A Brave New World: Archivists and Shareable Descriptive Metadata

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Abstract

The notion of "shareable" metadata has recently emerged in the cultural heritage community as a result of increased expectations for making descriptive metadata openly available. Archivists, too, must work to create shareable metadata if archives are to remain viable in a continually evolving information environment. This paper discusses the issues involved in applying shareable metadata principles to archival description, describes strategies and tools for creating shareable archival descriptive metadata, and considers emerging trends in metadata sharing. The authors also outline further recommendations for action by the archival community.

An Evolving Vision of Archival Description

Descriptive practices are a hot topic of discussion within the archival community. Daniel Pitti describes this current activity as a fundamental rethinking, originally motivated by technological change: "The opportunities for improving archival practices and services presented by computers and network technology have inspired archivists to engage in a new analysis of archival description."[1] This is not to say that technology on its own is responsible for recent developments in the field, but rather that technological developments have helped to motivate a new vision of what can be accomplished with more standardized archival description. Archivists have joined together to develop and revise community-based standards for finding aids to promote better discovery and delivery of archival descriptions to end users. The development and reasonably widespread adoption

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[1] Daniel V. Pitti, "Creator Description: Encoded Archival Context," *Cataloging & Classification Quarterly* 38, nos. 3–4 (2004): 206.

of EAD (Encoded Archival Description),[2] and to a slightly lesser extent, *DACS* (*Describing Archives: A Content Standard*),[3] are examples of this phenomenon, as is the "More Product, Less Process" movement[4] and the emergence of open-source archival management tools such as the Archivists' Toolkit[5] and Archon.[6]

Libraries are also re-examining descriptive practices, so that library metadata can participate in the wider information landscape. A new content standard, *Resource Description and Access* (*RDA*),[7] is under development to replace the long-used *Anglo-American Cataloging Rules*, 2nd edition (*AACR2*).[8] *RDA*'s design principles look both forward and outward. "*RDA* is being developed to provide a better fit with emerging database technologies, and to take advantage of the efficiencies and flexibility that such technologies offer with respect to data capture, storage, retrieval, and display."[9] *RDA*-compliant data are envisioned to be flexible, in that they ". . . should function independently of the format, medium, or system used to store or communicate the data. They should be amenable to use in a variety of environments."[10]

Anticipating these outward-focused goals, the Library of Congress commissioned a Working Group in late 2006 to advise it on its role and priorities in the evolution of library descriptive practices. The Working Group's report, released in January 2008, outlines five strategic areas for the Library of Congress, including "Position our technology for the future by recognizing that the World Wide Web is both our technology platform and the appropriate platform for the delivery of our standards. Recognize that people are not the only users of the data we produce in the name of bibliographic control, but so too are machine applications that interact with those data in a variety of ways."[11] The common theme

[2] "EAD: Encoded Archival Description Version 2002 Official Site," http://www.loc.gov/ead/, accessed 10 August 2008.

[3] *Describing Archives: A Content Standard* (Chicago: Society of American Archivists, 2004).

[4] Mark A. Greene and Dennis Meissner, "More Product, Less Process: Revamping Traditional Archival Processing," *American Archivist* 68, no. 2 (2005): 208–63.

[5] Archivists' Toolkit, see http://www.archiviststoolkit.org/, accessed 10 August 2008.

[6] Archon: The Simple Archival Information System, see http://www.archon.org/, accessed 10 August 2008.

[7] *RDA* is currently scheduled for a production release in the third quarter of 2009, see http://www.collectionscanada.gc.ca/jsc/rda.html, accessed 22 November 2008.

[8] *AACR2,* available at http://www.aacr2.org, accessed 10 August 2008.

[9] Joint Steering Committee for Development of *RDA, "RDA: Resource Description and Access*—Prospectus," 17 December 2007, available at http://www.collectionscanada.gc.ca/jsc/rdaprospectus.html, accessed 10 August 2008.

[10] Joint Steering Committee for Development of *RDA, "RDA: Resource Description and Access*—Objectives and Principles," 16 December 2007 available at http://www.collectionscanada.gc.ca/jsc/docs/5rda-objectivesrev.pdf, accessed 10 August 2008.

[11] Library of Congress Working Group on the Future of Bibliographic Control, "On the Record," 9 January 2008, 2, available at http://www.loc.gov/bibliographic-future/news/lcwg-ontherecord-jan08-final.pdf, accessed 19 August 2008.

of these statements is the promotion of descriptive metadata itself as a valuable resource, to be shared widely in machine-readable ways, rather than only being displayed to human users.

The increasing need for descriptive metadata to be pushed actively beyond local systems to promote reuse is not limited to libraries. Archives must also work toward this goal to act as full participants in the current networked information environment and to remain relevant in a progressively more distributed world. The concept of sharing archival descriptions outside of local systems is not new. Early efforts were limited to single-level descriptions, first in print with the *National Union Catalog for Manuscript Collections* (*NUCMC*),[12] and later in online union catalogs utilizing MARC AMC.

When expanding their sharing of descriptive metadata to include multilevel finding aids, archives generally use one of two models. A first approach is to create partnerships such as the Online Archive of California to take advantage of the economies of scale that come with collaboration, and in some cases, to save individual institutions the time and money it takes to set up the technical infrastructure to make their finding aids available online.[13] In this model, archives share descriptive metadata by necessity, as their finding aids are delivered through the central service and thus appear alongside finding aids from other institutions in the partnership. A second model of intentional sharing of archival data is exemplified by OCLC's ArchiveGrid[14] (formerly RLG Archival Resources), where EAD-encoded finding aids are harvested by agreement between institutions and the ArchiveGrid service, and aggregated together with HTML-encoded inventories and collection-level descriptions. In both models, contributors share through primarily manual processes based on deliberate decisions to participate in the common service. The technical solutions for sharing finding aids in these models therefore do not lend themselves well to sharing with other services.

This one-by-one approach to sharing does not support the wide distribution of data that is essential for archives to participate fully in a constantly changing information environment. The digitization and online presentation of portions of collections from both libraries and archives has helped to push the issue of widely sharing descriptive metadata, including finding aids, to the forefront in these respective professions. But the drive to share is not limited to materials that are themselves available online. Shared metadata itself is of value. Services such as ArchiveGrid are prime examples of the value of sharing, but they are limited

[12] *National Union Catalog of Manuscript Collections*, available at http://www.loc.gov/coll/nucmc/, accessed 14 August 2008. *NUCMC* and other sources have also been integrated into the commercial product Archive Finder.

[13] Charlotte B. Brown and Brian E. C. Schottlaender, "The Online Archive of California: A Consortial Approach to Encoded Archival Description," *Journal of Internet Cataloging* 4, no. 3/4 (2001): 99; Online Archive of California, see http://www.oac.cdlib.org, accessed 10 August 2008.

[14] ArchiveGrid, see http://archivegrid.org, accessed 10 August 2008.

to sharing within the archival community. Archival descriptive metadata could have great value to other communities as well.

In many cases, shared archival descriptive metadata can be of use to those with whom archives have no pre-existing relationships, to create "mashups"[15] combining archival metadata with that from other (including commercial) sources. Records with a geographic component, such as architectural records, could be plotted on historic or contemporary maps and integrated into services such as Google Earth.[16] Correspondence could be integrated with services offering biographical data, such as Wikipedia,[17] the Internet Movie Database,[18] or the Congressional Biographical Directory.[19] Almost any records could be plotted on a visual timeline with records from other repositories if machine-readable date information is available, or incorporated into services such as the Electronic Cultural Atlas Initiative.[20] Yet not only descriptive metadata about archival holdings can be of use in the shared environment. Structured descriptions about the creators of archival resources could be useful in many ways, for example, as raw material for mashups through services like Open Calais,[21] which offers automated creation of semantic metadata that can be used to build enhanced discovery systems.

This model of wide and unrestricted sharing is relatively new for archivists, who are accustomed to mediating access to archival collections. Open sharing means sacrificing control over what will be done with an archives' metadata. This sacrifice can be uncomfortable as it represents a change in the current practice. But openness is in keeping with the overall spirit of archives. The concept that records exist to be used is a core archival value.[22] Indeed, James O'Toole and Richard J. Cox assert that "archivists fulfill only half their responsibility to make records available if they simply sit and wait for users to come to them." They argue that "this responsibility implies the necessity of sharing information about what is in each archives," and that "archivists accomplish this by disseminating information about their collections in as many ways as they can."[23] Making archival descriptive metadata openly

[15] Mashup (web application hybrid), see http://en.wikipedia.org/wiki/Mashup_%28web_application_hybrid%29, accessed 10 August 2008.

[16] Google Earth, see http://earth.google.com/, accessed 10 August 2008.

[17] Wikipedia, see http://www.wikipedia.org/, accessed 10 August 2008.

[18] The Internet Movie Database (IMDb), see http://www.imdb.com, accessed 10 August 2008.

[19] Congressional Biographical Directory, see http://bioguide.congress.gov/, accessed 10 August 2008.

[20] Michael Buckland and Lewis Lancaster, "Combining Place, Time, and Topic: The Electronic Cultural Atlas Initiative," *D-Lib Magazine* 10, no. 5 (May 2004), available at http://dlib.org/dlib/may04/buckland/05buckland.html, accessed 10 August 2008.

[21] OpenCalais, see http://www.opencalais.com/, accessed 10 August 2008.

[22] James O'Toole and Richard J. Cox, *Understanding Archives and Manuscripts* (Chicago: Society of American Archivists, 2006), 106.

[23] O'Toole and Cox, *Understanding Archives and Manuscripts,* 128.

available for use and reuse requires archivists to actively participate in and plan for sharing. Archivists will need to strategically prepare for sharing metadata to minimize the impact of the downstream loss of control and structure data in standardized and self-evident ways so that the fundamental archival concept of context can be preserved, as necessary, in increasingly decontextualized environments.

Shareable Metadata

Simply opening up access to an institution's local metadata has not been as effective in creating high-value metadata aggregations as the cultural heritage community originally expected. The notion of "shareable" metadata as distinct from local metadata has recently emerged in the wake of increased expectations for making descriptive metadata openly available and the development of new technical protocols for machine-to-machine sharing of metadata, including the Open Archives Initiative Protocol for Metadata Harvesting (OAI PMH).[24] Large-scale metadata aggregators such as OAIster[25] pool together descriptive metadata from multiple institutions. Their experiences show that metadata optimized for local use frequently falls short of meeting the needs of an aggregated environment, when metadata from one institution is combined with that from many others.[26]

Shareable metadata, therefore, is designed explicitly to operate in an aggregated environment and represents a descriptive *view* of the resource optimized for this particular use, different from the locally useful view of the resource. In essence, a shareable metadata record is a second copy of a descriptive record, designed explicitly for sharing. Ideally, this shared view can be generated automatically from the "master" metadata record stored locally. There is no truly neutral descriptive metadata record—every decision the metadata creator makes regarding metadata structure, vocabularies, level of description, and so on has an effect on the uses that can be made of that record and the user groups for which it is most valuable. This shared view of the record should therefore be designed with a *use* and *audience* in mind, recognizing that if some uses will necessarily take preference over others, the primary uses should be explicitly determined. While shareable metadata is designed to facilitate machine processing of data, in the end, these machine processes generally create services for human users.

[24] Open Archives Initiative Protocol for Metadata Harvesting, see http://www.openarchives.org/pmh/, accessed 10 August 2008.

[25] OAIster. . .Find the Pearls, see http://www.oaister.org, accessed 10 August 2008.

[26] Sarah L. Shreeves et al., "Is 'Quality' Metadata 'Shareable' Metadata? The Implications of Local Metadata Practice on Federated Collections," in *Proceedings of the Twelfth National Conference of the Association of College and Research Libraries, April 7–10 2005, Minneapolis, MN*, ed. Hugh A. Thompson (Chicago: Association of College and Research Libraries, 2005), 223–37, available at https://www.ideals.uiuc.edu/handle/2142/145, accessed 29 January 2009.

Providing this optimized shared view requires two phases in implementation: 1) understanding and applying the principles of shareable metadata during initial descriptive metadata creation, and 2) providing the technical means of generating the shared record, ideally using automated rather than manual processes. As metadata aggregations grow and expand, local descriptive metadata increasingly appears in new and unanticipated environments. Ensuring that descriptive metadata is shareable is an important step toward promoting its use in these emerging and perhaps even currently unimagined services. While metadata records necessarily are optimized for particular purposes, records intended for sharing can adhere to a few simple principles to increase the probability that they will be useful for purposes beyond those originally intended. These principles for shareable metadata can be seen in a simple framework, described in more detail elsewhere[27] but summarized briefly here.

The Six Cs and Lots of Ss of Shareable Metadata

- **Content.** The shared metadata record as a whole should be optimized for the shared environment, rather than the local environment. It should support the most common features of current metadata aggregations, including metadata useful for indexing, display, or batch enhancement; identify any controlled vocabularies in use; and describe resources at the appropriate granularity.
- **Consistency.** Consistency breeds reliability, which is essential in increasingly automated environments. No matter what other shareable metadata principles are used, consistent records allow more effective batch processing.
- **Coherence.** Shared metadata records are commonly used without access to the resource itself and, therefore, should make sense on their own, without needing additional knowledge of the materials or the repository.
- **Context.** Effective shared records include both *enough* context, explicitly including information assumed in a local environment, and *just* enough context, excluding system-specific information and information not supporting functions of aggregators.
- **Communication.** While the metadata aggregation environment is largely automated, humans are involved at certain points. Communication between content providers and aggregators can happen in two ways: making use of structured, automated means of documenting practices

[27] Sarah L. Shreeves, Jenn Riley, and Liz Milewicz, "Moving Towards Shareable Metadata," *First Monday* 11, no. 8 (2006), available at http://www.firstmonday.org/issues/issue11_8/shreeves/index.html, accessed 10 August 2008.

when allowed by the sharing protocol, and taking advantage of humans when the opportunity arises.

- **Conformance to Standards.** Metadata structure standards, markup languages, vocabulary standards, encoding standards, content standards, and technical standards are some of the many types of standards in play when sharing metadata. To support shareable metadata, standards in each relevant area should be carefully chosen and conformed to.

Applying Shareable Metadata Principles to Archival Description

When optimizing shared archival descriptive metadata for a particular use and audience, the first step is defining and understanding the primary user groups for archival collections. As archivists we should not be limited by the user groups who have historically walked in the doors of our repositories (although we certainly cannot ignore them), but we should instead think more widely about how archival collections can be used if they are more widely accessible. Decisions on optimizing metadata for sharing must be evidence based, supplementing professional judgment with data gained from studies designed to learn more about user needs for archival collections.

All of the principles of shareable metadata outlined here can be applied to archival description, but perhaps the most significant for archives are context and content. Context is a fundamental concept in archival description and must find its appropriate place in the shared environment. Although the contextual information typically supplied by archivists should be available to the user at the point of need, how and when that context should be presented may vary based on the environment and the user. Archivists have traditionally focused on the "organizational, functional, and operational"[28] contexts of archival materials and their relationships, or the provenance- and custody-based contextual information sometimes contained in archival descriptions, but other contexts also need to be acknowledged. Context itself is not homogenous, as users will bring their own contexts to the materials. Sharing metadata requires a leap of faith and represents a significant decrease in the degree of control an institution exerts over its descriptions and the context in which they appear. This is a fundamental tradeoff in an open networked environment, and archives can mitigate this loss of control in part by also developing their own systems for the delivery of archival descriptive metadata. A workable balance in shared records will allow the shared record to contain enough context to make sense, but not necessarily replicate entirely a local presentation of archival descriptive

[28] Richard Pearce-Moses, *A Glossary of Archival and Records Terminology* (Chicago: Society of American Archivists, 2005), available at http://www.archivists.org/glossary/, accessed 21 November 2008.

metadata, complete with all the nuances of multilevel description. Metadata aggregations are not intended to replace archives-focused discovery mechanisms, but rather to supplement them.

Content is the second of the features of the shareable metadata framework that are most relevant to archives. Selecting the appropriate level of granularity for shared records is the greatest significant challenge facing archives that are making their descriptive metadata openly available for reuse. Most discussion and applications of shareable metadata in the cultural heritage sector have occurred in the digital library rather than in the archival arena. The most notable evidence of the library-style approach is a general assumption that resources to be shared have item-level descriptions, an assumption that does not necessarily hold true in the archival world, where rich collection-level and multilevel descriptions are available more often than item-level descriptions. For some uses of shared records, an item-level description would be most appropriate. But for other uses, a series-level, file-level, collection-level, or even a full hierarchical multilevel description might be best. Each of these would be of use only to an aggregator that understood the descriptive approach being applied and the metadata standards appropriate for the expression of that approach.

Archivists will need to address other challenges in making archival data more shareable. Most metadata aggregations take a record-centric approach to data, with each record standing on its own and data in those records in predictable places. Archival finding aids marked up in EAD employ a document-centric approach, starting from the finding aid as a document and adding eXtensible Markup Language (XML) tags around bits of its text to label specific features. While EAD can be generated from data stored in a relational model, or presented to the user in nontraditional, more data-centric ways, the schema itself is fundamentally document-centric. It is designed to capture and represent archival description as a single hierarchical document, that is, a finding aid. EAD, while the vehicle for encoded descriptive metadata in the archival world, is not a metadata structure standard in the same way that the Dublin Core Metadata Initiative Metadata Element Set (DCMI Element Set)[29] or the Metadata Object Description Schema (MODS)[30] is. Instead, its document-centric approach draws its inspiration more heavily from markup languages—encoding features of the text of a finding aid as they typically appear in local print and online access systems. This approach contrasts with the record-centric approach of defining a finite number of "buckets" (fields) for data, in predetermined combinations, that individually must be either filled in or determined not to be applicable. EAD contains features of markup languages, such as a

[29] Dublin Core Metadata Element Set, Version 1.1, available at http://www.dublincore.org/documents/dces/, accessed 10 August 2008.

[30] Metadata Object Description Schema: MODS, see http://www.loc.gov/mods/, accessed 10 August 2008.

mixed content model, formatting information, and structural information such as lists and paragraphs, that are not found in other descriptive metadata structure standards. An EAD-encoded finding aid is therefore both metadata about an archival collection and its contents, and a document in and of itself. The finding aid is not just a simple inventory—it is a full narrative, not easily or losslessly[31] converted to a form usable by record-centric systems.

As discussed later in this paper, EAD-encoded finding aids are a fundamental building block of sharing archival descriptive metadata. EAD encoding on a large scale is, of course, still a significant challenge for many repositories struggling with adding EAD to an already overloaded workflow, while backlogs grow. The More Product, Less Process (MP/LP) movement, promoting strategies to address this problem, takes a pragmatic approach: "It must be our aim to provide sufficient physical and intellectual access to collections for research to be possible, without the necessity of processing each collection to an ideal or arbitrary standard."[32] Just as the MP/LP approach is not fundamentally incompatible with EAD, it is also not incompatible with the creation of shareable metadata. MP/LP advises archivists to match the description of a collection to its relative value and importance, and the shareable metadata principles similarly advise sharing an *appropriate* description for whatever level of resource has been chosen, rather than outlining one monolithic specification to which all descriptions must comply.

Other challenges to creating shareable archival descriptive metadata are technological. Currently, the primary machine protocol for sharing metadata is the OAI PMH. This protocol operates with the notion of a *repository* that contains *items*. An item to the OAI PMH is "a constituent of a repository from which metadata about a resource can be disseminated."[33] It is not necessarily a physical item, therefore, and could instead be any level of description desired, although most metadata aggregators using OAI PMH do assume item-level description. The OAI PMH requires a metadata record in simple Dublin Core for each item represented in the repository. Repositories can supplement this simple Dublin Core record with a metadata record in any format, so long as it is defined by a W3C XML Schema.[34] As of December 2006, EAD2002 is available as a W3C XML Schema as well as the original DTD, so for some time now there has been an official version of the EAD language available to use with OAI PMH.

[31] "Lossless" describes a process by which a metadata record can be transformed into another format and back without permanently losing any information. It is borrowed from digital media files, where file formats and compression schemes are either lossless (where the full original data can be restored from the file at any time) or lossy (permanently discarding information deemed unimportant for the intended use).

[32] Greene and Meissner, "More Product, Less Process," 237.

[33] The Open Archives Initiative Protocol for Metadata Harvesting Protocol Version 2.0, available at http://www.openarchives.org/OAI/openarchivesprotocol.html, Section 2.3, accessed 10 August 2008.

[34] W3C XML Schema, available at http://www.w3.org/XML/Schema, accessed 12 November 2008.

Early experimentation with sharing archival data over OAI PMH, prior to the official EAD2002 XML Schema, gave mixed results. Analysis at the University of Illinois, designed to determine the effectiveness of sharing data derived from finding aids via OAI PMH, preliminarily concluded that it might not be as hopeless as it first seemed.[35] However, follow-up work to "flatten" the hierarchy of a component list in EAD into component-level Dublin Core records with pointers to other levels, rather than explicit inclusion of data from other levels of description, showed barriers to effective indexing and display.[36] This implicit rather than explicit approach to component-level records does not conform to the shareable metadata principle of coherence, as metadata aggregators using these records must recognize the pointers to external data and understand how to act on them before the records are indexed. An explicit approach to this problem would be more transparent for metadata aggregators that do not specialize in archival data, but the indexing and display issues would still persist. A method newly available to the archival community with the release of the EAD2002 XML Schema—defining the OAI PMH "resource" at the collection level, with a collection-level simple Dublin Core record available, and perhaps the full EAD finding aid as a supplemental metadata format—would seem to be the most promising at this time.

Despite these challenges, there is great promise for truly shareable archival metadata, both with other archives and with wider nonarchival environments. In many cases, archives are already sharing descriptive metadata, through participation in consortial EAD creation and delivery or services such as ArchiveGrid that aggregate archival descriptions in a variety of formats. The archival community can build on these first steps toward sharing of metadata to incrementally increase its comfort level with promoting its open use. And, while OAI PMH is in wide use, it is not the only protocol available for the sharing of metadata. Some emerging alternatives that might prove a better fit with multilevel description than OAI PMH will be discussed later in this paper.

Many possible strategies exist for archives to expose shareable metadata for use in new and unanticipated environments. The long-used staple of collection-level records is likely to continue to remain a viable and useful option. Describing resources at the item level, while not practical for most collections, may be a good choice for a select few. Working within the existing multilevel description environment is, however, probably the most effective overall approach. Several options may be used and might potentially operate simultaneously. Archives could collaborate to build metadata aggregators that understand multilevel

[35] Christopher J. Prom, "Does EAD Play Well with Other Metadata Standards?," *Journal of Archival Organization* 1, no. 3 (2002): 51–72.

[36] Christopher J. Prom, "Reengineering Archival Access through the OAI Protocols," *Library Hi Tech* 21, no. 2 (2003): 199–209.

description and make full use of EAD-encoded hierarchical finding aids. Alternatively, EAD files could contain file- or series-level data, with links out to an external system providing more granular description, perhaps in a metadata structure standard such as MODS or Dublin Core. This method is already in use at the Online Archive of California.[37] In any case, designing multilevel description carefully, with shareable metadata principles in mind, promotes reuse of this description at the file- or item-level into the future.

Making the Best of Legacy Data

Shareable metadata principles are best applied when the description of a resource is first created, but applying them to legacy data as well is both possible and desirable. Unless the institution has been very disciplined in its archival description program (or has a short history), consistency issues in descriptions will likely require some data cleanup. Given the amount of data facing most archives, the creation of shareable metadata from legacy finding aids cannot be a manual process. Identifying *any* consistent formatting that exists could help automate the transition and make the best of it. If container lists are recorded in tab-delimited word processed files or spreadsheets, macros and scripts can be used to automate conversion to the EAD <dsc> section. Built-in tools in word processing and spreadsheet programs familiar to many can be used to improve the consistency of data before the conversion to EAD. These include find/replace, styles, and data filtering features. Date normalization routines can be run, either on legacy data or its EAD representation.[38] "Boilerplate" data that applies to all collections, or all components within a collection, or that is assumed by a local environment, can be added automatically when using scripts or other programming methods to generate EAD documents from legacy descriptions. If no inventory exists, a basic collection-level finding aid can be created from a collection-level MARC record and can be filled out more fully later if time permits.[39]

[37] See, for example, Genie Guerard and Robin L. Chandler, "California Cultures: Implementing a Model for Virtual Collections," *Journal of Archival Organization* 4, nos. 1–2 (2006): 45–67 and Adrian L. Turner, "Committing to Memory: A Project to Publish and Preserve California Local History Digital Resources," *Journal of Archival Organization* 4, nos. 1–2 (2006): 11–27 for more information on how this is implemented at the California Digital Library.

[38] One date normalization tool can be found at http://www.archivists.org/saagroups/ead/tools. html, accessed 22 November 2008.

[39] This conversion can be done by transforming MARC to MARCXML using a number of software packages, including the Library of Congress's MARCXML Toolkit, available at http://www.loc.gov/standards/marcxml/marcxml.zip, then using a MARCXML to EAD XSLT stylesheet. Tools such as MarcEdit, available at http://oregonstate.edu/~reeset/marcedit/html/, can also perform this transformation, both accessed 22 November 2008.

Although an institution largely loses control of metadata once it is shared, it can and should have a great deal of control over creating the metadata to be shared in the first place. Determining the appropriate level of granularity for shared records begins with an analysis of the features of existing metadata. "Flattening" multilevel descriptions into individual lower-level descriptions might be feasible for more recently created finding aids designed with this purpose in mind, but might not be successful for legacy finding aids. Documenting descriptive practices and making this documentation available to aggregators, especially if re-engineering of the legacy description isn't feasible, will allow these aggregators to better understand and reuse an institution's metadata. If some re-engineering of legacy descriptions is possible (and for new descriptions), adherence to standards, most notably *DACS* and EAD for archives, promotes consistency of description that forms the core of effective shareable metadata.

DACS and the Creation of Shareable Metadata

Though sharing archival descriptive metadata outside of local systems is a primary strategy for increasing access to archival materials, accommodating additional, labor intensive steps in the archival workflow is not generally feasible. Many repositories still struggle to integrate the creation of EAD finding aids into their processing workflow without treating every finding aid as a legacy description to be encoded after it is created in a word processor. The push to decrease backlogs and reveal hidden collections by adopting less intensive processing procedures competes with pressure to digitize and create item-level descriptive metadata for more archival materials. Fortunately, it is possible to create shareable metadata while minimizing additional labor by creating quality shareable descriptions in the first place and streamlining workflows as much as possible. Archival standards and tools provide a framework to allow archivists to create shareable metadata readily without adding more steps to their workflow.

Creating quality, reusable metadata requires a content standard[40] developed to address the needs of the twenty-first-century descriptive environment, where archivists, librarians, and museum professionals may wish, or even be expected, to take advantage of multiple standards for encoding data. *DACS,* the current U.S. archival content standard, is output neutral and is not tied to a single data structure or encoding scheme. Descriptions created according to *DACS* rules can be encoded in a variety of metadata schemas, such as EAD, MARC, MODS, or Dublin Core. For example, a title created according to *DACS* rules can be used in a printed finding aid:

[40] A content standard provides guidelines for formulating the content of a descriptive element. For example, a content standard may guide the selection and order of terms in a supplied title. *DACS* provides rules for the content of twenty-five descriptive elements.

```
Title: Charles and Ray Eames papers
```

An EAD encoded finding aid:

```
<ead:unittitle>Charles and Ray Eames papers</ead:unittitle>
```

A MODS record:

```
<mods:titleinfo>
  <mods:title>Charles and Ray Eames papers</mods:title>
</mods:titleinfo>
```

Or a Dublin Core record for OAI PMH harvesting:

```
<dc:title>Charles and Ray Eames papers</dc:title>
```

In each case, the *content* of the field remains constant even as the encoding requirements of each data structure change. The ability to reuse content in multiple encoding formats gives archivists more flexibility in sharing descriptions with a variety of different aggregators, both within and beyond the archival community.

DACS is compatible with shareable metadata principles in other ways. The creators of *DACS* realized that most, if not all, archival descriptions will be published online and largely used without mediation by an archivist. Including appropriate contextual information in the shared record itself is essential to make that record shareable. The minimum requirements for *DACS*[41] include two elements that provide context necessary for the online environment, whether published on the repository's own website or shared with an aggregator: the Name and Location of Repository, and Language and Scripts of the Material elements.

One potential barrier to creating shareable archival descriptive metadata is consistency. This may stem from a traditional reluctance to standardize the description of archives and manuscripts that are by their nature unique, organically created materials. *DACS*, although it is a standard, provides room for flexibility, referring to the need for professional judgment and understanding of a repository's context in deciding how to apply *DACS* rules.[42] *DACS* does, however, encourage institutions to document their policy decisions and apply them consistently. Archivists interested in creating shareable metadata can use the principles described earlier to inform the development of these internal guidelines for applying *DACS*. Recording local application of *DACS* rules in a processing manual or other document and making that document openly available on the Web will then help ensure consistency across descriptions and later assist aggregators or the institution itself process and reuse descriptions—applying the communication principle of shareable metadata.

The use of data value standards (controlled vocabularies) is also important in creating useful shareable metadata. Although *DACS* does not provide rules for

[41] *Describing Archives: A Content Standard*, 8.

[42] *Describing Archives: A Content Standard*, 4.

subject access points, it encourages archivists to provide subject access points in all descriptions and to use controlled vocabularies and authority files.[43] Using standardized forms of subject terms and names enables the content of access points in archival descriptions to be compatible with others' descriptive metadata—archival or not.

EAD and the Exchange of Shareable Metadata

EAD is another archival standard that assists archivists in creating shareable metadata while helping to minimize additional work. EAD is a standard that identifies and defines data elements and also specifies an XML syntax for encoding those elements. In many ways, archivists' engagement with EAD laid the foundations for the profession to create shareable archival metadata. In ways far beyond the practice of contributing collection-level MARC records to union catalogs, EAD gives archivists more experience with sharing descriptive metadata outside of their own repositories, particularly since many EAD implementations are collaborative. EAD also requires that archivists think about archival description outside the repository context and consider the usability issues of publishing finding aids for a general audience.[44] These same kinds of user-based evaluation will continue to be necessary as more archival descriptions are available to aggregators where they will be intermixed with descriptive metadata records for many other kinds of resources and accessed by users who may have little experience with archival descriptions and archival materials. The fact that EAD is an XML schema is also advantageous to archivists interested in sharing descriptive metadata, as our relatively long history with XML gives us an understanding of and experience with this technology that is currently at the core of metadata sharing efforts.

Archival descriptions encoded in EAD are also to varying degrees machine processable, able to be parsed and manipulated by a computer without human intervention. Because EAD encoding allows a computer to "understand" what the content is, it can then process that content appropriately. This makes it possible to repurpose data, even in ways that may not have been originally anticipated by the encoder. For example, the EAD files created in the late 1990s, while the standard was first being propagated, can now be converted automatically into collection-level, shareable OAI PMH-compliant Dublin Core records.

[43] *Describing Archives: A Content Standard,* xviii.

[44] A literature review on user studies of archival finding aids through 2004 can be found in Lisa R. Coats, "Users of EAD Finding Aids: Who Are They and Are They Satisfied?," *Journal of Archival Organization* 2, no. 3 (2004): 25–39. For more recent work, see, for example, Christopher J. Prom, "User Interactions with Electronic Finding Aids in a Controlled Setting," *American Archivist* 67, no. 2 (2004): 234–68; Wendy Scheir, "First Entry: Report on a Qualitative Exploratory Study of Novice User Experience with Online Finding Aids," *Journal of Archival Organization* 3, no. 4 (2005): 49–85; and Xiaomu Zhou, "Examining Search Functions of EAD Finding Aids Web Sites," *Journal of Archival Organization* 4, nos. 3–4 (2006): 99–118.

For shareable metadata purposes, consistency in encoding is as important as consistency of descriptive content. Batch processing of EAD is generally content-agnostic and relies instead on the encoding itself. The use of date normalization, the level attribute for components, and the source attribute to indicate controlled vocabularies also improves the extent to which EAD-encoded finding aids are machine processable.

That EAD is an XML schema is a benefit for archivists wanting flexible, interoperable descriptive metadata. XML and its related standards[45] provide a technological means of generating the shared metadata record from the local metadata record. It can be very simple to translate data from one XML schema into another using XSLT. This allows an archives to more easily convert an EAD-encoded finding aid (or part of it), to OAI PMH-compliant Dublin Core or to MODS, for sharing outside the archival community. The following code excerpts present a small example of how XSLT can convert one type of XML into another.

EAD-encoded finding aid:

```
<ead:unittitle>W.E.B. Du Bois papers</ead:unittitle>
```

XSLT stylesheet:

```
<xsl:for-each select="ead:unittitle">
  <mods:titleInfo><mods:title>
    <xsl:value-of select=".">
  </mods:title></mods:titleInfo>
</xsl:for-each>
```

MODS record:

```
<mods:titleInfo>
  <mods:title>W.E.B. Du Bois papers</mods:title>
</mods:titleInfo>
```

Developing an XSLT stylesheet can be complicated and may require more advanced technical skills than some archivists have. However, shareable metadata efforts in general are collaborative efforts, and implementing processes to create shareable metadata in any repository is likely to require assistance from information technology staff. In addition, once a stylesheet is written it can be used to convert any number of finding aids provided that the data in those finding aids has been consistently encoded. Indeed, the archival community could potentially capitalize on its investment in creating shareable metadata if archivists share stylesheets, tools, and best practices as well as the metadata itself. This has certainly been the case with EAD adoption, where many institutions

[45] The W3C has published a number of specifications for extending and processing XML. The example in this section uses XPath, available at http://www.w3.org/TR/xpath and XSLT available at http://www.w3.org/ TR/xslt, both accessed 22 November 2008.

have gained from the availability the tools and stylesheets provided in the *EAD Cookbook.*[46]

The need to create shareable metadata that can be automatically generated from a repository's EAD-encoded finding aids will likely have implications for EAD workflow. As stated previously, conformance to published best practices,[47] particularly the rigorous use of date normalization, the level attribute for components, and the source attribute to indicate controlled vocabularies, will assist both archivists wishing to repurpose their EAD documents and aggregators developing services for shared archival descriptive metadata. Machine-readable dates are increasingly in demand, especially by scholarly users, for time-based discovery of resources in online aggregations of primary sources.[48] An aggregator that accepts native EAD documents and takes advantage of the multilevel description they contain might index or display components at different levels differently in order to provide a more streamlined, user-friendly experience. Explicit statements of vocabularies used when an element is under authority control can allow aggregators to build subject browse features, or map between known vocabularies to better collocate resources. These encoding practices are one example of how the creation of shareable metadata requires an up-front investment. The benefits from this investment for reuse of metadata in external environments, however, are significant.

As with any batch processing of data, automated conversion of EAD into other metadata formats will be more successful if original encoding has been done consistently. Consistent encoding relies on documentation of encoding practices, but technical tools can also help promote consistency. Archival collection management systems that export EAD, discussed in the next section, are one set of tools that can help achieve this goal. EAD XML templates can also be useful for achieving consistency, as can automated reviews of encoding such as those possible with OCLC/RLG Programs' EAD Report Card[49] or the Schematron XML assertion language.[50] Finally, because EAD encoding practices

[46] *EAD 2002 Cookbook,* available at http://www.archivists.org/saagroups/ead/ead2002cookbookhelp.html, accessed 13 November 2008. For a discussion of the *EAD Cookbook*'s impact on EAD implementation, see Christopher J. Prom, "The *EAD Cookbook:* A Survey and Usability Study," *American Archivist* 65, no. 2 (2002): 257–75.

[47] See, for example, RLG EAD Advisory Group, "RLG Best Practice Guidelines for Encoded Archival Description," August 2002, available at http://www.oclc.org/programs/ourwork/past/ead/bpg.pdf, accessed 21 November 2008.

[48] For an example of an aggregation of primary sources that takes advantage of machine-readable dates for search limiting, faceted browsing, and timeline plotting, see American Social History Online, available at http://www.dlfaquifer.org/, accessed 22 November 2008.

[49] EAD Report Card, available at http://www.oclc.org/programs/ourwork/past/ead/reportcard.htm, accessed 13 November 2008.

[50] Schematron, see http://www.schematron.com, accessed 13 November 2008.

can differ so widely, it is more effective when archivists make decisions about flattening their EAD structure into single-level descriptions locally, rather than relying on the metadata aggregator to do so.

Additional Tools for Creating and Managing Shareable Metadata

A lack of digital collections systems supporting the output of multiple metadata schemas has been identified as one of the challenges of creating shareable metadata.[51] Commercial collection management systems are increasingly incorporating EAD support,[52] and some offer MARC export, but a few recently developed open-source systems offer more features for the archivist interested in creating shareable archival descriptive metadata.[53]

Archon, developed at the University of Illinois, Urbana-Champaign, supports accessioning, description, location tracking, and management of authorities and controlled vocabularies. The system offers a direct public interface and also supports MARC and EAD export for sharing descriptive metadata through library catalogs, regional consortia, or services such as OCLC's ArchiveGrid. Capabilities for bulk export of MARC and EAD are in development, and incorporating a built-in OAI PMH data provider for digital object descriptive metadata and full EAD finding aids is under consideration.[54]

The Archivists' Toolkit, originally developed by the University of California, San Diego, New York University, and the Five Colleges, Inc., is an archival collection management system that also promotes the creation of shareable metadata. The Toolkit supports export of EAD finding aids, MARCXML for collections or digital objects, a METS wrapper with either MODS or Dublin Core descriptive metadata for complex digital objects, and both MODS and Dublin Core for digital objects. The Toolkit also provides some support for the creation of a local view and a different shareable view by separating collection management data from descriptive data, and allowing the archivist to identify certain descriptive fields as internal so that exported descriptions are not cluttered with information useful only in the local context.

[51] Shreeves et al., "Moving Towards Shareable Metadata."

[52] For example, Re:discovery Software, at http://www.rediscov.com/; Eloquent Archives, at http://www.eloquent-systems.com/products/archives.shtml; and Cuadra STAR/Archives, at http://www.cuadra.com/products/archives.html, all accessed 22 November 2008.

[53] While this paper focuses on developments in the United States, relevant work is being done elsewhere as well. See, for example, ArchivesHub, at http://www.archiveshub.ac.uk/ and the MEX toolset from the Midosa project, at http://sourceforge.net/projects/mextoolset, both accessed 22 November 2008.

[54] Archon—project Update April 2008, available at http://www.archon.org/ArchonUpdateApril2008.pdf, accessed 12 August 2008.

Emerging Trends in Shareable Metadata

Despite the relative success in the cultural heritage sector of OAI PMH for sharing metadata, using this method alone is not sufficient for the wide and open sharing of metadata archival institutions must embark upon to participate meaningfully in today's information environment. Not long after cultural heritage institutions began implementing OAI PMH, it became clear that the unpredictable nature of the metadata being aggregated made it difficult to provide more than the most basic discovery services on top of it.[55] Two strategies to combat this challenge have emerged, which are not mutually exclusive but are more effective if used in concert. The first is the shareable metadata framework described earlier in this article. The second is to take advantage of the assumption by the designers of OAI PMH that simple Dublin Core was best used only as a baseline for interoperability and that communities of practice would band together to define and implement metadata formats supplementing simple Dublin Core for sharing when such formats were meaningful to those communities. This second approach has been implemented by the Digital Library Federation Aquifer initiative,[56] which harvests descriptive metadata for its American Social History Online service in the Metadata Object Description Schema (MODS) format via OAI PMH. The Aquifer initiative has released a set of guidelines specifically for the use of MODS in shared records.[57]

Yet, the implementation of these strategies via OAI PMH continues to underscore the difficulties in using OAI PMH to share metadata both easily and widely. The National Science Digital Library project, for example, concluded that the OAI PMH was not as "low-barrier" for implementation as its designers originally believed, and that metadata sharing "is less effective in a context of widely varied commitment and expertise."[58] Jim Michalko, vice president, RLG Programs, OCLC, writes of libraries' data storage and exchange standards: "In general our community has opted for high value and low participation choices in this arena. . . . The barrier of our own high acronymic density has made it

[55] Sarah L. Shreeves, Joanne Kaczmarek, and Timothy W. Cole, "Harvesting Cultural Heritage Metadata Using the OAI Protocol," *Library Hi Tech* 21, no. 2 (2003): 159–69; Martin Halbert, "The Metascholar Initiative: AmericanSouth.Org and MetaArchive.Org," *Library Hi Tech* 21, no. 2 (2003): 182–98; Kat Hagedorn, "OAIster: A 'No Dead Ends' OAI Service Provider," *Library Hi Tech* 21, no. 2 (2003): 170–81; Shreeves et al., "Is 'Quality' Metadata 'Shareable' Metadata?"

[56] American Social History Online, see http://wiki.dlib.indiana.edu/confluence/x/4F4, accessed 10 August 2008.

[57] DLF Aquifer Metadata Working Group, "Digital Library Federation/Aquifer Implementation Guidelines for Shareable MODS Records," November 2006, available at http://wiki.dlib.indiana.edu/confluence/download/attachments/24288/DLFMODS_ImplementationGuidelines_Version1-2.pdf, accessed 22 November 2008.

[58] Carl Lagoze et al., "Metadata Aggregation and 'Automated Digital Libraries': A Retrospective on the NSDL Experience," in *Proceedings of the 6th ACM/IEEE-CS Joint Conference on Digital Libraries (JCDL 2006), June 11–15, 2006*, 232 (Chapel Hill, N.C. and New York: ACM, 2006), 3.

more difficult for others (who are operating the platforms where people actually work) to incorporate useful library services and information."[59] The same could be said for archives and museums.

These are strong words, and frightening to those who have worked tirelessly to understand and implement these standards. But they are nonetheless true. Cultural heritage institutions simply must expand the range of ways in which they make descriptive metadata available to others. The cultural heritage community can continue to use high-value protocols when they are demanded to drive advanced services for scholarly and other sophisticated users. But archives, libraries, and museums must *also* get "in the flow," as OCLC's vice president and chief strategist Lorcan Dempsey puts it.[60] This means pushing cultural heritage data out and allowing it to be pulled into more places, particularly those where users (and not just the ones who make the effort to walk into reading rooms) already are. It will require exposing data in ways that allow it to be remixed with data from other sources, used in services that others develop, and taken advantage of directly by users.

Different sharing protocols allow us to reach different types of users and external services. Cultural heritage institutions should consider methods for sharing such as OpenURL,[61] Search and Retrieve via URL (SRU),[62] Open Archives Initiative Object Reuse and Exchange (OAI ORE),[63] RSS,[64] Atom,[65] and the Semantic Web's Linked Data movement.[66] Some of these methods are used primarily by libraries, archives, and museums, but RSS, Atom, and the Linked Data movement reach out into the wider Web world, expanding the reach of cultural heritage organizations into new communities. An RSS feed, for example, can be used to "push" basic descriptive metadata to interested end users who subscribe to a repository's news feed.[67] Implementing methods such as the XML Sitemaps protocol[68] make it easier for online finding aids to be discoverable by Web search

[59] Jim Michalko, "Acronyms—Fragile and High," Hanging Together blog, 14 June 2008, available at http://hangingtogether.org/?p=435, accessed 10 August 2008.

[60] Lorcan Dempsey, "In the Flow," Lorcan Dempsey's Weblog, 24 June 2005, available at http://orweblog.oclc.org/archives/000688.html, accessed 10 August 2008.

[61] Z39.88, available at http://www.niso.org/kst/reports/standards?step=2&gid=&project_key=d5320409c5160be4697dc046613f71b9a773cd9e, accessed 10 August 2008.

[62] SRU: Search/Retrieval via URL, see http://www.loc.gov/standards/sru/, accessed 10 August 2008.

[63] Open Archives Initiative Object Reuse and Exchange, see http://www.openarchives.org/ore/, accessed 10 August 2008.

[64] RSS 2.0 Specification, available at http://www.rssboard.org/rss-specification, accessed 10 August 2008.

[65] The Atom Syndication Format, available at http://atompub.org/rfc4287.html, accessed 10 August 2008.

[66] Linked Data, see http://linkeddata.org/, accessed 10 August 2008.

[67] This is a common feature of institutional repositories, although the basic idea could work for collections of any type. See, for example, the RSS feed for recently added items to the University of Illinois' institutional repository, IDEALS, at http://www.ideals.uiuc.edu/feed/rss_2.0/site, accessed 22 November 2008.

[68] What Are Sitemaps?, see http://www.sitemaps.org/, accessed 10 August 2008.

engines and help to improve the ranking of online finding aids in these search results. Each of these and other options has a slightly different purpose and scope, and some are easier to implement than others. But only by broadcasting cultural heritage data as widely as possible, in as many ways as is feasible, can archives, libraries, and museums meet their fundamental goals of effective dissemination of information.

Next Steps for the Archival Community

Implement Shareable Metadata Principles

Certainly, incorporating principles behind the shareable metadata framework into local workflows, even before metadata is shared, is one method archives could use to make descriptive metadata more shareable. This is an incremental process; it is not the work of a committee or task force over a short period of time. Rather, it is a way of thinking about description, an approach to the process that involves imagining its utility in new environments. This process can begin well in advance of actually sharing metadata—the earlier the better. One specific activity that most archives could benefit from is to design multilevel description with an eye toward how it could be "flattened" in the future to a file- or item-level view, outside the context of the full finding aid.[69] The archival community should engage in discussions about how the hierarchical, contextual information that is core to archival description can best be used in distributed, decontextualized environments. As archivists we must also not limit ourselves to sharing finding aid data. "Authority" and contextual data, such as that for which Encoded Archival Context (EAC)[70] is designed, is also likely to be of significant benefit to third-party services looking to use data from multiple sources to provide high-level discovery and use services.

Implement Sharing Protocols

Implementing sharing protocols that allow data to flow freely among different applications will enable archivists to participate in the wide flow of

[69] Some might argue that a more data-centric view should be introduced into future standards for archival description. The authors of this paper believe these standards should reflect the core values of the profession, which prescribe a hierarchical approach to description. To date, the complexities of hierarchical description have led the archival community to rely on a narrative, document-centric approach. More experience collaborating and sharing metadata with the library and museum communities would hopefully lead to continued productive dialogue between these communities regarding the benefits and drawbacks of harmonizing descriptive practices.

[70] Work on a schema for EAC-CPF (Corporate bodies, Persons, and Families) is underway, and its principles of design indicate a recognition of the needs for reusable, shareable metadata. For more information, see Encoded Archival Context Working Group, "Report, Annual Meeting 2008 Society of American Archivists," available at http://www.archivists.org/saagroups/descr/EACWGReport08.doc, accessed 19 November 2008.

networked information that characterizes the current state of the Internet. Archivists must implement as many sharing protocols as is feasible and demand that the systems used to create and store archival data build in the capability for sharing in multiple formats and via multiple protocols. Tools such as the Archivists' Toolkit and Archon should support the optimization of descriptive metadata for sharing. Existing collaborations that provide consortial systems for delivering archival finding aids can also provide the technical infrastructure for sharing them in appropriate representations.

Collaborate on Best Practices and Tools

As both sharing metadata and working toward making it more shareable require an investment, archivists cannot do this effectively as individuals. The archival profession must find new ways to collaborate, to pool resources to find solutions to these problems that can work across institutional boundaries. While open sharing of documents such as processing manuals is both necessary and a step in the right direction, it is not enough. If archivists communicate what we learn in incorporating shareable metadata principles into archival description, other institutions can build upon that work rather than duplicate it. More predictable data and descriptive practices will also make it easier to reuse tools; investing in shared stylesheets for converting data from one schema to another, for example, would lower barriers for multiple institutions.

Build Metadata Aggregators

While archivists must take active steps to share our descriptive metadata directly with users and with third-party services, we can also begin building high-value aggregations within the archival community. It is likely that external uses of archival data will not be able to make full use of their complexity and context. This presents a significant opportunity for the development of systems that provide rich services (discovery, scholarly annotation, etc.) making the most of the nuances of archival descriptions. Such aggregations would likely collect and process full EAD documents, an activity not likely to be undertaken by aggregators outside the archival community.

Work with Related Communities

In addition to collaborating within the archival community, archivists must also collaborate with closely related communities such as libraries and museums. While the metadata standards can differ among these communities, the

resources being described are often more similar than many realize.[71] These communities can learn from one another's experiences in sharing metadata and work together to promote their common goals. Archives can also use this sort of collaboration to raise awareness of the structure and context in archival finding aids and how it can be taken advantage of in an aggregated environment.

Understand Users

Sharing descriptive metadata often involves promoting completely unknown and unplanned uses of collections. But metadata aggregations within the archival community and archival descriptive metadata in general can greatly benefit from a more in-depth understanding of who is using archival metadata and what they need from archival collections. In addition, archivists would benefit from performing usability studies on the effectiveness of archival descriptions in aggregations with metadata from other communities to understand the challenges users of these systems face when presented with archival metadata and to plan for appropriate solutions. In an environment where it is likely that single-level descriptions will be available in conjunction with multilevel descriptions, archivists also need to understand how these descriptions can work together so that users can navigate among them and recognize their relationships appropriately. Work on "next generation" finding aids,[72] examining how the products of archival description can evolve to take advantage of current technologies and the expertise and devotion of the archival user community, can also inform the design of archival metadata for use in these emerging systems.

As archivists adapt descriptive processes to incorporate recent standards such as *DACS,* to respond to the recommendations of MP/LP, and to begin using newly available tools, we must also understand the principles of shareable metadata and integrate them into archival descriptions. In taking advantage of opportunities for sharing descriptive metadata, we must also recognize that these possibilities will continue to expand, providing the archival community with new and unforeseen ways of increasing use of archival collections and allowing reuse of the metadata itself. Disseminating information about our holdings in as many ways possible is a core responsibility of archivists, and it is essential if archives are to remain viable in a continually and rapidly evolving information environment.

[71] Mary W. Elings and Günter Waibel, "Metadata for All: Descriptive Standards and Metadata Sharing across Libraries, Archives, and Museums," *First Monday* 12, no. 3 (2007), available at http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1386/1304, accessed 22 November 2008.

[72] Magia Ghetu Krause and Elizabeth Yakel, "Interaction in Virtual Archives: The Polar Bear Expedition Digital Collections Next Generation Finding Aid," *American Archivist* 70 (Fall/Winter 2007): 282–314; Max. J. Evans, "Archives of the People, by the People, for the People," *American Archivist,* 70 (Fall/Winter 2007): 387–400; Michelle Light and Tom Hyry, "Colophons and Annotations: New Directions for the Finding Aid," *American Archivist* 65 (Fall/Winter 2002): 216–30.