(3), 220–236. doi:10.1179/1758348912Z.00000000017
- Weisbrod, D. (2016). Cloud-supported preservation of digital papers: A solution for special collections? *LIBER Quarterly: The Journal of the Association of European Research Libraries*, 25(3), 136–151. <http://doi.org/10.18352/lq.10114>