

Advocating for Linked Archives: the Benefits to Users of Archival Linked Data*

Ashleigh Hawkins ^[0000-0003-4788-5398]

University of Liverpool, Liverpool, L69 3BX, UK
a.h.hawkins@liverpool.ac.uk

Abstract. Linked Data (LD) has been explored as a means of publishing and increasing access to archival data for over a decade. A growing number of case studies has demonstrated the ability to make both archival metadata and the contents of records available as LD, and recent large-scale projects suggest a burgeoning of investment in the tools and infrastructure necessary for Archival Linked Data (ALD). However, LD remains under-examined in archival scholarship; there is a heavy emphasis on technical aspects of the production of LD, but little consideration of how it benefits the users of archives. This paper details the benefits of ALD for those users, identifying four ways in which they benefit through increased and improved access to archival data, and through ALD's facilitation of novel means of interacting with, and interrogating, archival data. ALD enables archive services to meet the increasingly sophisticated needs of digital native users and allows them to keep pace as technology evolves to satisfy future users. The identification and increased understanding of these user benefits can be used to advocate for investment in development of the tools and infrastructure required to ensure equitable access to ALD, and provide support for the call for increased collaboration in the preparation, publication, and provision of access to ALD. Collaboration with digital humanities scholars and practitioners provides many opportunities to further develop that infrastructure, increase the production of ALD datasets, and move closer towards realizing the full potential of LD for archives.

Keywords: Linked Archives, Linked Data, Digital Humanities, GLAM.

1 Introduction

Linked Data (LD) has been explored as a means of publishing and increasing access to archival data for over a decade. A growing number of case studies demonstrate organizations' ability to make both archival metadata and the contents of records available as Archival Linked Data (ALD), and some of these studies have articulated various benefits of this approach. Recent large-scale projects, such as the International Council on Archives' development of the Records in Contexts Ontology (RiC-O), a LD rendering of the new archival descriptive standard [1], the 'Towards a National Collection' project research to virtually unify UK GLAM (Galleries, Libraries, Archives and Museums) collections using, among other technologies, Persistent Identifiers (PIDs) [2], Europeana's LD web service through which all Europeana datasets can be accessed [3], and OCLC's series of LD research projects, provide evidence of the burgeoning of investment in the tools and infrastructure necessary for ALD, and for the use of LD in the GLAM sector more widely [4].

* Copyright 2021 for this paper by its authors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).

Despite this explosion of interest, ALD remains under-examined. As a relatively new technology, there is perhaps understandably, a heavy emphasis on the technical aspects – the ‘how’ of ALD, but little consideration of the ‘why’ i.e., how it benefits the users of archives. This paper is a first step towards a definitive, structured statement of those benefits of ALD for the users of archives, extrapolating from a wide range of published case studies, scholarly literature, and project-related grey literature.

After briefly examining related work, and outlining the research approach, the paper then presents a subsection of the results of a larger PhD study of the benefits of ALD which identified benefits to archival data, the archives sector (both reported elsewhere), and to users. This paper focuses on four ways in which users are benefited by ALD increasing and improving access to archival data and facilitating novel means of interaction and interrogation. Finally, it considers how evidence of the benefits of ALD can be used to advocate for investment in the tools and infrastructure necessary for Linked Archives, and argues for increased collaboration between archival and digital humanities scholars and practitioners in the preparation, publication, and provision of access to ALD.

2 Related Work

There has been considerable documentation of the implementation of LD in GLAM [5-12], however, this tends to be dominated by activity within the library sector; there has been little analysis explicitly of ALD, or of the benefits to users within the archive sector specifically. Soon after the introduction of LD in 2006 [13], case studies began to emerge of its potential for application in the archives sector [14-17]. In the subsequent fifteen years, a substantial body of associated research can be identified, emerging from both research and practitioner perspectives. Karen F. Gracy’s analysis of the opportunities and challenges of implementing LD identified user benefits which included being able to connect seamlessly to related information, to search across multiple fonds, and to gain an enhanced understanding of archival records and records creators [18]. In a scholarly overview of early trends in ALD practice, Jinfang Niu determined that many of the methods of accessing LD are beyond the capabilities of, what she terms, ‘generic users’ of archives [19]. However, she predicted that once ALD practice matures, and easier-to-use LD user interfaces are developed, users will benefit from better information services and the ability to formulate more complex queries.

Several ALD projects have been motivated by a wish to improve the general user experience, or to meet the needs of particular users [20-24]. The case studies resulting from these projects demonstrate a wide range of user benefits, though centering on developing data visualization and analytical tools to interrogate ALD datasets [23, 26-28], developing web-based user interfaces [20, 25-31], and on improving the user experience of information retrieval systems [32]. A limited number of case studies documented projects involving collaboration with users [20-21, 25]. Of the project case studies available in English, the majority originate from Europe, North America, and

Australia, with the UK, US and Finland leading the way. This suggests that the application of LD within the archives sector remains a research activity primarily confined to the global north and has not yet entered the mainstream of archival practice.

3 Research Approach

The research findings discussed in this paper are a subset of broader PhD research into the use of LD in a business archives setting, a project funded under the UK Arts and Humanities Research Council's Collaborative Doctoral Award scheme. One of the objectives of that PhD was to develop a comprehensive and evidence-based record of the benefits to users of ALD given the lack of such noted above. Constructivist Grounded Theory was used to analyze a corpus of ninety-four sources of literature (scholarly, case study and project-related grey literature) relating to LD in the fields of Archive Studies, Records Management, Library and Information Studies, Museum Studies, Semantic Web Studies, Archaeology, History and the Digital Humanities, and related praxis, which covered a data range of 2011 to 2021. These were selected during multiple periods of literature search during 2020-2021 using the EBSCO, Google Search, Google Scholar, and Scopus databases to identify literature which met the following criteria:

1. only studies which include more than a passing reference to Linked Data/Linked Open Data/the Semantic Web
2. for scholarly literature: only published articles or conference papers
3. for project-based literature: published articles, conference papers, presentation slides, websites and blogs
4. for reports: only of results of surveys of Linked Data practitioners
5. only studies published in the English language

Constructivist Grounded Theory is "a way of conducting inquiry that shapes data collection and emphasizes analysis" [33 p26]. It involves the iterative gathering and analysis of data using successive rounds of coding (initial, focused, and theoretical) and comparative methods which lead to the construction of conceptual categories, the identification of the relationships between them, and the construction of a theory grounded in the data, and hence a grounded theory. The author used Atlas.ti, a Computer Assisted Qualitative Data Analysis Software, in conjunction with manual methods, to identify and code articulations of the benefits of Linked Data within the source literature (see Table 1 for example instances of the initial code 'facilitating archival analysis/research not possible manually', which was subsequently assigned as a property of the focused code *Facilitating New Methods of Engagement and Analysis*). Through an iterative process of successive rounds of comparing, categorizing and refining the codes and seeking further data to extend the findings, the author identified fifteen benefits of Linked Data for archives (focused codes) and their properties (initial codes). These were further analysed to form three areas of benefit (conceptual categories) - empowering users, enhancing data, and future-proofing the archives sector - with the former being the focus of this paper. The results of this analysis were triangulated using a virtual focus group conducted with UK banking and financial services archivists in early 2021.

Table 1. Example instances of the benefit *Facilitating New Methods of Engagement and Analysis*

Benefit	Property	Quote
Facilitating New Methods of Engagement and Analysis	facilitating archival analysis/research not possible manually	‘Relationships between individuals and institutions, social and professional, can be [sic] also be analyzed, documented and explored...revealing for the first time both the social and intellectual networks that informed practice in post-war Queensland, and the depth and complexity of these.’ [26 p51]
		‘Linked Data can also be used in combination with data mining and information visualization techniques to facilitate analysis of archival information dispersed across many collections and institutions; such techniques will help researchers expand the breadth and depth of archival analysis beyond what is possible with manual methods...’ [18 p249]
		‘Linking historical documents and records to place allows synthesized, seamless access across heterogeneous archival data sets and facilitates novel ways of being able to search and browse large-scale archival collections.’ [14 p128]

4 Results

It is clear that ALD meets the needs of a wide range of users and in multiple ways, with Niu, for example, claiming it “will greatly improve the capability of archives in satisfying researchers’ needs.” [19 p95] There is considerable evidence that LD meets the needs of professional researchers, including historians, arts and humanities researchers, and digital humanities scholars, as it “provides the type of flexibility that researchers require to quickly incorporate new information and data structures that are necessary as their research progresses.” [34 p254] Other findings have suggested that LD meets the needs of Indigenous communities, for example by facilitating archive services’ work with and in support of Indigenous communities, enabling those communities’ ownership, control, access, and possession of records with a shared provenance or which have been created about, rather than with or by, such communities, and facilitating the creation of interfaces which can be tailored to the needs of the community by optimising resource-discovery and rights-management [22, 35]. As well as categories of users, needs are also met on an individual level, for example by using user profiles to contextualise and customise search results for the individual [36]. The following four sections give a structured overview of four identified ways in which users benefit from ALD.

4.1 Facilitating New Methods of Engagement and Analysis

Succinctly articulating a claim for ALD made on multiple occasions across the literature, in their introduction to *Records in Contexts* Daniel Pitti et al. argued that semantic technology and LD “allow the use of archival data in ways that a few years ago were unimaginable or prohibitively difficult to do for both social and technological reasons.” [37 p176] A significant benefit of publishing archival data as LD is that it is machine readable; it is thus able to support semantic data automatic reasoning and analysis, perform analysis across disparate and dispersed corpora of data, query large volumes of data, and offer new methods for discovering, engaging with, interpreting and using archival data. Such methods facilitate types of research which are not possible manually and which previous digital methods have not enabled [14, 18, 26, 37-38]: they allow users to construct more complex queries in ways not previously possible [28], enable the detection of previously unidentified relationships within and across datasets and collections, regardless of record format [25-27, 39], and allow for deeper analysis of archival sources [39]. Adopting LD creates a digital research environment, opening up archival data to natively digital methods, and supporting dynamic research methods. There are further benefits in combining LD with other digital technologies in order to expand the depth and breadth of possible archival analysis, including the incorporation of graphical interfaces, data or text mining, data visualization, optical character recognition (OCR), network analysis, natural language processing (NLP), and named entity recognition (NER).

4.2 Improving User Experience by Linking to Other Data Sources

LD’s machine readability and its ability to connect disparate datasets and reveal relationships across datasets improves the user experience by creating links to other sources of data. ALD enables users to navigate seamlessly across datasets, to reuse, align and enrich archival data, and to integrate it with data derived from other sources. Indeed, referring to the work of the Linking Lives project, Jane Stevenson claimed that users are benefited by LD “connect[ing] archives more effectively to the wider information landscape, bringing them together with other sources.” [29 p14] In addition to the benefits engendered by the general improvement in the quality of the research experience there are also improvements in the process of information discovery. By creating links to other data sources, the results of information discovery are richer and more meaningful, the data surfaced is higher quality and more comprehensive, and new avenues are provided for further exploration. For example, archival data is better contextualised by it not being presented in isolation from data from other sources [18, 22, 29, 40]; such contextualisation enables users to have a better understanding of the data and the archival objects they document. Furthermore, users benefit from the increased range of information revealed to them, which might include further descriptive, contextual and authority data (either internal administrative data previously not made publicly available, or drawn from external sources) [18, 37, 40], and newly identified connections between collections and datasets [15, 18, 37-38, 40-42].

4.3 Improving the Search Process

Much of the literature documents improvements in the information search and retrieval process as a result of adopting LD technologies. Niu claimed that adoption of LD could “fundamentally change the nature of information discovery in LAMs” [17 p84], and there is widespread consensus that LD adoption increases the capabilities of the search process, and improves its effectiveness, efficiency and precision [21, 23, 43-44]. The search process is improved in a number of ways, including through improved content querying, the ability to deliver richer, more meaningful, sophisticated and relevant search results, which can be browsed at finer levels of granularity, and through retrieving information otherwise overlooked through common techniques such as keyword searching. More complex queries can be accommodated by the SPARQL query language. With a single query, searches can be made across multiple collections, and navigation across archival and non-archival sources of data is made possible [42, 44]. New pathways into archival data are created, users can access and navigate archival data not only in linear ways, but also serendipitously. As a result, the search time and associated costs are reduced [21].

Furthermore, LD pushes archival data closer to the individual user, allowing them to access data for their specific purposes more efficiently. It accommodates multiple search methods, thus meeting the needs of different users. These methods include SPARQL endpoints, LD web services and user interfaces which support entity, semantic concept, or keyword search, browsing, and serendipitous search. Such LD user interfaces can enable more complex filtering of search results and faceted results [45-47], graphical representations and visualizations of data, such as statistical and map-based visualizations [26, 41, 47], and auto-filling suggested search terms [23, 26]. LD can also be embedded into catalogue data, thus making ALD also accessible via original search interfaces and online catalogues [19].

4.4 Increasing Access to and Ease of Use of Archival Data

There is considerable evidence that adopting LD increases access to, and usage of, archival data, providing a powerful argument for archives services to engage with LD as a means of achieving the goal of ‘opening up’ the archives. The Open Metadata Pathway project was not alone in its claim that one of the ways in which the project had underlined the value of ALD was through increasing access and discovery [16]. Evidence of high levels of access can be seen from the examples of the Finnish projects BiographySampo, which had 43,000 distinct users during its first five months, and WarSampo, which reported 690,000 distinct users between 2015 and 2020 [24, 45]. ALD extends the reach of archival catalogues and data, making data more widely available and thus able to reach new and larger audiences. Furthermore, it has been suggested that it enables archives to reach users who would not typically otherwise engage with archives and archival data [44, 48], a further priority of the archives profession. LD provides new entryways into archival data and increases access by making data shareable, extensible, and reusable, and increasing the openness, visibility, and discoverability of archival data.

Self-evidently, any initiative which makes archival data easier to access and use is of great benefit to users. Indeed, increasing the ease of use of archival data is a common motivating factor of ALD activity. Given that any archival data is made easier to use by its increased availability, visibility and discoverability, the process of converting archival data and publishing it as ALD enriches it, as well as creating unprecedented opportunities for its discovery, interpretation, and use [27, 39, 43], including facilitating multilingual access [49-50]. The possibility of linking between data increases accessibility, making it easier to access related information. Users are able to access data more easily for their specific purposes without requiring specific technical knowledge of archival jargon, cataloguing standards or LD in order to efficiently access information [8, 19, 50].

5 Discussion

Examination of ALD scholarship and practice-based case studies has provided substantial evidence of the benefits of ALD for users, benefits which can be used as a powerful tool to advocate for investment in ALD. However, many of the studies cited in Sections 2 and 4 also highlight that it is not enough just to make ALD available; for users to fully benefit from the potential provided by ALD, it needs to be accessible in multiple ways and serve multiple research purposes and methods. The creation of accessible LD web services, user interfaces and analytical tools is essential to enable users with a range of experience and research interests to access, interrogate and manipulate ALD without the need to develop expertise in LD or to master SPARQL (SPARQL Protocol And Query Language), the difficulties of which are well documented in ALD scholarship [19, 44]. Already, ‘traditional’ descriptive cataloguing no longer meets the needs of some user groups [51], a situation likely to become rapidly more commonplace; at the same time the actual needs of users in the ALD environment are little understood and ALD surveys have primarily focused on implementers.

The principal source of user needs in the UK is the UK and Ireland Archives and Records Association’s bi-annual Survey of Visitors to Archives, most recently conducted in 2018 [51]. Respondents to the survey are in person visitors to participating archives services over the age of seventeen; there is no equivalent survey for online users. This report reveals an increase in visitors aged 17-44, and that there are consistently low levels of satisfaction with both the usability and quality of online catalogues, and with the quality and provision of access to other online sources. The report also acknowledges that the demands of users are becoming more sophisticated. LD offers a viable means of meeting the increasingly sophisticated needs of digitally native users. Through the ability to create multiple applications and search interfaces over a single ALD dataset, LD enables archives services to provide access to archival data in a manner tailored to meet the needs of specific, or multiple, types of user, and also empowers users to create their own tools and interfaces. Furthermore, as user needs continue to evolve in conjunction with technological advances, LD also enables the needs of *future* users to be met [25], users who, Gracy suggests, “will want to not just discover new information, but understand the connections among the various entities associated with what is being described” [40 p359].

Collaboration is crucial to making archival data available, discoverable, and accessible as LD, and has clearly become commonplace in ALD activity [12]. However, users are rarely involved in such collaborations, and those who are tend to be academic researchers. A challenge of collaborating with other types of users is likely to be that general awareness of LD remains low, and user-friendly tools for the generation and use of LD are in their infancy. However, there is one group of users with whom it would be especially beneficial for archives and other GLM institutions to collaborate, digital humanities scholars. The Digital Humanities utilizes computational methods to interrogate large digital datasets in order to address an ever-expanding range of humanities questions. Digital humanities scholarship sits at the intersection of computational technologies and humanities scholarship [53], and has changed humanities research by becoming more interdisciplinary and collaborative [54-55]. LD is becoming increasingly important in digital humanities scholarship as a means of creating, publishing, and analyzing GLAM data [37].

Significantly, digital humanities LD studies using archival data clearly demonstrate that investment in LD tools and services for the purposes of digital humanities research benefits users in general [24, 28, 34, 56-58]. As an inherently interdisciplinary and collaborative field with experience of a range of digital methods that is information and data-driven, requires access to large-scale digital datasets, and has a demonstrable interest in, and impetus for, making archival data more digitally accessible, there is a natural synergy between digital humanities scholars and the archives sector which could be built upon in order to progress towards widespread adoption of ALD, and in so doing, ensure that archives services are better able to meet the needs of users.

6 Conclusions

“The challenges of designing and implementing standards and systems that will satisfy many different users remain difficult to resolve satisfactorily for all archives and users of archival collections.” [18 p278]

There is overwhelming evidence that ALD benefits users in multiple ways. However, there is currently little understanding of the needs of users with specific regards to ALD, and users are not commonly involved in ALD activity. As a profession, we need to better understand the benefits of ALD, including those particularly advantageous to users. Such knowledge is essential in order to advocate for investment in the often resource-intensive process of generating ALD and developing the web-services, user interfaces and tools necessary to make it accessible, usable, and capable of meeting the needs of the wide range of users and current non-users of archives. Furthermore, extensive user testing is crucial to improve the discovery and usability of ALD [59]. In enabling archives to ‘open up’ their collections, attract new audiences, and increase accessibility, ALD can progress the archives sector towards providing access to FAIR (Findable, Accessible, Interoperable, Re-usable) digital data [60]. However, interdisciplinary collaboration is vital for the successful implementation of ALD. Collaboration with

digital humanities scholars provides many opportunities to further develop the infrastructure required for ALD and increase the production of ALD datasets, both of which will benefit users more widely, and move the archives sector closer towards realizing the full potential of LD for archives.

References

1. ICA, Standards: Records in Contexts – Ontology, <https://www.ica.org/en/records-in-contexts-ontology/>, last accessed 2021/06/10.
2. Towards a National Collection Homepage, <https://www.nationalcollection.org.uk/>, last accessed 2021/06/10.
3. OCLC, Research: Linked Data, <https://www.oclc.org/research/areas/data-science/linked-data.html>, last accessed 2021/06/10.
4. Europeana Pro, Introduction, <https://pro.europeana.eu/page/linked-open-data>, last accessed 2021/06/10.
5. Ali, I., Warraich, N.: Linked Data Initiatives in Libraries and Information Centres: a systematic review. *Electronic Library* 36(5), 925-937 (2018). DOI: 10.1108/EL-04-2018-0075
6. Hallo, M., Luján-Mora, S., Maté, A., Trujillo, J.: Current State of Linked Data in Digital Libraries. *Journal of Information Science* 42(2), 117-27 (2016). DOI: 10.1177/0165551515594729
7. Yoose, B., Perkins, J.: The Linked Open Data Landscape in Libraries and Beyond. *Journal of Library Metadata* 13(2-3), 197-211 (2013). DOI: 10.1080/19386389.2013.826075
8. Rasmussen Pennington, D., Cagnazzo, L.: Connecting the Silos: Implementations and perceptions of Linked Data across European Libraries. *Journal of Documentation* 75(3), 643-666 (2019). DOI: 10.1108/JD-07-2018-0117
9. Raza, J., Mahmood, K., Warraich, N.: Application of Linked Data Technologies in Digital Libraries: A review of Literature. *Library Hi Tech* 36(3), 9-12 (2019). DOI: 10.1108/LHTN-10-2018-0067
10. Smith-Yoshimura, K.: Analysis of International Linked Data Survey for Implementers. *D-Lib Magazine* 22(7-8), (2016). DOI: 10.1045/july2016-smith-yoshimura
11. Smith-Yoshimura, K.: Analysis of 2018 International Linked Data Survey for Implementers. *Code4Lib Journal* 42, 2018-2029 (2018).
12. Desmeules, R.E., Turp, C., Senior, A.: Exploring Methods of Linked Data Model Evaluation in Practice. *Journal of Library Metadata* 20(1), 65-89 (2020). DOI: 10.1080/19386389.2020.1742434
13. Berners-Lee, T., Design Issues: Linked Data, <https://www.w3.org/DesignIssues/LinkedData.html>, last accessed 2021/06/10.
14. Clough, P., Tang, J., Hall, M., Warner, A.: Linking Archival Data to Location: a case study at the UK National Archives. *Aslib Proceedings: New Information Perspectives* 63(2-3), 127-147 (2011). DOI: 10.1108/00012531111135628
15. Ruddock, B.: Linked Data and the LOCAH Project. *Business Information Review* 28(2), 105-111 (2011). DOI 10.1177/0266382111404013
16. AIM25 Step change and Open Metadata Pathway project blog, <http://openmetadatapathway.blogspot.com/>, last accessed 2021/06/10.
17. Civil War Data 150 Homepage, <https://www.civilwardata150.net/>, last accessed 2021/06/10.
18. Gracy, K.F.: Archival Description and Linked Data: a preliminary study of opportunities and implementation challenges. *Archival Science* 15(3), 239-294 (2015). DOI: 10.1007/s10502-014-9216-2

19. Niu, J.: Linked Data for Archives. *Archivaria* 82, 83-110 (2016). DOI: <https://archivaria.ca/index.php/archivaria/article/view/13582>
20. de Boer, V., de Bryun, T., Brooks, J., de Vos, J.: The Benefits of Linking Metadata for Internal and External Users of an Audiovisual Archive. In: Garoufallou, E., Sartori, F., Siatiri, R., Zervas, M. (eds.) *Metadata and Semantic Research 2018*, CCIS vol. 846, pp. 212-223. DOI: 10.1007/978-3-030-14401-2_20
21. Robeldano-Arillo, J., Navarro-Bonilla, D., Cerdá-Díaz, J.: Application of Linked Open Data to the Coding and Dissemination of Spanish Civil War Photographic Archives. *Journal of Documentation* 76(1), 67-95 (2019). DOI: 10.1108/JD-06-2019-0112
22. Corn, A., Patrick, S.: Exploring the Applicability of the Semantic Web for Discovering and Navigating Australian Indigenous Knowledge Systems. *Archives and Manuscripts* 47(1), 131-142 (2019). DOI: 10.1080/01576895.2019.1575248
23. Rademaker, A. et al.: A Linked Open Data Architecture for the Historical Archives of the Getulio Vargas Foundation. *International Journal on Digital Libraries* 15(2-4), 153-167 (2015). DOI: 10.1007/s00799-015-0147-1
24. Hyvönen, E. et al.: WarSampo Data Service and Semantic Portal for Publishing Linked Open Data about the Second World War History. In: Sack, H. et al. (eds) *European Semantic Web Conference 2016*. LNCS vol. 9678, pp. 758-773
25. Debruyne, C. et al.: 'A Semantic Architecture for Preserving and Interpreting the Information Contained in Irish Historical Vital Records. *International Journal on Digital Libraries* 17(3), 159-174 (2016). DOI: 10.1007/s00799-016-0180-8
26. Hunter, J. et al.: A Web 3.0 Approach to Building an Online Digital Archive of Architectural Practice in Post-war Queensland. *Comma* 2012(2), 39-54 (2012). DOI: 10.3828/comma.2012.2.5
27. Pattuelli, M.C. et al.: Crafting Linked Open Data for Cultural Heritage: Mapping and Curation Tools for the Linked Jazz Project. *Code4Lib Journal* 21, 1-7 (2013).
28. Koho, M. et al.: WarSampo Knowledge Graph: Finland in the Second World War as Linked Open Data. *Semantic Web* 12(2), 265-278 (2021). DOI: 10.3233/SW-200392
29. Stevenson, J.: Linking Lives: Creating an End-User Interface Using Linked Data. *Information Standards Quarterly* 12(2-3), 14-23 (2012).
30. Bones, H.: Linked Digital Archives and the Historical Publishing World: An Australasian Perspective. *History Compass* 17(3). DOI: 10.1111/hic3.12522
31. Daquino, M. et al.: Enhancing Semantic Expressivity in the Cultural Heritage Domain: exposing the Zeri Photo Archive as Linked Open Data. *Journal on Computing and Cultural Heritage* 10(4), 2017. DOI: 10.1145/3051487
32. Candela, G., Escobar, P., Carrasco, R., Marco-Such, M.: A Linked Open Data Framework to Enhance the Discoverability and Impact of Cultural Heritage. *Journal of Information Science* 45(6), 756-766 (2019). DOI: 10.1177/0165551518812658
33. Charmaz, K.: *Constructing Grounded Theory*. 2nd edn. Sage Publications Ltd, London (2014).
34. Oldman, D., Doerr, M., Gradmann, S.: Zen and the Art of Linked Data: New Strategies for a Semantic Web of Humanists Knowledge. In: Schreibman S., Siemens R., Unsworth J. (eds.) *A New Companion to Digital Humanities*, pp. 251-273. Wiley Blackwell, New Jersey (2016)
35. Douglas, J. et al.: Decolonizing Archival Description: Can Linked Data Help? In: Luanne F. (ed.) *Proceedings of the Association for Information Science and Technology Annual Meeting* 55(1), pp. 669-672. John Wiley and Sons, New Jersey (2018). DOI: <https://doi.org/10.1002/pr2.2018.14505501077>

36. Bikakis, A. et al.: Editorial: Special issue on Semantic Web Cultural Heritage. *Semantic Web* 12(2), 163-167 (2021). DOI: 10.3233/SW-210425
37. Pitti, D., Stocking, B., Clavaud, F.: An Introduction to ‘Records in Contexts’: an archival description draft standard. *Comma* 2016(1-2), 173-188 (2016). DOI: 10.3828/comma.2016.18
38. Gartner, R.: An XML Schema for Enhancing the Semantic Interoperability of Archival Description. *Archival Science* 15, 295-313 (2015). DOI: 10.1007/s10502-014-9225-1
39. Pattuelli, M.C., Hwang, K., Miller, M.: Accidental Discovery, Intentional Inquiry: Leveraging Linked Data to Uncover the Women of Jazz. *Digital Scholarship in the Humanities* 32(4), 918-924 (2017). DOI: 10.1093/llc/fqw047
40. Gracy, K.F.: Enriching and Enhancing Moving Images with Linked Data: An exploration in the alignment of metadata models. *Journal of Documentation* 74(2), 354-371 (2018). DOI: 10.1108/JD-07-2017-0106
41. Browell, G.: From Linked Open Data to Linked Open Knowledge. In Baker, D., Evans, W. (eds.) *Digital Strategies: From Applications and Content to Libraries and People*, pp. 87-99. Elsevier Ltd, London (2016). DOI: <https://doi.org/10.1016/B978-0-08-100251-3.00006-8>
42. Gracy, K., Zeng, M., Skirvin, L.: Exploring Methods to Improve Access to Music Resources by Aligning Library Data with Linked Data: A report of methodologies and preliminary findings. *Journal of the American Society for Information Science and Technology* 64(10), 2078-2099 (2013). DOI: 10.1002/asi.22914
43. Llanes-Padrón, C., Pastor-Sánchez, J.A.: Records in Contexts: The road of archives to semantic interoperability. *Program: electronic library and information systems* 51(4), 387-405 (2017). DOI: 10.1108/PROG-03-2017-0021
44. McKenna, L., Debruyne, O’ Sullivan, D.: Understanding the Position of Information Professionals with regards to Linked Data: A survey of Libraries, Archives and Museums. In: *Proceedings of the 18th ACM/IEEE Joint Conference on Digital Libraries*, pp. 7-16. Association for Computing Machinery, New York (2018). DOI: 10.1145/3197026.3197041
45. Koho, M. et al.: Linked Death – Representing, Publishing, and Using Second World War Death Records as Linked Open Data. In Blomqvist, E. et al. (eds) *European Semantic Web Conference 2017, LCNS*, vol 10577, Springer, Cham (2017). DOI: 10.1007/978-3-319-70407-4_45
46. Laurencé, C.M.: Linked Data and the Library of Congress. *Library Philosophy and Practice (e-journal)* 1114 (2013).
47. Miyakita, G., Leskinen, P., Hyvönen, E.: Using Linked Data for Prosopographical Research of Historical Persons: Case U.S. Congress Legislators. In Ionnides, M. et al. (eds) *Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection*, pp. 150-162. Springer, Cham (2018).
48. Park, O.N.: Development of Linked Data for Archives in Korea. *D-Lib Magazine* 21(3-4), 1-17 (2015). DOI: 10.1045/march2015-park
49. Binding, C., Tudhope, D., Vlachdis, A.: A Study of Semantic Integration across Archaeological Data and Reports in Different Languages. *Journal of Information Science* 45(3), 364-386 (2019). DOI: 10.1177/0165551518789874
50. Marjit, U., Sharma, K., Sarkar, A., Krishnamurthy, M.: Publishing Legacy Data as Linked Data: A state of the art survey. *Library Hi Tech* 31(3), 520-535 (2013). DOI: 10.1108/LHT-09-2012-0075
51. Krier, L.: Serials, FRBR, and Library Linked Data: A way forward. *Journal of Library Metadata* 12(2-3), 177-187 (2012). doi:10.1080/19386389.2012.699834

52. Archives and Records Association National Surveys Group: Survey of Visitors to UK Archives 2018: National Report. CIPFA (2019). available at: https://www.archives.org.uk/images/Public_Services_Quality_Grp/Survey_of_Visitors_to_UK_Archives_2018_-_National_Headline_Report_pdf
53. Schriebman, S., Siemens, R., Unsworth: The Digital Humanities and Humanities Computing. In: Schriebman, S., Siemens, R., Unsworth, J. (eds.) *A Companion to Digital Humanities*, pp xxiii-xvi. Blackwell Publishing, Oxford (2004).
54. McCarty, W.: Collaborative Research in the Digital Humanities. In: Deegan, M., McCarty, W. (eds) *Collaborative Research in the Digital Humanities: A volume in honour of Harold Short on the Occasion of His 65th Birthday and His Retirement*, pp. 1-10. Ashgate Publishing, Ltd., Farnham (2012).
55. Spiro, L.: Computing and Communicating Knowledge: Collaborative Approaches to Digital Humanities Projects. In: McGrath, L. (ed.) *Collaborative Approaches to the Digital in English Studies*, pp. 44-82. Computers and Composition Digital Press/Utah State University Press, Logan (2011).
56. de Boer, V. et al.: DIVE into the Event-based Browsing of linked Historical Media. *Journal of Web Semantics* 35, 152-158 (2015). DOI: 10.1016/j.websem.2015.06.003
57. Hyvönen, E.: Linked Open Data Infrastructure for Digital Humanities. In: Reinsone, S. et al. (eds) *Proceedings of the Digital Humanities in the Nordic Countries 5th Conference*, CEUR-WS, vol. 2612, pp. 254-259. CEUR, Aachen (2020).
58. Hyvönen, E.: Using the Semantic Web in Digital Humanities: Shift from data-publishing to data-analysis and serendipitous discovery. *Semantic Web* 11(1), 187-193 (2020). DOI: 10.3233/SW-190386
59. Jaillant, L.: After the Digital Revolution: Working with emails and born-digital records in literary publishers' archives. *Archives and Manuscripts* 47(3), 285-304 (2019). DOI: 10.1080/01576895.2019.1640555
60. Wilkinson, MD. et al.: The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data* 3 (160018). DOI: 10.1038/sdata.2016.18