A “Major Technological Challenge”: Multi-level Description and Online Archival Databases

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Abstract

While archival description has been standardized in North America since the 1990s, the online environment has introduced new challenges in preserving the hierarchical nature of archival description. Many archival databases, in an attempt to mimic library discovery layers and web search engines, have collapsed the archival aggregation into item-level records, which can erase the context and structure of the content described. This article examines the communication breakdown that happens between the archivist and end user via online archival description and proposes solutions to improve multi-level description including the use of predicates in links, increased online instructional support, and the inclusion of digitized assets in archival description databases.

Keywords: Archival description; Archival organization; Multi-level description; Archival databases; Digital repositories

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Introduction

Shortly after the standardization of archival description in North America in the 1990s-2000s, archives have swiftly moved to formulate methods of making archival description digitally available to their staff and patrons. This includes both the creation of methods to encode archival description, in addition to building and utilizing both internal and online archival databases. Both Encoded Archival Description (EAD)¹ and Extensible Markup Language (XML)² were released in 1998, shortly after the publication of the first edition of Rules for Archival Description (RAD)³ (Pitti, 2006, p. 10). Roughly 20 years after the standardization of input standards for archival description, the field has yet to set new output standards. The output of archival description is not uniform across institutions and the functionality and interfaces utilized by archival databases can vary widely. Kim's (2004) study found that there was variation across not just data elements, but also browse functions, search functions, and interface design of EAD-encoded finding aids hosted on the web. A cursory glance at similar elements across different archival databases and digital repositories will return similar results. As Pitti (2006) argues, "it is only when related components are combined that you have a complete archival description.... The description and representation of relations presents a major technological challenge" (p. 20). Archival databases do present a "major technological challenge," particularly as they relate to the inherent contextual nature of archival

¹ Encoded Archival Description (EAD) is a standard for the encoding of archival descriptions in a web environment.

² Extensible Markup Language (XML) is a markup language used to encode documents. It is commonly used to encode metadata records because of its ability to be parsed by both humans and machines.

³ Rules for Archival Description (RAD) is the Canadian standard for archival description. It is currently maintained by the Canadian Council for Archives.

description. This article will examine both the problems and potential solutions associated with the relational database model for the hosting and parsing of multi-level description, usability and user preferences for archival databases, the need to preserve context in archival databases, and the problems and potential inherent with hosting archival descriptions and digital surrogates in the same database.

Literature Review

Primary Source Literacy

Primary source literacy ultimately relates to the use of primary sources in instruction and research and the ability to effectively locate and make sense of primary sources. While information literacy has been a common aspect of librarians work for over thirty years, primary source literacy is a more recent aspect of archivists' and special collections librarians' professional practice (Carini, 2016). Since the publication of the *Guidelines for Primary Source Literacy*, interest in primary source literacy as both a facet of archival practice and research has increased (SAA-ACRL/RBMS JTF-PSL, 2018). The guidelines are organized primarily around sets of learning objectives that demonstrate primary source literacy. These sets revolve around the ability for users to: conceptualize; find and access; read, understand, and summarize; interpret, analyze, and evaluate; and use and incorporate primary sources. A number of research projects have been taken on by archivists, special collections librarians, and faculty to investigate the application and efficacy of primary source literacy in the classroom (Carini, 2009; Bahde, 2013; Horowitz, 2015; Hauck & Robinson, 2018; Quill et al., 2019). Primary source literacy activities and projects take many forms, but often involve the pairing of primary sources, at the collection or item level, with relevant curricula

through site visits, classroom activities, targeted assignments, etc. (Yaco et al., 2020, p. 463). As noted by Yaco et al. (2020) while much has been written on primary source instruction, other aspects of primary source literacy, such as marketing, planning, and access, have gone under examined (p. 461).

Databases, Linked Data, and the Encoding of Archival Description

Pitti (2006) contends that most databases fall into one of four categories: hierarchical, network, relational, and object-oriented. The most common of the four are relational databases, where records are grouped according to their relation to one another and represented by tables. In contrast, hierarchical databases observe a strict tree structure where each record is linked to one above it. Network databases use a node structure and were common in mainframe systems before being outmoded by the relational model. Finally, object-oriented databases are similar to relational databases, except that they store records as objects rather than within tables (O'Regan, 2016, pp. 275-278). Due to their near ubiquity of relational databases, the majority of archival description databases use the relational model (Hamill, 2017, p. 125). Many archival databases encode their data using standards like EAD, and some make use of some form of linked data, if not linked open data, as well.

The Semantic Web, a term initially coined by computer scientist and inventor of the World Wide Web, Tim Berners-Lee, is predicated on the structuring of semantic information via machine-readable metadata (Gracy, 2015, p. 240). Linked data, another concept from Berners-Lee, facilitates this through the structure of interlinked data. Semantic links are based on the interrelationship, known as the predicate, between a subject and object (Gartner, 2015, p. 297). These three semantic units, the subject,

object, and predicate, are known as triples (Gracy, 2015, p. 242). Semantic links allow for the encoding of semantic information, which is often referential, and can often be highly conceptual or culturally informed. These are wider concepts that apply broadly to a number of computer science applications, but within LIS and archival science there are particular forms of structuring and encoding metadata to allow for both interoperability and complex semantic queries. While standards like EAD and Machine-readable Cataloging (MARC) are used to encode the metadata itself in a way that is readable by both human and machine, standards like Resource Description Framework (RDF), Simple Knowledge Organization System (SKOS), and Web Ontology Language (OWL) are used to define the semantic relationships between resources and terms (Gracy, 2015, pp. 242-243).

User Experience and Archival Databases/Digital Archives

Scholarly inquiry into user preferences for digital archives, digital libraries, digital/institutional repositories, and archival databases have produced conflicting, and sometimes contradictory, results. DeRidder et al.'s (2012) study found that users with previous experience using digital collections preferred item-level retrieval, whereas users without previous experience preferred browsing hierarchically. Despite this, the authors still found that most of the participants preferred the item-level interface, with experienced researchers preferring the finding aid interface.¹ In contrast, Scheir's (2006) and Duff and Stoyanova's (1998) studies found that users preferred fonds-level retrieval to item-level retrieval. Participants from Allison-Bunnell et al.'s (2011) study

¹ In this context, experienced researchers mean users who have previously done archival research. In this study experienced researchers were not necessarily the same users who had previous experience using digital collections.

preferred hierarchical structures and interfaces that replicated the reading room experience, whereas Bawden and Vilar's (2006) participants typically started their research process by searching and were generally disinterested with collections. Duff (2012, pp. 201-202) contends that the relative expertise of the user has an impact on their information behaviour, as seasoned archival researchers are more likely to make full use of a finding aid in order to understand the context of the aggregation, than a novice user who may scan for more discrete units of information. This is echoed by DeRidder et al. (2012) who note in their literature review that students and community members tend to prefer item-level retrieval and description, whereas academic/more adept researchers prefer multi-level description. Also noted by Duff (2012, p. 203) is that users struggle with generating appropriate queries and understanding the context of retrieved archival sources. Conflicting and changing user expectations and preferences are unlikely to change. As contended by Teruggi (2011), wider developments in web technology will naturally impact the expectations of users. Most importantly, as identified by Kelly (2014), the majority of the scholarship on usability and the user experience of digital libraries, digital archives, digital repositories, and similar projects, have been specific to a particular institution or project, making it difficult to broadly generalize the results.

Relational Databases, Information Retrieval, and Archival Description

Integrated Library Systems as well as their public-facing module, the Online Public Access Catalog (OPAC), are relational databases. As such, many archives patrons are already familiar with the use of relational databases, whether knowingly or not. Many archival databases also utilize a relational model, and since the majority of users are

familiar with using these kinds of systems already, they need minimal instruction on their use. Despite the ease associated with using a familiar system, relational databases are not necessarily the most logical fit for multi-level archival description. Gilliland (formerly Gilliland-Swetland; 2001) contends that finding aids “[assume] a form quite unlike the concise bibliographic description with name and subject access most users are accustomed to using in other information systems such as library catalogs” (p. 207). Archival description is inherently hierarchical, with the fonds/collection at the highest level breaking down into series, filing units, and discrete items (Canadian Committee on Archival Description, 2008, p. xxiv). Archival descriptive standards often function off the assumption that the descriptions will be presented in a hierarchical fashion. For example, RAD mandates that information not be stated at multiple levels of description (Canadian Committee on Archival Description, 2008, pp. 1-5). Without the context of the hierarchy, information given at a higher level may be lost at the lower levels. Presenting hierarchical description in a relational database is tricky as relational databases typically require relationships to be broken down into one-to-one or one-to-many relationships. Breaking the finding aid into item-level records that are retrieved at an individual level by patrons results in a loss of nuance and “the communicative power of the text description” (Gartner, 2015, p. 298). Despite this, some archivists are heavily in favour of the atomization of archival description regardless of the potential loss of context and nuance.

The move to archival description in the online, digital environment results in calls from archivists like Daines III and Nimer (2011) to flatten the multi-level nature of archival description into individual records that can be retrieved separately from their

hierarchical structure, much like search engines and OPACs that retrieve records at an item level. As the authors argue, while users can be oriented towards the use of finding aids by an archivist in a reading room, this rarely happens when users encounter finding aids in the digital environment. Now nearly a decade after the publication of Daines III and Nimer's (2011) article, the issues that have resulted from this fracturing of the archival aggregation during information retrieval has made themselves clear. Though using a similar structure and interface to familiar search engines, like Google, might make it easier for users in the short-term, these structures do not accurately reflect the content, structure, or context of the materials being described. Preserving the contextual and hierarchical nature of archival description and organization requires descriptive systems and structures that honour that context, such as a hierarchical database model. While users may be used to OPACs and item-level retrieval, using a system that mimics item-level retrieval is ultimately misleading to the user who may come into the reading room expecting to receive and inspect a single item, rather than a series of items, files, or boxes. This is not to say that archivists should return solely to the traditional finding aid that is uploaded and retrieved as a single document, which can be daunting and confusing to novice users, but that our databases should present a complete record of the fonds to the user that is comprised of discrete parts and can be collapsed and expanded on command.

The presentation and contextualization of archival description can be rectified in one of two ways. One would be to replace the use of relational databases with hierarchical ones, as these naturally mirror the hierarchical nature of archival description and organization. However, hierarchical databases are imperfect in their own right and

archivists run the risk of breaking the database's tree when a record is entered incorrectly. Moreover, fully replacing relational databases is a tall order. Many archives and memory institutions use open-source software to serve their descriptions, and a significant number of these software packages are built on MySQL or MariaDB, variations of an incredibly popular and open source relational database system. Database models are not interchangeable, a software package that is built on a particular model has to have those dependencies filled in order to function effectively. However, some software packages are better at presenting archival description using a relational model than others. Systems like Collective Access are better at presenting the hierarchical nature of archival description within a single window than a comparable package like Islandora.

Usability of Archival Databases and User Preferences

Regardless of whether a relational or hierarchical database model would be more effective in accurately presenting archival description, users present conflicting viewpoints on their preferences for database structures and interfaces. In their article, Daines III and Nimer (2011) point out that users have complaints with the “hierarchical display of information, item-level access, text blocks, and terminology” (p. 7) when encountering traditional finding aids online. Evidently users are struggling with archival databases, regardless of how much they resemble library catalogues. The preferences of users also change depending on their level of familiarity with archival research. It is clear, however, that users with different levels of primary source literacy have different preferences when it comes to archival description and retrieval (DeRidder et al., 2012).

In contrast to the disparate opinions on the level of description contained in archival databases, users' reactions to database interfaces are more uniform. Based on Scheir (2006) and Duff and Stoyanova's (1998) findings, it could be inferred that the most user-friendly way to approach information retrieval of archival descriptions would be to have the database recall fonds-level descriptions and then have the interface auto-navigate to the element or section of the finding aid that matches the user's query. To a degree, solving the issues that archival databases face includes not just altering how archival descriptions are formatted and retrieved, but also bridging the archival literacy gap among users of different skill and competency levels. In order to be truly effective, archivists need to ensure that primary source literacy instruction, whether in person or virtually, is paired with the modification of the structure and interface of archival databases. Fortunately, Scheir's (2006) study found that, even in cases where users were unclear about archival terminology in an online finding aid, they were still able to find what they were looking for and that archival terminology had no significant impact on findability. Scheir's findings in this regard are comforting, as they demonstrate that users do not face a steep learning curve, and that archivists simply need to close the archival literacy gap.

Finally, improving the usability of archival databases requires ensuring that archival descriptions are described in such a way that they are findable. As DeRidder et al. (2012) note in their literature review, users are primarily using search queries over the browse function in archival databases, and that they are struggling with selecting effective search terms. Since the majority of archives do not assign subject headings to their finding aids, this can further complicate the search process for users who may be

looking for information on a particular topic without knowing where to start. Though this can be remedied by a reference interview with an archivist, it also creates a bottleneck in the information-seeking process. This can be improved by either adding more, or any, subject headings to archival descriptions, creating research guides on popular topics covered by the institution's holdings, or providing online tutorials or a toolkit on navigating the database/portal.

Preserving and Presenting Context in Archival Databases

The purpose of archival description is two-fold: to describe and contextualize records (Bountouri, 2017, p.3). However, as Zhang and Mauney (2013) contend, archival description is often more interested in the contextualization of records than their description. The hierarchical structure of archival description has a direct relation to its contextual nature. The hierarchy represents, and replicates, the ways that administrative functions, categories of materials, chronology, etc., form smaller components of the aggregation. This structure collectively allows researchers and archivists to draw conclusions about the totality of the person, group, or organization being described. In the traditional finding aid, this was communicated through headings and indentations but has become far less stable or apparent in the digital environment. Relational archival databases typically separate the elements of the finding aid into different datasets, which are then connected to one another via links. Since most relational databases cannot handle many-to-many relationships, this is done to break down many-to-many relationships into more discrete one-to-one relationships. Though linking records in archival databases functionally preserves the multi-level nature of archival description, this is not always apparent to users, particularly those

unacquainted with archival description. Take, for example, the Ontario Jewish Archives' (OJA) database (UJA Federation of Greater Toronto, n.d.). A keyword search in the OJA database returns records from any point in the description, from the item to fonds level. It is not possible to view a traditional finding aid using the OJA database and searching for a specific fonds within the database returns all the records associated with the fonds, rather than a single fonds-level description. The only way to comprehend the hierarchical structure of the OJA's archival descriptions is by clicking on a small button below each record titled "view in hierarchy" (UJA Federation of Greater Toronto, n.d.). A cursory glance at the Museum of Anthropology's Audrey & Harry Hawthorn Library & Archives AtoM database reveals a similar problem (Museum of Anthropology, n.d.). The "popular this week" (Figure 1) feature has a list of links to the records that have received the most visits. These links include fonds-level records, file-level records, item-level records, and authority records, yet the feature presents all the links in the same way without differentiating between the different levels of description. Though these systems allow users to quickly locate relevant material, it conflates the different levels of description and authority records and removes the contextual nature of the archival aggregations. A user looking for material on William McLennan might click on his authority record under the "popular this week" feature and then not understand how to get to his fonds or whether the repository even holds any materials on him.

Figure 1. The “popular this week” feature on the Museum of Anthropology’s Audrey & Harry Hawthorn Library & Archives AtoM database on February 2, 2020.

[Figure 1. Museum of Anthropology Archives. (n.d.). *Popular this week*. Retrieved February 2, 2020, from <https://atom.moa.ubc.ca/>. Screenshot by author.]

The relationship between the elements of the finding aid was implicit in traditional archival description. The user could tell, via the hierarchical nature and layout of the finding aid, that an item fell under a particular series and that the series fell under the overarching fonds. This is no longer clear to users, particularly to the uninitiated. Pitti (2006) contends that “relations must be described” (p. 21) and the lack of description in this context is precisely the problem with the relational databases that retrieve single elements of the finding aid. A user that retrieves a record for a series may not

understand that the series is part of a fonds, even if the fonds is linked. This is partly due to the generic conventions of the finding aid. As MacNeil (2012) argues, archivists rely on at least some background knowledge on the part of the user in the writing of a finding aid. The same logic — that users must have a base level of knowledge to use archival databases — applies to these segmented applications of archival description. Without explicitly laying out the relationship between the descriptive records, the user can easily become confused about the nature of the record and how it may or may not relate to its fonds or other materials held by the institution. This can be practically accomplished by utilizing the semantic linkages laid out by Berners-Lee et al. (2001). The importance of embedding semantic information in linkages, rather than just providing a link on its own, is that computers cannot parse semantic information. For example, while a human being can understand the relationship between a still from the movie *Titanic* (Cameron, 1997) and a photograph of the ship of the same name, that relationship is semantic in nature and could not be read or understood by a machine (at least, not presently). Semantic links can be used to make hierarchical archival structures more obvious to the user. While it is evident to an archivist that a series is a smaller component of a fonds, this is often not obvious to users and cannot be understood by digital infrastructure unless it is explicitly laid out. Implementing predicates in online archival description and making them visible to the user rather than solely embedded in the back-end code, can assist in making the relational nature of archival description in a database more obvious and intuitive to the user. Further, as argued by Niu (2016, p. 84) implementing semantic linked open data allows for more complex search queries. However, as Gartner (2015) identifies, encoding a large

number of triples can quickly become very complex (p. 298). Utilizing a schema that allows for the assigning of relationships and coverage can allow for individual record retrieval to preserve the hierarchical nature of the description in the online environment. For example, the CENDARI schema uses triples to identify: 1) element types, which clearly lay out what the element is, 2) coverage, which links all of the records in a fonds together, and 3) relation type, which both links to the related resource and utilizes predetermined relationship types (Gartner, 2015).

Figure 2. The results when searching for the Philip Givens fonds in the Ontario Jewish Archives' database.

The screenshot displays the search results for 'Philip Givens fonds' in the Ontario Jewish Archives database. The search bar at the top shows the query 'setName:"Philip Givens fonds"'. Below the search bar, there are navigation options: 'PRINT', 'PDF', 'SORTED BY HIERARCHY', 'LIST VIEW', and 'EXPAND ALL'. The results are displayed on page 1 of 9, showing 442 records. The first three results are visible:

- Philip Givens fonds [multiple media] – [192-]-1990.** This result is a 'Fonds' with 'Fonds 51' and 'Archival Descriptions'. It includes links for 'Add', 'Share', 'Permalink', 'More like this', and 'View in hierarchy'.
- P.M. Louis St. Laurent with Phil Givens [graphic material] – 19 Feb.1949.** This result is a 'File' within 'Fonds 51; File 1' and 'Archival Descriptions'. It includes links for 'Add', 'Share', 'Permalink', 'More like this', and 'View in hierarchy'.
- Scrapbook [multiple media] – 1949-1953.** This result is a 'File' within 'Fonds 51; File 2' and 'Archival Descriptions'. It includes links for 'Add', 'Share', 'Permalink', 'More like this', and 'View in hierarchy'.

On the left side, there is a 'Narrow By' section with various filters: Collection Name, Source, Format, Date, Description Level, Subject, Name, Place, Language, Restrictions, and Available Digital Content.

[Figure 2. Ontario Jewish Archives. (n.d.). *Philip Givens search results*. Retrieved February 2, 2020 from <https://search.ontariojewisharchives.org/List?q=setName%3A%22Philip+Givens+fonds%22&p=1&ps=50>. Screenshot by author.]

Despite the difficulties that relational databases present for archival description, there are advantages as well. As Pitti (2006) contends, creators and functions are interrelated across archival aggregations and the digital environment can allow archivists to reflect this through the linking of records in ways that paper finding aids could not (p. 17). A good example are the architectural records donated to Western University's Archives & Special Collections by Museum London (Berg, 2020a; Berg, 2020b). The donation, a single accession with multiple fonds of architectural records, was initially donated from a later iteration of an architectural firm to Museum London, which was later transferred to Western University's Archives & Special Collections (Berg, 2020a; Berg, 2020b). Over the past century the architectural firm had changed names many times as name partners came and went, with some partners going on to create separate firms that went on to also undergo a series of name changes. Though the different iterations of the firms within the accession are being arranged and described separately as individual fonds, those individual fonds have series, biographical sketches, and provenance access points that repeat or intersect with one another. Daines III and Nimer (2011) argue that this is why finding aid elements should be separated out, in order to facilitate easier reuse of information across complex or intersecting archival aggregations. Linking between elements of the finding aid can work, but they must be made more explicit and communicated to the user through the description, the interface, or the predicate.

Intersections Between Digital Repositories and Archival Description Databases

In addition to the display of descriptive records, some digital repositories function both as repositories of digitized materials and as descriptive databases. As Daines III and Nimer (2011) argue, a single search could retrieve both descriptive records and digital surrogates of archival holdings, which conflate the two, and ultimately make information retrieval more confusing for the user. However, the combination of digitized collection materials and descriptive records could be synthesized in a more effective manner. Embedding digitized materials within the finding aid, as pointed out by DeRidder et al. (2012), could simulate the physical arrangement of the fonds without requiring individual, item-level description. This could be done by storing digitized items within their filing unit in the multi-level description in the same order that they are arranged within the physical fonds. Arca (British Columbia Electronic Library Network, n.d.), which is built using the digital repository software Islandora, implements this model with their multi-level records. The fonds-level record gives a brief description equivalent to the scope and content element of RAD. Within the fonds-level record it lists each series title with an image thumbnail of the contents of each series. Each series title then links out to the series-level record. The series-level records also contain a scope and content note and list the file-level titles, which link out to the file-level records as well. The file-level records contain an embedded e-book, with each page of the e-book composed of individual digitized items in the order they would be arranged in the physical fonds. Though aspects of this implementation could be improved, the design is intuitive and reflects the hierarchical nature of the fonds. Where Arca (British Columbia Electronic Library Network, n.d.) runs into trouble as a platform is that performing a keyword

search can result in the database retrieving records at multiple levels and the hierarchical nature of the archival aggregations is not obvious when starting the information retrieval process from an item- or file-level record.

Figure 3. An example of the visual fonds level display on Arca.

[Figure 3. Arca. (n.d.). *1971 Centennial Committee fonds*. Retrieved February 2, 2020 from https://arcabc.ca/islandora/object/osoyoos%3Acentennial?solr_nav%5Bid%5D=91971da942ae7a4f7bf5&solr_nav%5Bpage%5D=0&solr_nav%5Boffset%5D=0/. Screenshot by author.]

In addition to the fact that retrieval of item-level records divorces those records from the context of their archival aggregation, item-level records require item-level description, which most archives cannot afford to provide for their collections (Evans, 2007). Gilliland (2001) notes that multi-level description is “an expedient practice designed to yield optimum levels of control over materials based upon an assessment of a collection’s physical extent and perceived intellectual density” (p. 210). Despite users’ preference for item-level description and retrieval, this is not a feasible or sustainable practice for most archives. Allowing for item-level digitized content to be hosted sans-description and embedded within the filing unit could make the hosting of digitized content more feasible for under-resourced institutions. This arrangement also more accurately mirrors the experience that users would have if they were to access the fonds physically in the reading room. Allowing users to retrieve item-level records separate from their multi-level description in an archival database gives the false impression that they will be able to request that item on its own. Further, there is reason to believe that item-level metadata is not being utilized by users. DeRidder et al. (2012) — as quoted from correspondence with Paul Conway about the findings of his research — found that “users of digitized photographs have relatively little interest in or knowledge of the physical properties of original source photographs and place particular emphasis on image descriptions derived directly from the original objects or from associated filing schemes, rather than making use of metadata assigned by catalogers” (p. 145). Users navigating an archival database would be able to see digitized items within the context of their fonds, rather than as singular entries devoid of context, and the hosting of digitized content within archival description in this way could ultimately

improve both the feasibility of hosting digitized content and the accessibility of archival material for the end-user.

Conclusion

Fixing multi-level archival description in the digital environment requires critically examining: a) how users interact with archival databases b) how archival description is currently being atomized into datasets and individualized descriptive records and c) how multi-level description is communicated and facilitated through archival databases. Pitti (2006) asserts that archival description “employs both document-centric and data-centric components” and that “neither can be subordinated to the other without loss of potentially essential functionality and economies” (pp. 15-16). Rather than choosing between a relational archival database that breaks up the elements of the finding aid, or uploading a whole-text PDF file finding aid, archives need to find ways to implement the atomization of the database environment on the back-end, while still presenting a complete, multi-level description to users on the front-end. Archives should also consider supplementing item-level description of digitized materials with the embedding of digitized contents within its filing unit. Finally, archives need to pair the modification of their archival database structures and interfaces with an increase in outreach and instruction aimed at increasing archival literacy for distance and online users.

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