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"Proposal for IMLS Collection Registry and Metadata Repository"**

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**Findings Pertaining to the Framework of
Guidance for Building Good Digital Collections**

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Introduction

In the spring of 2001, the Institute of Museum and Library Services (IMLS) convened a Digital Library Forum to discuss the implementation and management of networked digital libraries (DLs), including issues surrounding DL infrastructure, metadata, the use of thesauri and other forms of authorities for controlled terminologies, and the use of automated processes for content enrichment, e.g., to better support inclusion of digital resources in curriculum materials and teacher guides. In consultation with a parallel body convened by the National Science, Technology, Engineering, and Mathematics Education Digital Library (NSDL),¹ the IMLS Digital Library Forum created *A Framework of Guidance for Building Good Digital Collections*.

The *Framework*, first published by IMLS in November 2001, is intended to enhance long-term value of digital content and maximize potential for reusability by encouraging institutions to plan digitization projects strategically and to publish digital content so as to facilitate integration with

¹ The NSDL program is administered by the Division of Undergraduate Education, Directorate for Education & Human Resources, National Science Foundation.

other digital collections. It seeks to translate "*indicators of goodness*" which have emerged or are emerging from practice into explicit "*principles*" of practice pertaining to and organized around four core entities: **Collections**, **Objects** (digital content), **Metadata**, and **Projects**. Linkages are made throughout the *Framework* to exemplar digital projects and collections. The *Framework* has since been adopted by the National Information Standards Organization. (NISO Press, 2004, 2nd edition, available: <<http://www.niso.org/Framework/Framework2.pdf>>.) Accompanying the *Framework* was a report from the Digital Library Forum to IMLS. This report recommended both the creation of a collection registry for IMLS-funded digital collections and large-scale experimentation by IMLS grantees with metadata sharing technologies such as the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). The current project is partially an early effort to test and prove benefits of putting into practice a subset of the guidelines and principles articulated in the *Framework*.

This white paper details our findings to date relevant to the *Framework*. We provide sixteen recommendations to NISO suggesting potential ways to improve the impact and/or utility of the *Framework* itself. For selected recommendations, we identify complementary research opportunities for IMLS; these appear as boxed text alongside each relevant recommendation. We base our comments and recommendations largely on observations of practice gleaned over the first three plus years of the current project. Recommendations are meant constructively; our general assessment is that the *Framework* as it stands is good and useful. Our intent is to help make a good tool better. The scope of the *Framework* is broad. By comparison, the scope of our project is narrow. As a consequence, the following discussion bears on selected parts of the *Framework* only; this selective treatment of the *Framework* should not be seen as reflecting negatively on it.

Overview: Applying Principles Articulated by the Framework

Of interest to our project from the outset has been the degree to which principles articulated in the *Framework* are being followed in the IMLS grantee community. Where *Framework* principles are not being followed, why not? Could some of the *Framework* principles be better organized or presented? Is additional clarification needed? Are key concepts conflated? Are some *Framework* principles spurious or not needed? Is the *Framework* not visible enough? What's missing from the *Framework*? Are additional principles or explanations required? What external to the *Framework* itself is needed to make it more useful to the IMLS grantee community? Are there steps IMLS could consider that would further the underlying objectives of the *Framework* -- i.e., enhancing the long-term value and utility of digital content? These questions are addressed here first at a general level, and then in subsequent sections, at a more specific level in regard to digital collections and item-level metadata.

Our general sense, based on the sum of our interactions with grantees, a number of systematic analyses (e.g., analyses of survey results, grantee interactions with the collection-level registry, and analyses of harvested item-level metadata), and anecdotal experience, is that many *Framework* principles remain unrealized for many projects. This does not appear to be due to inherent flaws in the principles articulated by the *Framework*, nor for lack of interest. Our surveys and interview results suggest that most IMLS projects would like to do better in

conforming to those community best practices realizable by and relevant to their projects; however, practitioners continue to struggle to bridge the gap between theoretical goal and practical implementation. The *Framework* and the resources cited in the *Framework* provide the target, but it is not always easy to see the way there. The increased emphasis in the second edition of the *Framework* on case studies was a step forward in this regard, but more is needed to help practitioners put the advice of the *Framework* into everyday use.

RECOMMENDATION 1 (for NISO): Incorporate new content that helps to bridge from *Framework* concepts and principles to practice.

RESEARCH OPPORTUNITY 1 (for IMLS): Explicitly encourage projects, research, and other work that will help operationalize the *Framework*.

Our interviews and surveys of projects also suggest that practitioners are not as aware as might be wished of all that the *Framework* offers in the way of guidance and links to community best practices. The *Framework* is not frequently mentioned or cited as a resource and it is not evident that those aware of the *Framework* generally realize the scope and breadth of what it includes.

RECOMMENDATION 2 (for NISO): Include features (e.g., an implementation checklist) that will make it easier for IMLS and other funders to encourage not only general awareness of the *Framework* as a whole, but also its specific application to individual projects.

Lastly at a general level, we suggest three enhancements to the *Framework* which might improve its overall utility in practice and better support its long-term use and evolution.

RECOMMENDATION 3 (for NISO): Include principles that span multiple of the entities (collection, object, metadata, projects). Combine and/or broaden existing principles tied to single entities which encourage good documentation, sustainability, measurements of usefulness, and descriptions of IP rights with basic entities. Consider new principles that cut across multiple entities.

RECOMMENDATION 4 (for NISO): More clearly articulate a rationale for ordering the principles presented, and provide explicit linkages between principles as warranted.

RECOMMENDATION 5 (for NISO): Suggest specific research, experimentation, and testing that will inform the ongoing evolution and improvement of the *Framework* so that it will maintain its relevance and value over time.

Framework Principles for Good Collections

Framework collection principle 1 recommends that digital collections be "*created according to an explicit collection development policy that has been agreed upon and documented before digitization begins.*" This is good advice. However, as of February 2006 only 8 of 167 Collection Registry entries included explicit information on collection development policy. The lack of

substantial pre-existing collection development policies hint at problems engendered by the opportunistic way that digitization and digital collection creation is undertaken. Too often definitions of digital collections are based more on what can be funded than on classic, systematic collection development principles of what might best serve users. (See Palmer et al. in print for further discussion of this concern.)

Moreover, our research and examination of those collection policies that do exist suggests that many practitioners struggle with the meaning of digital library collections. Many acknowledge this concern (Again, see discussion in Palmer et al. in print.) Collections and projects are sometimes conflated. There is confusion between collection development policy and digitization selection guidelines, which though closely related are not synonymous.

RECOMMENDATION 6 (for NISO): Update the *Framework* to elaborate further on the nature of digital collection identity and the spectrum of good and useful approaches to digital collection development. Make the distinction between collection development policy and digitization selection guidelines explicit, i.e., not conflated (suggesting potential need for 2 separate principles).

RESEARCH OPPORTUNITY 2 (for IMLS): Encourage additional research in this domain to inform the evolution of digital collection development practice.

Framework collection principle 2 suggests that collections "*should be described so that a user can discover characteristics of the collection, including scope, format, restrictions on access, ownership, and any information significant for determining the collection's authenticity, integrity, and interpretation.*" The *Framework* cites two rationales in support of this principle: first, that such description will help users discover collections; second, that such description will help users better understand what they are looking at once they have discovered the existence of a particular collection.

Our success in assembling rich collection descriptions for IMLS NLG digital collections and in implementing a functional Collection Registry suggests that good schemes for collection description are indeed emerging and that collection-level descriptions support useful DL services. The successes of the Research Support Libraries Program (Powell et al. 2000) and follow-on projects in the UK and Europe and renewed interest in the work of the DCMI Collection Description Working Group (partly in response to release of the *Framework* and more directly to the work of our project and others like it) also support this conclusion and suggest that an increasing segment of the community is coming to the realization that quality collection descriptions are useful. Interest from digital content creators and from users of digital content is promising. Through mid 2006 over a third of the NLG projects having collections aggregated in our IMLS DCC collection registry have taken the time to review and edit collection registry records. Interest in the collection registry from users (albeit so far more librarians and others involved in the mediation of information than ultimate end-users) has also been strong as indicated by links to and use of the Registry since its public release in February 2005. (By way of illustration a summary of blog entries pertaining to the IMLS DCC Collection Registry is attached as appendix 1.)

However, there remains a disconnect between practice and interest in collection description. One possible indication is that while 22 of 73 digital resource developers responding to a recent survey reported having sub-collections, only 4 distinguished sub-collections in their top-level collection description records. Collection-level description sometimes is neglected in practice unless mandated from above. We found that pre-existing collection descriptions were poorly if at all structured. Simple, unstructured narrative descriptions of collections tend to be incomplete and inadequate to support machine-to-machine interactions. Ways to fully and unambiguously describe ownership and access-restriction attributes of especially aggregated collections remain problematic. Ways to express relationships among and between collections are limited. This may also indicate changing views of collections and sub-collections in digitized environment. (See discussion in Palmer et al. in print.)

RECOMMENDATION 7 (for NISO): Elaborate further on the importance of complete, standard, (and especially) well-structured collection-level description.

Our research also suggests a benefit of collection-level description not emphasized in the *Framework*. In addition to helping users better find and then understand the nature of collections discovered, quality collection description may help facilitate item-level resource discovery by providing added context for item-level metadata describing resources contained in a collection. An early quantitative analysis of real user queries provides concrete evidence that collection-level descriptions used in combination with item-level description have the potential to facilitate discovery and ranking of items relevant to an end user's query (Foulonneau et al. 2005).

RECOMMENDATION 8 (for NISO): Elaborate existing principles and/or include additional principles in order to better address the emerging significance of collection-item and collection-collection relationships, and stress especially the value of describing collections in the context of other digital resources, i.e., encourage outward-looking description in addition to inward-looking views of the collection.

RESEARCH OPPORTUNITY 3 (for IMLS): Encourage work that features further research regarding and/or applications exploiting structured collection-level description, descriptive granularity, relationships between collections and items / other collections.

Collection principle 3 states, “*Collections built with special internal or external funding should have a plan for their continued usability beyond the funded period.*” According to our survey of IMLS DCC participants, 52 of 71 respondents reported that digital content will be or already has been added to the collection after completion of the grant period. This information suggests that there is interest in not only maintaining, but also adding to the collection after the initial funding period has expired, and suggests that many if not most DL managers in the IMLS NLG grantee community are adhering to this principle.

According to **Collection principle 4**, good digital collections are broadly available, avoiding “*unnecessary impediments to use.*” **Collection principle 5** addresses management of intellectual property rights. While we are not in a position to report on issues relating to interface

accessibility design with respect to individual projects (e.g., supporting access by the visually impaired), we can say that according to our survey, 71 of 73 respondents reported open access (in an intellectual access sense) to their collections. The IMLS DL community is embracing the idea of sharing content by making their collections available to all. To this extent the advice of Collection principles 4 and 5 are being followed across the community. However, while conditions of use statements are common across participating collections, generally collection managers are not reporting this information, and information regarding property rights more generally in a machine-readable format. Machine-readable expressions of intellectual property rights that would make enforcement of IP rights across collections easier to manage remain an issue.

Recommendation 9 (for NISO): Continue to stress the importance of intellectual property rights management and recommend machine-readable formats for expressing these rights.

RESEARCH OPPORTUNITY 4 (for IMLS): Encourage further research and application development to facilitate and move-forward community use and understanding of machine-readable approaches for expressing IP rights and assertions.

Collection principle 6 states, “*A good collection has mechanisms to supply usage data and other data that allows standardized measures of usefulness to be recorded.*” The Framework suggests observation, surveys, interviews, experiments, and transaction log analysis as means to track and evaluate usage and usefulness. Most of our survey respondents to this question (53 of 69) reported tracking usage statistics, suggesting that most digital projects are aware of the importance of evaluating their collections. However, the concept of “usefulness” regarding a digital collection lacks a clearly understood definition. At a minimum functionality, content, and interface all need to be useful in a DL environment. What metrics best support assessments of usefulness are not clear; there are not widely accepted standards in this area at this time.

Recommendation 10 (for NISO): More clearly differentiate between use and usefulness. Change the phrasing of Collection Principle 6 from “standardized measures” to “systematic measures” (due to lack of standardized measures of usefulness).

RESEARCH OPPORTUNITY 5 (for IMLS): Because the differences between use and usefulness are not clear to DL managers, encourage research informing and providing guidance for assessing digital collections and evaluating their usefulness.

Collection principle 7 recommends that “*a good collection fit into the larger context of significant related national and international digital library initiatives.*” According to our user surveys, 15 of 62 projects are contributing to OCLC, and one project explicitly mentioned contributing to the NSDL. While this statistic indicates that more collections could contribute to national and international efforts, it shows beginnings of greater awareness within the community. IMLS projects should be further encouraged to look toward the future to anticipate how they will fit into a larger national effort and how their content will be used by future generations.

Recommendation 11 (for NISO): Continue to emphasize the importance of contributing to aggregating projects, but without specifying individual projects within the principle itself (which tends to focus attention only on these projects). In addition to the larger projects (e.g., NSDL and OCLC), smaller aggregations and registries should be contributed to as appropriate. Additionally, more explicitly address the benefits gained by contributing to aggregations.

Framework Principles for Good [Item-Level] Metadata

The *Framework* specifies (**metadata principle 1**) that "*good metadata should be appropriate to the materials in the collection, users of the collection, and intended, current, and likely future use of the digital object.*" The *Framework* appropriately acknowledges different metadata schemas and their uses within both local and national contexts. Our results to date suggest good awareness within the IMLS NLG grantee community of major metadata schemes. Our survey results indicate at least 8 distinct standard schemas in use across the spectrum of collections in the Collection Registry, in addition to multiple local schemas. A third of the projects we have surveyed use multiple metadata schemas, indicating that many projects (if not yet a majority) are cognizant that metadata can usefully be transformed for different uses and contexts (i.e., that metadata is not monolithic -- see discussion in Shreeves, Riley, and Milewicz 2006). Nonetheless, our analysis of harvested metadata suggests uneven levels of metadata quality even within individual projects. There appear to be several limiting factors -- lack of widely accepted and understood metadata quality metrics, limited vendor system support for more ambitious formats, uncertainty as to the benefits of metadata quality improvements, inconsistency in practice even within individual projects. The situation seems to be improving. New work on metadata quality metrics is emerging (e.g., Bruce and Hillmann 2004), and our sense is that newer projects are creating better quality metadata.

Framework metadata principle 2 extends **principle 1** to emphasize the importance of creating metadata which can be effectively and usefully shared. Again, our research shows that although desirable this principle is not easily realized for many projects, suggesting that shareable metadata quality targets also are proving difficult to achieve. (See Shreeves et al. 2005 for discussion on that.) Projects are still challenged to look beyond local needs. As noted above, we have found considerable variability in harvested item-level metadata quality, both in terms of outright metadata errors and ambiguities and in terms of inconsistent and variable use of metadata attributes essential to enable later reuse in alternative contexts (i.e., completeness of metadata records). For example, in our initial analysis of 154,000 records harvested from 16 IMLS NLG data providers (as documented by Stvilia et al. 2004) the Dublin Core *subject* element appeared in less than three-quarters of all metadata records analyzed, *creator* and *description* elements appeared in only about half of the records, and *coverage* elements (encompassing both spatial and temporal coverage of resources described) appeared in less than 6% of the records. Moreover, *subject* values in a significant number of instances were not from controlled vocabularies. Examining the suitability of harvested metadata in particular for sharing revealed a number of issues and concerns (Shreeves et al. 2005), though here also our qualitative sense is that progress is being made and newer projects are doing better.

These observations regarding metadata quality generally and specifically for purposes of sharing and interoperability suggest four recommendations regarding *Framework* metadata **principles 1 and 2**:

Recommendation 12 (for NISO): Continue to stress the importance of interoperable metadata, better acknowledge the challenges inherent in the creation of high-quality shareable metadata, and emphasize explicitly that metadata is not monolithic. Given how closely coupled principles 1 and 2 are, consider merging or segmenting these two principles, differently than presently done. Include or reference more metrics for evaluating metadata quality in order to help collection managers assess quality of the metadata they are creating.

RESEARCH OPPORTUNITY 6 (for IMLS): Encourage additional research on metadata quality and additional longitudinal analyses of how metadata best practices spread through communities of practice and how metadata quality is changing over time.

RECOMMENDATION 13 (for NISO): Provide a better sense of process and time involved in changing descriptive practices to better account for metadata quality and sharing.

RESEARCH OPPORTUNITY 7 (for IMLS): To engender the creation of metadata more optimized for sharing, continue to look for opportunities to fund projects that emphasize interoperability and the sharing of metadata and document the benefits that accrue from such processes.

In regard to readiness for metadata sharing we are seeing differences by type of institution. While concerns with general metadata quality and completeness are present for all segments of the IMLS NLG community, our experience suggests that museums and archives are often more likely than other cultural heritage institutions to offer high-quality, rich metadata. However, until recently, museums especially have been much more likely to use idiosyncratic metadata schemes and vocabularies. The current edition of the *Framework* does a good job acknowledging the need to meld content from multiple types of institutions. Additionally acknowledge and describe how differences in community traditions can impact steps different institutions must take to achieve some of the goals laid out in the *Framework*.

RECOMMENDATION 14 (for NISO): More explicitly address ways differences in descriptive traditions can affect the path that needs to be taken to create metadata better optimized for sharing.

As metadata sharing and aggregation projects such as ours gain visibility, awareness of metadata quality and interoperability issues appears to be growing and reliance on idiosyncratic metadata schemes decreasing. Since initial release of the *Framework* there are multiple new projects and training initiatives encouraging the use of richer metadata content standards within given communities (e.g., CCO, DACS, RDA). To complement the progress being made by metadata authors, progress also is being made with regard to metadata and terminology registries, and by our project and others with regard to metadata remediation, normalization, and augmentation.

Countering this argument is a recent paper from the NSDL project's Core Integration group (Lagoze et al. 2006) suggesting that foreseeable improvements in data provider produced metadata and service provider mediation will not be enough. At this point we do not share the pessimism of this paper by the NSDL core integration team. Our experience suggests that aggressive collaborative efforts could in the long-term address many of the difficulties identified. Collaboration between data provider and service provider is key, however.

RECOMMENDATION 15 (for NISO): Stress the obligations of DL service providers and their role as collaborators with data providers in enabling and facilitating delivery of DL services across distributed collections of content through the staged creation, normalization, remediation, and enrichment of metadata at multiple points in the metadata use cycle.

Metadata Principle 3 emphasizes the importance of using controlled vocabulary in metadata *subject* elements. We strongly support this principle. Our surveys indicate rather high use of controlled vocabularies among IMLS NLG grantees (75% of respondents use controlled vocabularies for at least one metadata field). Of those using formal terminologies, some are revisiting their thesaurus choices in the hopes of finding terminologies that might more accurately describe their collections. Some collections still do not use any subject thesaurus. Use of controlled vocabularies should continue to be emphasized for all DL collection building. The *Framework* as it stands does an excellent job in this regard.

Our ability to comment as regards *Framework* **Metadata Principles 4, 5**, and to some extent **6** is limited. Our experience to date suggests that most NLG projects have not yet begun to address these aspects of metadata authoring in a full, systematic way. In the commercial sector there have been strides in intellectual property rights (IPR) metadata, but to the extent that rights metadata are addressed by NLG projects at all, they tend to provide for only blanket binary restricted access / unrestricted access statements. There may be work ongoing locally on management metadata, and the management of metadata records as objects in their own right, but if so, we don't see it in the metadata we harvest. To the extent these principles are being addressed by NLG funded institutions, our qualitative sense is that they are being addressed to only a limited degree (i.e., in a lower priority way) and possibly more by museums and archives than by libraries.

Conclusions

The bright-line distinctions between DL objects, collections, projects, metadata, and services are blurring, especially as we go beyond consideration of search and discovery (i.e., IFLA-FRBR Finding functionality) and look at other functions that DL service providers support or want to support - functions like Identify, Select, and Use. Is a thumbnail view of an image resource metadata or a content object data stream? Thumbnails are not needed by service providers to support finding, but are useful in lists of aggregated search results to help end-users identify and select those resources of most interest and relevance to their query. How should annotations associated with a resource be classed? Metadata? Part of the content object? Something else altogether? Again, annotations are relevant for a variety of functions of interest to an aggregator

or service provider. Does a Web service to OCR scanned pages of text held elsewhere create new content or simply instantiate a new data stream of the original intellectual objects represented by the scanned text pages? As models of DL functions evolve, the need for more precise and formal modeling of what constitutes a content object and the relationships among various access views of content objects is becoming evident. Content object models are evolving and becoming more complex (Bekaert and Van de Sompel 2006), and this in turn will have future implications for the *Framework*. There is the near-term prospect of moving from DLs based largely on a "metadata-based economy" to DLs based increasingly on more "object or service centric economies" which might better support Michael Heaney's (2000) view of a flexible and responsive-to-the-individual "information landscape." Our sense is that the *Framework* will need to evolve accordingly. The *Framework's* assumption of highly separable collection, object, and metadata entities has limitations and it may be opportune to reconsider the current approach. These observations lead to our final recommendation regarding the *Framework*.

RECOMMENDATION 16 (for NISO): Address models of and principles relating to DL services and functions, at least to the extent that those models and principles impinge on the other DL entities with which the *Framework* deals.

RESEARCH OPPORTUNITY 8 (for IMLS): Encourage innovative research regarding new models of DL services and interoperability, where such research has the potential to inform the evolution of new and better working definitions of Digital Libraries.

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Appendix I

Online Mentions of the IMLS Collection Registry

Mentions in blogs

<http://www.escholarlypub.com/digitalkoans/2005/07/>
<http://gort.ucsd.edu/mtdocs/archives/diglet/002580.html>
http://librarianinblack.typepad.com/librarianinblack/2005/08/imls_digital_co.html
<http://grove.ufl.edu/%7Erolandc/html/links.html>
<http://hurstassociates.blogspot.com/>
<http://reference.sonoma.edu/snoopings/?p=60>
<http://www.mmkitchen.com/20/>
<http://libcollections.blogspot.com/2005/07/imls-digital-collections-registry.html>
http://www.resourceshelf.com/2005/07/resource-of-week-by-shirl-kennedy_28.html
<http://radio.weblogs.com/0114870/2005/07/23.html#a374>
<http://arashid.blogspot.com/2005/07/digital-collections-registry.html>
<http://www.resourceshelf.com/2005/07/companies-turn-to-knowledge-management.html>
http://www.wisconsinhistory.org/widgit/archives/collections_we_love/index.asp
http://phyllisfavorites.blogspot.com/2005/11/tues-nov-29-2005_29.html
<http://hlcampbell.blogspot.com/2005/11/support-for-digitization.html>

Mentions in subject guides

<http://www.twu.ca/library/whichindmulti.htm>
<http://www.library.southernct.edu/opengeneral.html>
<http://linksammlung.zlb.de/1.2.1.50.0.html>
http://digital.library.pitt.edu/drl/diglib_links.html
<http://www.interleaves.org/~rteeter/interdis.html>
<http://www.library.wvu.edu/ref/subjguides/art/digitimage.html>
<http://ucblibraries.colorado.edu/govpubs/us/histexib.htm>

Appendix II

Glossary of Acronyms

CCO – Cataloguing Cultural Objects

DACS – Describing Archives: A Content Standard

DCC – Digital Collections and Content

DCMI – Dublin Core Metadata Initiatives

DL – Digital Library

IFLA-FRBR – International Federation of Library Associations and Institutions – Functional Requirements for Bibliographic Records

IP – Intellectual Property

IPR – Intellectual Property Rights

IMLS – Institute of Museum and Library Services

NISO – National Information Standards Organization

NLG – National Leadership Grants

NSDL – National Science Digital Library

OAI-PMH – Open Archives Initiative - Protocol for Metadata Harvesting

RDA – Resource Description and Access