

# Metadata Best Practices and Guidelines

Current Implementation and Future Trends

Edited by  
Jung-ran Park

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# Metadata Best Practices and Guidelines

Metadata best practices and guidelines function as an essential mechanism for metadata planning, application and management, and interoperability. There has been a rapidly growing body of digital repositories and collections; accordingly, a wide range of digital projects and initiatives have adopted various metadata standards. Because of differences in the formats and knowledge domains of the resources, it is inevitable that these digital projects and initiatives may have different needs regarding metadata. Therefore, when a metadata standard is adopted in various institutions and organizations, it may have to be modified to reflect the community needs and characteristics of given resources. The flexibility and complex structure of natural language allow for the representation of a concept in various ways. Thus, common understanding and definitions of terms in a given metadata standard is essential for quality metadata generation, management, interoperability and resource sharing. This opens up a pressing need for a systematic examination of documentation practices, an area that up to now has been relatively unexplored. This book begins to fill the research gap through an empirical assessment of metadata guidelines and best practices.

This is a book published as a special issue of the *Journal of Library Metadata*.

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## Introduction

Metadata best practices encompassing metadata guidelines and application profiles function as an essential mechanism for metadata planning, application, and management. Thus, examination of the documentation processes of metadata best practices is essential. There has been a rapidly growing body of digital repositories and collections; accordingly, a wide range of digital projects and initiatives have adopted various metadata standards. Because of differences in the formats and knowledge domains of the resources, it is inevitable that these digital projects and initiatives may have different needs regarding metadata. Therefore, when a metadata standard is adopted in various institutions and organizations, it may be modified to reflect the community needs and characteristics of given resources.

For instance, in the case of the Dublin Core (DC) metadata standard, flexibility is one of the salient characteristics that accounts for Dublin Core's popularity. Although the Dublin Core Metadata Initiative offers a set of standard elements and elementary guides for using DC elements, various versions of metadata best practices and application profiles have been created to serve the special needs of individual digital projects and initiatives. Even based on the same metadata standard, different metadata best practices and guidelines may select different sets of metadata elements. They may also have different requirements regarding other aspects such as controlled or uncontrolled vocabulary and cardinality/metadata element status (e.g., mandatory, optional, repeatable).

In an ongoing exploratory study, we analyze the variations and commonalities among twenty local metadata best practices and guidelines, based on the DC metadata standard, in terms of metadata element status, metadata semantics in relation to label names and definitions/descriptions of metadata elements, content encoding rules, usage of controlled and uncontrolled vocabularies, and locally added homegrown metadata elements (Park, Tosaka, & Lu). Results of the study evince great divergence in the application of the DC metadata standard. Each set of guidelines utilizes different labels, different interpretations of metadata elements, and locally defined homegrown additions and variants to the DC metadata standard. Regarding locally defined homegrown metadata elements, these have the potential to facilitate the information needs of users in local environments. This same flexibility, however, may also engender hindrances in achieving interoperability and

resource discovery across digital repositories (Park et al.; see also study by Han, Cho, Cole, & Jackson, in this issue).

Owing to the flexibility and complex structure of natural language, which allows for the representation of a concept in various ways, there is a critical need for common understanding and definitions of terms in a given metadata standard (Park, 2006). As briefly discussed, when we compare two or more of the locally created metadata best practices, we face issues in relation to interoperability. However, despite problems in achieving interoperability, metadata best practices seem to be fundamental for metadata planning and quality metadata generation.

Heery (2004) points out that local metadata application profiles must be documented and made accessible at least in human-readable form in order to encourage the reuse of existing metadata beyond the immediate local environment. The current level of difficulty in finding information about documentation practices is particularly alarming because the sharing of such local best practices and application profiles in turn may bring forth increased metadata interoperability and facilitate efficient metadata planning, application, and management especially for new digital projects and initiatives.

There is a pressing need for systematic examination of documentation practices. Notably, however, there is a lack of studies that address such needs based on empirical examination of existing metadata guidelines, best practices, and application profiles, particularly through comparative analysis.

## AIM AND SCOPE OF THE SPECIAL ISSUE

The general aim of this special issue is to address such needs and to present current practices and trends in the creation and implementation of metadata best practices, guidelines, and application profiles among various institutions and organizations. It seeks to outline the major issues, challenges, applications and tools, and future perspectives vis-à-vis documentation practices for resource description and access as well as for metadata interoperability and resource sharing across distributed digital repositories.

The special issue includes discussion on metadata decisions drawn from international surveys, locally defined unique fields, educational metadata standards, semiautomatic metadata generation and the Semantic Web. Several case studies present documentation practices and implementation of local best practices for metadata creation and quality control and management. Metadata best practices in relation to collaboration with cross-institutional repositories are also discussed. Best practices in relation to metadata standards (e.g., Dublin Core, Text Encoding Initiative (TEI), Metadata Encoding & Transmission Standard (METS), Metadata Object Description Schema (MODS)) and resource types including electronic theses and dissertations,

electronic texts, and maps are also discussed. Below is a brief introduction to the contributed studies.

## METADATA BEST PRACTICES: ISSUES AND CHALLENGES

In “Metadata Decisions for Digital Libraries: A Survey Report,” Marcia Lei Zeng, Jaesun Lee, and Allene F. Hayes report on IFLA-initiated survey results drawn from over 400 answers covering 49 countries. The aim of the survey is to identify major issues and concerns in terms of the design and planning of digital projects, element set standards, data contents, authority files, and controlled vocabularies and metadata encoding. The survey results will be addressed in *IFLA Guidelines for Digital Libraries*, set to be released in 2010. A workflow chart drawn from the survey results is presented in this paper. The authors emphasize the importance of recognition of the ultimate aim of the creation of metadata element sets, content standards, and value-encoding schemes; namely, the generation of high-quality metadata.

Jane Greenberg, Hollie C. White, Sarah Carrier, and Ryan Scherle, the authors of “A Metadata Best Practice for a Scientific Data Repository” report on the metadata best practices of the Dryad Repository, designed for the preservation, access, and reuse of scientific research publication. Dryad’s efforts directly address the two prongs of the metadata approach: (1) immediate needs to content access in DSpace via an extensible markup language (XML) schema and (2) long-term goal to align with the Semantic Web through the Dublin Core–based metadata application profile. Dryad’s metadata functional requirements are based on simplicity, interoperability and Semantic Web alignment. Machine processable metadata are provided in the Dryad Repository. The authors address the challenges of the project vis-à-vis communication issues among diverse project members, lack of metadata registries fully supporting Semantic Web agents, and limited resource description framework (RDF) data.

The study entitled “Metadata for Special Collections in CONTENTdm: How to Improve Interoperability of Unique Fields through OAI-PMH” by Myung-Ja Han, Christine Cho, Timothy W. Cole, and Amy S. Jackson presents locally-defined unique fields created by a total of 21 CONTENTdm-based collections utilizing the Dublin Core metadata standard. The researchers found that out of a total of 491 fields, 171 are locally defined unique fields that are not in simple or qualified Dublin Core. The unique fields are categorized into descriptive, administrative, and technical metadata. The study shows that 107 (84.3%) out of 127 unique descriptive metadata fields can be mapped onto pertinent DC metadata elements. This indicates that DC metadata semantics affect the correct application of DC standard in local contexts. It also makes clear that collection curators often misunderstand the definition of certain Dublin Core elements, notably <type>, <format>, <source>, <relation>,



and <identifier> (see also Park and Childress, 2009). Insightful strategies are discussed for increasing interoperability of metadata beyond local collections.

In "Implications and Challenges of Educational Standards Metadata," Anne R. Diekema discusses the practice of standards-based education in public elementary and secondary school. The author discusses the difficulties faced by educators in addressing standards in teaching, while relating such issues to educational standards information in the resource metadata. Issues and challenges drawn from educational standards metadata are discussed in depth. The study also reports on the semiautomatic metadata generation tool CAT (content assignment tool) developed at Syracuse University. Through natural language processing and machine-learning techniques, CAT assists catalogers and teachers in providing relevant standards based on the educational resource to which the cataloger and/or teacher assigns standards. The author addresses unresolved issues in semiautomatic metadata assignment while identifying the principal cause of such difficulties: gaps derived from conceptual and vocabulary mismatches between standards and educational resources.

## DOCUMENTATION AND IMPLEMENTATION OF METADATA BEST PRACTICES

The four case studies based on institutional digital repositories discuss experiences and lessons drawn from the implementation processes of locally developed metadata best practices and guidelines. These experiences are invaluable in that they may offer insights and efficient mechanisms for metadata planning and reuse of best practices directed to digital initiatives.

Rebecca L. Lubas, the author of "Defining Best Practices in Electronic Thesis and Dissertation Metadata," reports on a case study drawn from the electronic theses and dissertation (ETD) deposit utilizing open source DSpace at the University of New Mexico. After reviewing current practices for thesis and dissertation metadata creation, the study presents recommendations for enhancing author-submitted metadata, metadata quality control, and enhancement together with cross-walking of the metadata to the library's catalog and training for metadata practitioners.

In "Implementing TEI Projects and Accompanying Metadata for Small Libraries: Rationale and Best Practices," Richard Wisneski and Virginia Dressler present the electronic text encoding project at Case Western Reserve University. The study presents documentation practices including aspects on workflow, TEI headers metadata, structural markup, creation of metadata records, such as MODS, METS and Dublin Core, and, techniques to analyze policies and procedures. It argues for enhanced access to the collection

and a long-term solution to preservation through electronic text encoding projects. It demonstrates the feasibility of implementing such projects, even in small institutions, through proper planning, training and collaborative work.

The study, "Providing Metadata for Compound Digital Objects: Strategic Planning for an Institution's First Use of METS, MODS, and MIX," by Michael Dulock and Christopher Cronin presents the implementation processes of METS, MODS, and the NISO Metadata for Images in XML Schema (MIX) for a collection of digitized Sanborn fire insurance maps at the University of Colorado at Boulder. The study illustrates lessons learned through the implementation of these metadata standards. It offers an in-depth discussion on the decision-making process and insightful strategies regarding implementation of the new metadata structures.

In "Documenting Local Procedures: The Development of Standard Digitization Processes through the Dear Comrade Project," Emily Symonds and Cinda May present a digital project involving the Eugene V. Debs correspondence collection using the digital collection-management software CONTENTdm at Cunningham Memorial Library at Indiana State University. The project is part of the Wabash Valley Visions & Voices Digital Memory Project built upon cross-institutional collaboration and partnerships. The authors present local practices and workflow for the project, including the usage of a metadata template for consistent metadata creation across multiple organizations and collections. Lessons drawn from the project, applicable to other similar projects, are presented.

## FUTURE DIRECTIONS

In summary, the rapidly growing body of digital repositories calls for further investigation of documentation practices. Growing numbers of metadata best practices, guidelines, and application profiles demand novel approaches and techniques for extracting, analyzing, and comparing those locally developed documentations. Such future endeavors may bring forth a better understanding of core and emergent semantics of metadata best practices. This may further contribute to the development of mechanisms for sharable and interoperable metadata. Further studies also lie in the development of integrating best practices with semiautomatic metadata generation applications and tools. Approaches and techniques for converting best practices into machine-processable formats and formalization of metadata best practices are impending areas for future studies.

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Editor

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# **Metadata Decisions for Digital Libraries: A Survey Report**

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*A survey on metadata conducted at the end of 2007 received over 400 answers from 49 countries all over the world. It helped the authors to identify major issues and concerns regarding metadata that should be addressed in the IFLA Guidelines for Digital Libraries. The questionnaire included a question of the roles respondents may have, and five questions of the major concerns in any project that relates to metadata, regarding design and planning of digital projects, element set standards, data contents in a record, authority files and controlled vocabularies, and metadata encoding. Findings from the survey are reported and a workflow chart is included in this paper.*

## **BACKGROUND**

In June 2005, the Librarian of Congress James H. Billington presented a proposal to UNESCO (United Nations Educational, Scientific and Cultural Organization) to establish a World Digital Library (WDL). The objectives of the World Digital Library are to: promote international and intercultural understanding and awareness, provide resources to educators, expand

non-English and non-Western content on the Internet, and contribute to scholarly research. UNESCO and the Library of Congress co-sponsored an experts meeting in December 2006 with key stakeholders from all regions of the world. That meeting resulted in a decision to establish working groups to develop standards, best practices, and content selection guidelines.<sup>1</sup> The working groups are:

1. Selection and content working group
2. User research outreach and marketing group
3. Technical architectural working group
4. Best practices working group (IFLA Working Group on Digital Library Guidelines [WGDLG])

The IFLA (International Federation of Library Associations and Institutions) Working Group on Digital Library Guidelines was one of the four working groups recommended to be established at the conclusion of the UNESCO experts meeting; it is a stand alone IFLA/UNESCO working group. The group has been supported by the WDL, which in return hopes to benefit from the results. Established in May 2007 by IFLA President Claudia Lux, the WGDLG is composed of representatives from several IFLA sections. The group's objective is to develop digital library guidelines and best practices with recommendations on the various aspects of a digital library in order to help libraries build, publish, provide access to, and share digital collections in a standardized way. The guidelines are intended to be used by libraries and other cultural institutions around the world.<sup>2</sup>

At the IFLA WGDLG's first meeting held at the Library of Congress in May 2007, the working group decided to include a chapter on metadata in the *IFLA Guidelines for Digital Libraries*. The authors of this paper, who are working-group members from IFLA Division IV (Bibliographic Control)<sup>3</sup> and the Library of Congress, are responsible for the metadata chapter. In preparing the chapter on metadata for the *Guidelines*, the authors developed a questionnaire that aimed to identify the major issues and concerns regarding metadata and controlled vocabularies that needed to be addressed in the *Guidelines*. The authors then conducted a survey on metadata decisions in late 2007 and analyzed the survey data in 2008. This paper reports the feedback from the survey and the resultant chapter content.

## REVIEW OF RELATED BEST PRACTICES AND GUIDELINES

Metadata decisions may be made at different stages of a digital library project, and intelligent decisions are integral to successful implementation of the project. Questions that arise at the beginning stages of a digital collection project can be all-important and determine the quality and consistency

of all subsequent phases of metadata creation, implementation, and interoperability. Even after a digital collection is built, there may still be metadata-related questions if it is involved in further collaboration and development. Considering metadata as a unique component in a digital collection, *A Framework of Guidance for Building Good Digital Collections*, issued by a NISO working group (2nd edition, 2004; 3rd edition, 2007),<sup>4</sup> presents a set of requirements for metadata. Among them, some have long since been implemented by the conventions of library cataloging (such as, conforming to community standards, supporting interoperability, and, the employing of authority control and content standards), while other requirements pay attention to the newer particular functions of administration, rights management, and preservation. This clearly indicates that metadata creators must have knowledge beyond the application of the rules specified by structure and content standards; they must now be involved in decisions beyond descriptive cataloging, beginning from the very outset of a digital collection project.

The *Handbook on Cultural Web User Interaction*, edited by MINERVA EC (Ministerial NETwork for Valorising Activities in digitisation, eContentplus) Working Group Quality, Accessibility and Usability, suggests an increasing importance of metadata issues in the cultural Web world. MINERVA's seventh principle of quality states: "A good quality cultural website must be committed to being interoperable within cultural networks to enable users to easily locate the content and services that meet their needs." A related document is the *MINERVA Technical Guidelines for Digital Cultural Content Creation Programmes* (2008) which has a full chapter "Metadata, standards and resource discovery." The chapter provides examples along with best practices for descriptive, administrative, preservation, and structural metadata, as well as collection-level description.<sup>5</sup>

Best practices provide guidance and information for the most efficient (least effort and expense) and effective (best results and function) ways of accomplishing a task and are empirically based on repeatable procedures in different settings. Project-based and metadata standard-centered best practices and guidelines have been available for some time for usage in digital collections and digital libraries, and usually include general guidelines that are related to metadata planning. The National Science Digital Library (NSDL)'s *NSDL\_DC Metadata Guidelines*, for example, covers overarching considerations and issues, background knowledge, decisions on what to describe, and appropriate levels of granularity.<sup>6</sup> A comparable document is the *Best Practices for OAI Data Provider Implementations and Shareable Metadata*, a joint initiative between the Digital Library Federation and the NSDL. It includes two best practices guides: (1) *Best Practices for OAI Data Provider Implementations* and (2) *Best Practices for Shareable Metadata*.<sup>7</sup> Similarly, a white paper, "Preliminary Recommendations for Shareable Metadata Best Practices" was released as part of a three-year interim project report for the IMLS Digital Collections and Content Project hosted by the University of

Illinois at Urbana-Champaign.<sup>8</sup> The recommendations emphasized sharable metadata creation, which ensures that data will remain meaningful in a broader context (regardless of the local environment in which it was created).

## DATA COLLECTING

The authors created a questionnaire to identify major issues and concerns regarding metadata that should be addressed in the chapter on metadata in the *IFLA Guidelines for Digital Libraries*. It included

1. a question of the roles respondents may have and
2. five main questions of the major concerns in any project that relates to metadata regarding
  - design and planning of digital projects
  - element set standards (data structure decision)
  - data contents in a record (data content decision)
  - authority files and controlled vocabularies (data value decision), and
  - metadata encoding (data format/technical interchange decision)

The draft questionnaire was distributed to members of the IFLA Cataloging Section's Standing Committee at the August 2007 IFLA conference held in Durban, South Africa. The Standing Committee consists of 20 members from different countries. Based on the valuable suggestions collected during this preliminary review, the questionnaire was revised and transformed into a Web-based form utilizing SurveyMonkey.com's survey tool.

A letter seeking respondents was sent through the IFLA listserv and further forwarded by IFLA members to the professional listservs in their respective countries and communities. During a one-month period (from October to November 2007) over 400 answers from 49 countries in Asia, Africa, North America, South America, Europe, and Australia were received. These included answers from individual professionals as well as collective answers from several national libraries and many institutions. In addition to respondents from the countries who are active members of IFLA Division IV, there were responses from many other countries, including Albania, Azerbaijan, Cameroon, Costa Rica, Jamaica, Lithuania, Malta, Moldova, Mongolia, and Nigeria.

Among the 417 valid questionnaire answers, a total of 413 respondents answered the question "Which of the following best describe your role in your digital collection/digital library project(s)? (Please check all that apply)." The roles of the respondents are summarized in Table 1, with a rank according to the response percentage and count.

About half of the respondents work directly with metadata creation as a creator and/or a supervisor. About 40% have roles beyond creating metadata,

## METADATA BEST PRACTICES AND GUIDELINES

**TABLE 1** Respondents' Roles in Digital Collection/Digital Library Projects (413 Answered, Each Respondent could Choose All that Apply)

Role	Response %	Response #
creating metadata records	47.50	196
supervising metadata and/or cataloging project(s)	45.30	187
consulting on metadata issues	40.40	167
developing policies and best practices	40.40	167
coordinating digital collection/digital library projects	39.50	163
creating and maintaining controlled vocabularies (lists of subject headings, thesauri, taxonomies, etc.) and authority files	32.00	132
teaching and training information professionals	28.60	118
consulting on vocabulary control issues	27.60	114
providing technical support to the digital library projects	21.30	88

which include consulting, policy making, and coordinating for the metadata-related issues and work. Related to these, 32% of respondents' roles include creating and maintaining controlled vocabularies and authority files, and 27% have been consulted on vocabulary control issues. This indicates that vocabulary and authority control is a very important aspect during the whole metadata process. Also, nearly 29% of the respondents have been involved in the teaching and training of information professionals. This is likely because of the demands of dealing with newer metadata standards beyond MARC and a much larger and dynamic metadata creation workforce that requires more up-to-date training than ever before.

Thirty-four (8.2%) respondents chose "Other" as their response. An analysis of these answers found that half of them can be categorized into the roles of coordinating projects, technical support, and education. Additional categories include: information architecture (including interface design, portal administration, and search engine development), marketing and promoting digital libraries, funding, human resource development and management, evaluation, database analysis, and metadata schema development.

### DATA ANALYSIS: RESPONSES TO FIVE "MAJOR CONCERNS" QUESTIONS

Five issues were listed under the second question, "What are the major concerns you have in your project that relate to metadata?" There were two comments indicating that the word "concerns" was not clearly defined since it could relate to "worries." They indicated that people may be "worried" about something because they do not know the best way to approach them, whereas the areas they would be paying the most attention to would be the "concerns." This may have had some impact on specific answers.



Ideally, metadata-related standards should be selected according to their purposes and their relationship to the workflow of a digital library. Therefore, after the first question regarding the overall design and planning, the questions were based on the types of standards that have been created by different communities for specific purposes. They included

- Standards for data structures. Metadata element sets are standards for data structures and semantics (e.g., Dublin Core Metadata Element Set).
- Standards for data content. Data content standards are created to guide the practices of metadata generation or cataloging (e.g., *Anglo-American Cataloging Rules, Second Edition (AACR2)*, *Cataloging Cultural Objects (CCO): A Guide to Describing Cultural Works and Their Images*, and *Describing Archives: A Content Standard (DACS)*).
- Standards for data values (referred to as value encoding schemes in a metadata standard). These include controlled-term lists, classification schemes, standardized codes, thesauri, authority files, and lists of subject headings.
- Standards for data exchange (often referred to as formats in the context of data exchange and communication). They are standards for data exchange, separately designed or bound together with the element sets.

### Question 2.1: Major Concerns—For Designing and Planning of Digital Projects

Question 2.1 intended to form a general picture of the major concerns when designing and planning a digital library as related to metadata. The suggested areas of concerns and responses are listed in Table 2, from the most selected to the least selected.

A majority of the areas listed under this question received responses of over 40% of concerns from 324 respondents. The six areas match, and are consistent with Table 2 and are numerically ordered in the same way.

- to understand possible workflows
- to consider reusing existing cataloging records by integrating them or transforming them to other formats in the new project
- to plan how search functions can be supported by metadata information
- to explore how to include various types of resources in one project
- to learn how to measure and control metadata quality
- to decide upon levels of description (e.g., item level, collection level)

The feedback reflects the changing and challenging nature of current metadata-creation work highlighting how it differs from conventional cataloging work, which has followed only a few established rules and formats for a well-established period of time. A digital library project decision-maker