

**Guidance on the Nature, Implementation, and  
Evaluation  
of Metadata Schemas in Libraries**

*Final Report of the IFLA Cataloguing Section  
Working Group on the Use of Metadata Schemas*

*For the Review and Approval of  
the IFLA Cataloguing Section*

*31 July, 2005*

**Not approved**

<http://www.ifla.org/VII/s13/>

# **Guidance on the Nature, Implementation, and Evaluation of Metadata Schemas in Libraries**

## ***Final Report of the IFLA Cataloguing Section Working Group on the Use of Metadata Schemas***

*For the Review and Approval of  
the IFLA Cataloguing Section*

*31 July, 2005*

### ***Section***

- 1.0 Introduction
  - 1.1 Background to the report
  - 1.2 Working Group's terms of reference
  - 1.3 Working Group membership
  - 1.4 Working Group activities and accomplishments
- 2.0 Using Metadata in Libraries or Other Information-Intensive Organizations
- 2.1 Initiating a Metadata Project
  - 2.2 Selecting a Metadata Schema or Schemas
  - 2.3 Suggested Specific Uses for Metadata Records
  - 2.4 Some Core Attributes in Metadata Schemas

Selected Bibliography of Metadata Resources

Appendices:

- I. Core attributes and their presence in selected metadata schemas
- II. Core attributes in metadata schemas – by frequency of occurrence

# Guidance on the Nature, Implementation, and Evaluation of Metadata Schemas in Libraries

## *Final Report of the IFLA Cataloguing Section Working Group on the Use of Metadata Schemas*

### 1.0 INTRODUCTION

#### 1.1 *Background to the final report*

Over the past decade, the proliferation of electronic texts, images, sounds, and objects stored in Internet- and Intranet-accessible knowledge bases or other digital repositories has increased the potential range and quantity of readily-accessible multimedia information. It has also resulted in what Levy (1990)<sup>1</sup> has referred to as a “second flood”, threatening to drown the engaged searcher in massive amounts of material, both useful and irrelevant. The need to delimit electronic resources more precisely in order to facilitate access has intensified activity in the development of metadata schemas – with metadata generally defined as “data about data”. This “Metadata Movement”, as Baker<sup>2</sup> has described it, has included the development of general application metadata schemas, such as the Dublin Core (DC), the Government Information Locator Service [now Global Information Locator Service] (GILS), or Digital Object Identifier (DOI), as well as domain-specific metadata schemas, such as the Text Encoding Initiative (TEI), the Encoded Archival Description (EAD), the Visual Resources Association (VRA) Core Categories, the Content Standard for Digital Geospatial Metadata (CSDGM), and the Online Information Exchange (ONIX) publishing standard – to name only a few. Such schemas are based on a common “machine-readable” syntax, such as HTML (Hypertext Markup Language), SGML (Standard Generalized Markup Language), or XML (eXtensible Markup Language). Metadata-enabled search engines can thus retrieve by precise metatags and values, those electronic resources in which a metadata record is embedded, or to which a separately housed metadata record points.

#### 1.2 *Working Group’s terms of reference*

In response to a growing international interest in, and application of, metadata schemas<sup>3</sup> the IFLA Cataloguing Section Working Group on the Use of Metadata Schemas was established at the IFLA 1998 Conference in Amsterdam, the Netherlands.

---

<sup>1</sup> Levy, Pierre. 1990. *Les Technologies de l’Intelligence*. Paris: La Découverte.

<sup>2</sup> Baker, Thomas. 1999. Organizing Access with Metadata. *TIAC White Paper on Appropriate Technology for Digital Libraries* at URL: [http://www.tiac.or.th/tiacweb/Baker/Section2\\_3.html](http://www.tiac.or.th/tiacweb/Baker/Section2_3.html). Accessed 31-07-02

<sup>3</sup> For a definition of the term, “schemas”, see URL: <http://www.linktionary.com/s/schema.html>

The Working Group drafted its terms of reference agreeing to focus on outcomes deriving from the following three objectives:

- *Objective 1:* to create an inventory of the development and implementation/application of metadata schemas in different countries
- *Objective 2:* to provide guidance (and ultimately, as appropriate, guidelines) to libraries as to when and/or how best to use metadata records and bibliographic records (catalogue records)
- *Objective 3:* to determine a metadata “core record” – i.e., a set of most commonly occurring elements in selected metadata schemas – that could be used by authors and/or publishers of electronic records to enhance resource discovery, and to provide, where appropriate, elements for incorporation into bibliographic records (catalogue records)

### ***1.3 Working Group membership***

While not all members listed below have been active throughout the full 1998-2005 period, Working Group membership has included the following:

- Fernanda Campos, Portugal
- Lois Mai Chan, USA
- Assumpcio Estivill, Spain
- Christel Hengel, Germany
- Lynne C. Howarth, Canada (Chair)
- Mona Madsen, Denmark (to 2001)
- Dorothy McGarry, USA
- Monika Muennich, Germany
- Eeva Murtomaa, Finland
- Glenn Patton, USA
- Charlotte Pederson, Denmark (2001-)
- Barbara Tillett, USA
- Mirna Willer, Croatia
- Maria Witt, France
- Maja Žumer, Slovenia

In addition, the Working Group has invited input – and, in some cases, representation – from the IFLA Sections on Information Technology, Classification and Indexing, Bibliography, and Libraries for the Blind, as well as from the Permanent UNIMARC Committee (PUC) and the DCMI Libraries Working Group.

### ***1.4 Working Group activities and accomplishments***

In fulfilling its terms of reference, the Working Group held six sets of formal meetings, beginning in Bangkok, Thailand at the IFLA 1999 Conference, and continuing at subsequent annual sessions of the IFLA World Library and Information Congress (WLIC) in Jerusalem, Israel (2000), Boston, USA (2001), Glasgow, Scotland (2002), Berlin, Germany (2003), and Buenos Aires, Argentina (2004). Over the six-year period,

the Working Group concentrated on completing its three objectives (see section 1.2, above). Correspondingly, and in partnership with the IFLA Information Technology Section (ITS), the Working Group presented a program at the IFLA 2000 conference in Jerusalem, Israel, showcasing a number of innovative metadata projects. It also co-sponsored (with ITS) the Metadata Discussion Group (at IFLA conferences in 2000, 2001, and 2002), and engaged in discussions with the DCMI Libraries Working Group. These various efforts culminated in a draft report, *Guidance on the Structure, Content, and Application of Metadata Records for Digital Resources and Collections*, that was posted on IFLANET for worldwide review from mid-November 2003 to mid-February 2004. A paper<sup>4</sup> summarizing comments from the review, and outlining next-steps for the Working Group was presented as part of the IFLA Cataloguing Section program at WLIC 2004 in Buenos Aires, Argentina. Feedback both from the worldwide review, and from meetings at WLIC 2004 of the IFLA Cataloguing Section and the Working Group, respectively, were incorporated into this final report.

### ***1.5 Scope and outline of the final report***

Comments deriving from the worldwide review and from WLIC 2004 meetings confirmed three clear directions for the Working Group to pursue in completing both its final report and its mandate. First was the acknowledgement that, with the obvious intensifying of metadata-focused activity, the initial objective of *creating an inventory* of implementations was no longer feasible. Moreover, it was felt that, with the emergence of metadata registries for identifying and tracking implementations and adaptations of different metadata schemas, there were formal and well-maintained sources for the international bibliographic community to access. The metadata site accessible via IFLANET (<http://www.ifla.org/II/metadata.htm>) provides an excellent starting point for those interested in examples of project implementations. Likewise, the Dublin Core Metadata Initiative (DCMI) site (<http://dublincore.org/>) maintains application profiles for different Dublin Core implementer domains (e.g., libraries; education; government), as well as a DCMI Registry. Other metadata schemas maintain Web-accessible sites with regularly updated schema documentation, project registries, links to other implementers, and helpful contacts. Such resources should be accessed directly by those contemplating or already engaged in a metadata project implementation.

The second clear direction to the Working Group involved restating Objective 2 to read: “To provide guidance to the library community on the nature and implementation of metadata schemes, including bibliographic or catalogue records, so that a project can evaluate and select which scheme will best match the goals of the project.” With this restatement in mind, and building on section 2 of the draft report, the Working Group has summarized a number of high level considerations which should provide initial guidance to libraries undertaking a metadata project. Section 2.0 *Using*

---

<sup>4</sup> Howarth, Lynne C. *Enabling Metadata: Creating Core Records for Resource Discovery*. World Library and Information Congress: 70<sup>th</sup> IFLA General Conference and Council, August 22-27, 2004, Buenos Aires, Argentina. Accessible at: <http://www.ifla.org/IV/ifla70/papers/008e-Howarth.pdf>

*Metadata in Libraries or Other Information-Intensive Organizations*, outlines key points regarding how to initiating a metadata project, how to select and evaluate a metadata schema or schemas, and what elements to consider as important or essential to a metadata record, particularly where records may be shared with other repositories.

The third directive to the Working Group was that of rethinking and recasting totally the third objective. The purpose of the proposed “core of cores” that appeared in section 3 of the draft report was confusing and unclear to most reviewers. While one national cataloguing committee endorsed the concept of the “core of cores”, “... as a framework with the potential to bring about a common, minimal standard and extended interoperability between metadata produced in different projects and by different agents,” others found its articulation as a “core record framework” misleading and largely reflective of the Dublin Core element set. The Working Group elected to recast Objective 3 as suggested by one of the national cataloguing committees that participated in the worldwide review. As the latter noted, “Since librarians are already active participants in the ongoing development of many of the metadata schemas noted in this section, the best way to accomplish the aims of Objective 3 would be through the development of a “library application profile”<sup>5</sup> *specific to any metadata schema that a library might choose to employ, rather than a general across-the-board set of elements meant to apply to any metadata schema.*” In a similar vein, another national agency offered the following:

There is some confusion as to what was intended for the “core of cores”—it seems that it was starting out to describe a core set of elements that should be part of any metadata schema that was designed (a good idea); but, it sometimes implies that these are core data elements that should be in every metadata record (i.e., every metadata record should have something from each of these core elements)—this would be problematic in that not all elements would be appropriate for every record. We suggest the emphasis should be more clearly placed on core elements that should be a part of all metadata schemas, and remove references to a core “*record*” per se.

Thus, the Working Group has elected to include its ten “core” elements within the section in this final report that deals with how to select and evaluate a metadata schema or schemas.

## **2.0 USING METADATA IN LIBRARIES OR OTHER INFORMATION-INTENSIVE ORGANIZATIONS**

The following section offers some high level guidance to individuals and/or libraries contemplating a metadata project. Included are suggestions concerning how to approach a metadata project, the types of metadata that may be required to support the project, and whether or when to use an existing schema or institute a local metadata schema. The section concludes with some recommendations concerning the most

---

<sup>5</sup> This terminology comes from the Dublin Core Metadata Initiative, where such a profile has been developed.

appropriate use of metadata records uniquely, or in concert with, bibliographic records – as a potential context or guidance to libraries planning to incorporate metadata in some part of their bibliographic activities.

## **2.1 Initiating a Metadata Project**

- **Defining the Scope, Inclusion Criteria, and Purpose of the Project**

Prior to initiating a metadata project, it will be important for the library or bibliographic agency to define clearly the nature, scope, coverage, inclusion/exclusion criteria for selection, and format(s) of items or objects to be included in the “digital collection” (portal, subject gateway, knowledge repository, etc.) for which metadata records will be created. For what kinds of electronic resources will identification and access (links) be required?

- **General Metadata Record Types or Structures**

Depending on what is included, and the intended purpose(s) or use of the library’s specified digital collection, a number of *types* or *structures* of metadata may be considered appropriate to the configuration of the final surrogate record. As a review of a number of large-scale metadata implementations confirm, these can be broadly categorized as follows:

- **Administrative metadata:** “housekeeping” information about the record itself – its creation, modification, relationship to other records, etc. Examples of elements pertaining to administrative metadata include, but are not restricted to, the following:
  - Record number
  - Date of record creation
  - Date of last modification
  - Identification of creator/reviser of record
  - Language of record
  - Notes
  - Relationship of this record to other(s)
- **Descriptive metadata:** information describing the physical and intellectual properties or content of a digital item or object with such elements as:
  - Title (also alternative and parallel titles; subtitles; short titles; etc.)
  - Creator (author; composer; cartographer; artist; etc.)
  - Date
  - Publisher
  - Unique identifiers (ISBN; ISSN; etc.)
  - Dynamic links (URI; URL; etc.)
  - Summary; descriptive note; review; etc.
  - Audience level
  - Physical media; format; etc.

- Language of the item or object
- Version
- **Analytical metadata:** information analysing and enhancing access to the resource's contents. Sometimes referred to as “subject metadata”, elements may include:
  - Controlled subject terms, e.g., subject headings, descriptors
  - Subject/topic keywords
  - Abstract; Table of Contents (TOC)
  - Codes derived from classification systems or categorization schemes
  - Other elements of local importance, e.g., department affiliation; links to other related e-content
- **Rights management metadata:** information regarding restrictions (legal; financial; etc.) on access to, or use of, digital items or objects. Such elements as the following may apply:
  - Restrictions on use
  - Permission statements
  - Subscriber/licensing/pay-per-use fees
  - Acknowledgements
  - Copyright notice
  - Retention schedules
  - Quality ratings
  - Use disclaimers
- **Technical metadata:** particular hardware or software used in converting an item/object to a digital format, or in storing, displaying, etc. May require the use of such elements as:
  - Digitizing equipment specifications
  - Camera positions
  - Shooting conditions
  - Coding parameters
  - Voice recognition and/or read-back hardware and software
  - Optical scanner specifications
  - Image rendering equipment
  - Type of file and conversion software requirements
- **Preservation metadata:** information pertaining to the physical condition of an item/object, and actions (refreshing; migration; etc.) undertaken to preserve and manage physical and digital items/objects/collections. May include such elements as:
  - Audit trail of changes and decisions
  - Authenticity information such as technical features or custody history
  - Responsibilities and rights information applicable to preservation actions
  - Retention schedule related to digital content



- **Structural metadata:** information describing the types, versions, relationships and other characteristics of digital items or objects, and/or their component parts.
- **Use metadata:** information relating to the level and type of use of physical or digital items/objects/collections.
- **Other metadata, as determined:** particular metadata elements based on local, regional, and/or organizational requirements, or in accordance with a nationally mandated metadata standard, and not subsumed within any metadata type above.

## 2.2 *Selecting a Metadata Schema or Schemas*

The choice of a metadata schema or schemas to be used in creating the surrogate records for uniquely identifying and linking to digital items or objects in a collection will depend on where and how the resources will be accessed and used. For example, a local land registry site of scanned documents, photographs, and maps, accessible exclusively on the organization's Intranet, and fully maintained in-house, might necessitate only descriptive and technical metadata. On the other hand, a digital repository created and maintained by a distributed network of national organizations with content comprised of high quality Web sites (text and images only), and limited to a subject area in a technical domain might require a mix of administrative, descriptive, and analytical metadata. Likewise, a "virtual exhibit" containing links to a variety of digital objects within an international consortium of public and private art galleries and museums would necessitate the use of technical and rights management metadata, in addition to those required for administrative, descriptive, analytical, and preservation purposes.

A final determination of metadata schema may also depend on the desired degree of *granularity*, or the amount of detail to be captured and represented in the metadata record. A "core record" – created using a metadata schema, such as the Dublin Core with its eighteen element set (any of which is optional, repeatable, and extensible) – may include, as appropriate and/or required, administrative, descriptive, analytical, and rights management metadata, and can accommodate information related to technical specifications and preservation history. In some specialized domains, however, a metadata schema, such as the Dublin Core, may lack sufficient granularity (detail) to represent resources adequately, or the particular purposes to which the subject gateway is directed. The ONIX metadata standard for international publishing and publishers, or the Content Standard for Digital Geospatial Metadata (CSDGM) are two examples of rich, detailed, and highly technical metadata schemas, derived especially to deal with complex content and unique applications within the domain.

In addition to deciding on the level of detail to be captured in metadata-enabled records, the choice of schema can be narrowed in response to questions, such as the following:

- Is there a structured, rich format metadata standard that is appropriate to the items/objects selected for, and intended purpose of, the digital collection?

- Which metadata elements or fields would be most useful to the community of users the digital collection is intended to support? How much detail should those fields support?
- Which metadata elements or fields would be most useful to those who are creating and/or maintaining the digital collection? How much detail should those fields support?
- Will the use of, or access to, this digital collection be restricted in any way? How will (should) this be made explicit in the metadata record?
- Are there any requirements related to language, or format of material, or type of media for which particular (or additional) metadata elements or fields must be provided?
- Are there requirements to create or share resources among a network of collaborators with responsibility for the digital collection(s) Are (additional) metadata fields required to support network cooperation?
- If the use of more than one metadata schema is envisioned or required (sharing resources across networks), are authoritative cross-schema mappings (crosswalks) readily and immediately available to facilitate and maintain interoperability? Can resources represented in one metadata schema (or standard) be exchanged with collaborators who are using a different schema (or standard)?
- How widely used is a particular schema, and in what applications or environments comparable to the one currently proposed? How robust and/or flexible is the schema within different contexts?
- How readily can one migrate from this particular schema to another should data conversion be required at some time?
- How or how well does a particular schema comply with mandated organizational local, national, or international standards, if any?
- What human (numbers; education; training), technical, financial, or other resources are required to support the application of the metadata schema, and does the organization or operation have those resources readily and sufficiently available? Are there other practical constraints to implementing and maintaining a particular schema or schemas?

Having answered any or several of the preceding questions, the choice to use one or more *standardized* metadata schemas may be confirmed. Alternatively, an individual, organization, or network of libraries may determine that a local or “home grown” solution – a set of locally-determined and supported metadata elements – is the preferred option. Similarly, some choose to combine elements of an established standard, such as the Dublin Core, with elements appropriate to the local situation of resources and objectives. While there is no single recipe or “one-size-fits-all solution to which metadata schema or standard to use in initiating a project, libraries are well advised to consider the benefits of using, or building on, standards-based metadata and existing schema wherever possible, particularly where there possibilities for sharing records both within and beyond the institution. In this context, the creation of local schema should be employed only when available schemas have been rejected as they demonstrably do not meet organisational needs.

### **2.3 Suggested Specific Uses for Metadata Records**

A library may choose to use a metadata schema to markup a collection of electronic resources that may not previously have been accessible to end-users. Such collections may include materials that only exist in electronic format (e.g., subject-focused websites), or that have been digitized (using some kind of optical scanning or digital image capture technology) and are being added to a library's Intranet, Internet, portal, or knowledge repository for public or private use. For example, a collection of paper maps could be scanned and metadata records describing and providing dynamic links to those digital images could be created using an appropriate existing metadata schema (e.g., DC; CSDGM; VRA), or a locally devised metadata schema. The latter could be fully independent of any existing schema, or be derived based on an existing schema that is extensible.

Depending on the metadata schema selected, the library should be aware of the purpose(s) for which the surrogate descriptive metadata record(s) is/are being created (internal and/or external discovery of the resource; legal deposit compliance; e-business application; inventory control; etc.), in order to ensure that all metadata elements required are embedded in the record template. Are additional metadata for administrative, technical, legal use, archival, or other purposes, required? Moreover, how will metadata be derived, modified, and maintained across time? A procedures manual may be required to ensure consistency of application and use across time and across an institutional environment. Likewise, how will links from the record to the item be created and maintained in a dynamic environment? Finally, to what extent will this digital collection be integrated with other databases or repositories of electronic materials ("legacy knowledge") within the institution's collections?

In some cases libraries are choosing to continue using cataloguing standards (e.g., MARC 21 or UNIMARC with content standards ISBD or AACR) for physical collections of print and/or audio-visual items, and metadata standards (DC; TEI; CIMI) for electronic/digital resources accessible via the Web. There has been movement towards standardizing on one metadata schema to facilitate end-user understanding of, and access to, materials regardless of their type of physical format. Such initiatives include the Resource Description Framework (RDF), the Open Archives Initiative (OAI), and the Semantic Web project. The development of XML (itself based on SGML) has provided a common syntax for facilitating "interoperability" among metadata schemas. As individual elements within each schema are mapped to, and expressed in the language (or syntax) of, XML, exchange of data within the XML framework is greatly facilitated and transparent to the end-users. For consistency across multiple knowledge stores some libraries are choosing to move from a dual or multiple standards approach (e.g., a MARC format with ISBD for printed text and for physical objects and DC for electronic resources regardless of type), to a single metadata schema application (e.g., DC for all materials; TEI regardless of whether the text is printed in a paper-based or digital environment). This is more appropriately done, or more readily accomplished, when the volume of "legacy collections" (i.e., those for which records were created using long-

established codes, standards, or protocols) is low or non-existent. Where this is not the case, planning for retrospective conversion of records may be required. In any case, use of multiple metadata schemas is not problematic where expressed in common syntax. Crosswalks (mapping one metadata schema to another) are readily available for widely used schemas (e.g., Dublin Core to MARC21; TEI to Dublin Core; etc.) to facilitate migration of records encoded in one schema to another.

With the growth in cooperative or collaborative projects, the number of tools that will automatically convert a record from one metadata schema format to another (e.g., expressing a GILS record within the Dublin Core metadata set) has been growing. So-called legacy records can readily co-exist with emerging metadata standards. A metadata-enabled record describing an electronic resource to which it is linked can be captured and converted into a MARC format for inclusion in a library's online public access catalogue (OPAC) or WebPAC. When a Web-based search engine or Web crawler "discovers" a digital item, the metadata embedded within the HTML <Head> can be used as a foundation for the surrogate record that is added to the library's internal knowledge repository. In short, metadata expressed in one environment can be harvested and re-used in another, as appropriate or required. This approach may be especially beneficial to linking across different subject domains, disciplines, fields, or applications, including those associated with archives, museums, art galleries, education, publishing, or government – to name only a few.

#### **2.4 *Some Core Attributes in Metadata Schemas***

When determining which metadata schemas may best serve the operational requirements of a library and the resources it wishes to mark-up for inclusion in its repository/repositories, it may be useful to begin the evaluation by determining whether or not the following core attributes or sets of elements are included in the schema. While not all elements will apply to, or be important for, a particular set of objects in a collection, many will be useful, not only to the structure of a metadata record, per se, but also to sharing metadata records within and beyond the repository. This same core set of elements may also serve as a useful starting point for those devising a local schema.

The following list represents elements (with definitions) that are commonly found in a number of widely used metadata schemas<sup>6</sup>:

**SUBJECT:** Provides a term, keyword, or phrase that describes, identifies, or interprets the intellectual content of a work and what it depicts or expresses. These may include proper names (e.g., people or events), geographic locations (places), time period covered, or topics (e.g., iconography, concepts, themes, or issues). Depending on the metadata schema being used, the descriptive terms used to communicate the subject of the work may be derived from either controlled vocabularies or natural language. In different metadata schemas, the element "subject" may pertain to different facets. In some cases,

---

<sup>6</sup> (see Appendix I for examples of schemas from which elements were derived; Appendix II for their frequency of occurrence within schemas)

the term “subject” is used to mean topic or theme; in others, it may be used as a collective term implying various facets such as topic, time, place, etc. In the broad sense, it is defined as “what a resource is *about*.”

**DATE:** Indicates the particular year and may, as appropriate, include a day, month and/or day ~~or year~~ associated with the work. Dates and times may be used for a number of different reasons and in a number of different contexts. The date(s) could describe when the work was created, published, modified, accessed, etc.

**CONDITIONS OF USE:** Indicates the limitations and legal rules that may restrict or deny access to a work, or that affect how the work (or, in CSDGM, the metadata describing the work) is to be used *after* access has been granted. Generally, these constraints are applied to ensure the protection of privacy or intellectual property. Restrictions may include regulations, special procedures imposed by a repository, donor, legal statute, or other agency regarding reproduction, publication, or quotation of the described materials. May also indicate the absence of restrictions, such as when copyright or literary rights have been dedicated to the public.

**PUBLISHER:** Provides the name, location, and other identifying and/or contact information concerning an entity responsible for making a resource available, whether by production, manufacture, maintenance, distribution, etc.

**NAME ASSIGNED TO THE RESOURCE:** The name or phrase given to a work (or code set in some cases in CSDGM), often referred to as title. It may consist of a word, phrase, character, or group of words and/or characters. The title may or may not adhere to bibliographic standards. Schemas describing artistic works and images (VRA and CIMI) also include the names of complex works or series and the discrete units within these larger entities (e.g., a print from a series, a panel from a fresco, a building within a temple complex), or may identify only the larger entity itself.

**LANGUAGE/MODE OF EXPRESSION:** Identifies the language and/or script, sublanguages, dialects, etc., of the intellectual content of the work. Language information may be indicated through the use of complete words or predetermined alphabetic, numeric, or alpha-numeric codes.

**RESOURCE IDENTIFIERS:** Unique names, alphabetic codes, or numbers associated with a work that are used consistently to distinguish one resource from another.

**RESOURCE TYPE:** Can be divided into two facets: type of content; and type of carrier. Carrier deals with the 'package' of the resource and content is how the resource is presented (e.g., genre, data type). This category contains tags that describe the physical format, rendering, appearance, or construction of the work.

**AUTHOR/CREATOR:** Name(s) of organization(s) or individual(s) responsible for creating or compiling the intellectual or artistic content of the work. May include a brief statement indicating the nature of the responsibility.

**VERSION:** Provides information on the version, edition, or adaptation of a particular work, or relationships to other works.

## SELECTED BIBLIOGRAPHY OF METADATA RESOURCES

The literature dealing with metadata schemas, applications, and project implementations is vast and growing. The following represents a selection of articles and websites that address metadata in general, and/or that cover topics, such as application profiles, crosswalks and mapping, interoperability, and registries. Where a URL link is provided, and unless noted otherwise, the site was last accessed July 15, 2005.

The Working Group particularly recommends the International Federation of Library Associations and Institutions (IFLA) site, *Digital Libraries: Metadata Resources*, for its comprehensive listing of documents and tools. Periodically updated, this valuable resource is available on IFLANET at URL: <http://www.ifla.org/II/metadata.htm> .

Baca, M., ed. (2000). *Introduction to Metadata: Pathways to Digital Information*. Los Angeles, CA: Getty Research Institute. Version 2, 2000, available at URL: [http://www.getty.edu/research/conducting\\_research/standards/intrometadata/index.html](http://www.getty.edu/research/conducting_research/standards/intrometadata/index.html)

Baker, T., Dekkers, M., Heery, R., Patel, M., and Salokhe, G. (2001). What terms does your metadata use? Application profiles as machine-understandable narratives. *Journal of Digital Information*, 2(2). Available at URL: <http://jodi.ecs.soton.ac.uk/Articles/v02/i02/Baker/>

Buckland, M. K., Chen, A., Chen, H.-M., Kim, Y., Lam, B., Larson, R. R., et al. (1999). Mapping entry vocabulary to unfamiliar metadata vocabularies. *D-Lib Magazine*, 5(1). Available at URL: <http://www.dlib.org/dlib/january99/buckland/01buckland.html>

Caplan, P. (2003). *Metadata fundamentals for all librarians*. Chicago: American Library Association.

Chan, L. M., and Zeng, M. L. (2002). Ensuring interoperability among subject vocabularies and knowledge organization schemes: a methodological analysis. *IFLA Journal*, 28 (5/6), 323-327. Available at URL: <http://www.ifla.org/V/iflaj/art280506.pdf>

Cromwell-Kessler, W. (1998). Crosswalks, metadata mapping and interoperability: What does it all mean? In Murtha Baca, ed. *Introduction to Metadata: Pathways to Digital Information*. Los Angeles, CA: Getty Information Institute. Pp. 19-22.

Day, M. (2001). *Metadata: Mapping between metadata formats*. UKOLN. Available at URL: <http://www.ukoln.ac.uk/metadata/interoperability/>

Day, M. (1999). *The metadata challenge for libraries: A view from Europe*. Available at URL: <http://www.ukoln.ac.uk/metadata/presentations/metadiversity/challenge.html>

Day, M. (2000). Resource discovery, interoperability and digital preservation: Some aspects of current metadata research and development. *Vine*, 117: 35-48.

Day, M., Duval, E., and Causton, L. (2001). *Schemas metadata watch report #5*. Available at URL: <http://www.schemas-forum.org/metadata-watch/5.html>

Dekkers, M. (2001). Application profiles; or, how to mix and match metadata schemas. *Cultivate interactive*, 3 (29 January 2001). Available at URL: <http://www.cultivate-int.org/issue3/schemas/>

Dovey, M. J. (2000). "Stuff" about "stuff": The differing meanings of "metadata". *Vine*, 116: 6-13.

Dublin Core Metadata Initiative. (2002). *Dublin Core Metadata Registry*. Available at URL: <http://fiord.ulis.ac.jp/dcregistry/index.html>

Duval, E., Hodgins, W., Stuart, S., and Weibel, S. (2002). Metadata principles and practicalities. *D-Lib Magazine*, 8(4), Available at URL: <http://www.dlib.org/dlib/april02/weibel/04weibel.html>

Gill, T. (2000). Metadata and the World Wide Web. In Baca, M., ed. *Introduction to Metadata: Pathways to Digital Information, Version 2*. Los Angeles, CA: Getty Research Institute. Available at URL: [http://www.getty.edu/research/conducting\\_research/standards/intrometadata/2\\_articles/gill/index.html](http://www.getty.edu/research/conducting_research/standards/intrometadata/2_articles/gill/index.html)

Gilliland-Swetland, A. J. (2000). Introduction to metadata: Setting the stage. In Baca, M., ed. *Introduction to Metadata: Pathways to Digital Information, Version 2*. Los Angeles, CA: Getty Research Institute. Available at URL: [http://www.getty.edu/research/conducting\\_research/standards/intrometadata/2\\_articles/index.html](http://www.getty.edu/research/conducting_research/standards/intrometadata/2_articles/index.html)

Heery, R., Gardner, T., Day, M., and Patel, M. (2000). *DESIRE [Development of a European Service for Information on Research and Education] II metadata registry framework*. Available at URL: <http://www.desire.org/html/research/deliverables/D3.5/d35.html>

Heery, R., and Wagner, H. (2002). A metadata registry for the Semantic Web. *D-Lib Magazine*, 8(5). Available at URL: <http://www.dlib.org/dlib/may02/wagner/05wagner.html>

Hillman, D. (2003). *Using Dublin Core*. Dublin Core Metadata Initiative. Available at URL: <http://dublincore.org/documents/2003/08/26/usageguide/>

Howarth, L.C., Cronin, C., and Hannaford, J. (2002). Designing a Metadata-Enabled Namespace for Accessing Resources Across Domains. In Howarth, L.C., Slawek, A., and



Arsenault, C., eds. *Advancing Knowledge: Expanding Horizons for Information Science: Proceedings of the 30th Annual Conference of the Canadian Association for Information Science/Association canadienne des sciences de l'information – held with the Congress for the Social Sciences and Humanities of Canada, University of Toronto, Toronto, Canada, 30 May-1 June, 2002*. Pp. 223-232.

Hudgins, J., Grace, A., and Brown, E. (1999). *Getting mileage out of metadata: applications for the library*. Chicago: American Library Association.

Hunter, J., and Lagoze, C. (2001). *Combining RDF and XML schemas to enhance interoperability between metadata application profiles*. Available at URL: <http://archive.dstc.edu.au/RDU/staff/jane-hunter/www10/paper.html>

Lagoze, C., and Hunter, J. (2001). The ABC ontology and model. *Journal of Digital Information* 2(2). Available at URL: <http://jodi.ecs.soton.ac.uk/Articles/v02/i02/Lagoze/>

Lagoze, C. (2001). Keeping Dublin Core simple: Cross-domain discovery or resource description? *D-Lib magazine*, 7(1). Available at URL: <http://dlib.org/dlib/january01/lagoze/01lagoze.html>

Leviston, T. (2001). *Metadata registry requirements and realities*. Available at URL: <http://www.dstc.edu.au/Research/Projects/Infoeco/publications/registry-discussion.pdf>

Manola, F., and Miller, E., eds. (2003). *World Wide Web Consortium RDF primer*. Available at URL: <http://www.w3.org/TR/rdf-primer/>

Miller, A. P. (1998). An introduction to Resource Description Framework. *D-Lib Magazine*. Available at URL: <http://www.dlib.org/dlib/may98/miller/05miller.html>

Miller, A. P. (1996). Metadata for the masses. *Ariadne*, 5. Available at URL: <http://www.ariadne.ac.uk/issue5/metadata-masses/>

Milstead, J., and Feldman, S. (1999). Metadata: Cataloguing by any other name. *Online* 23 (1). Available at URL: <http://www.cbuc.es/5digital/1.pdf>

Neuroth, H., and Koch, T. (2001). *Metadata mapping and application profiles: Approaches to providing the cross-searching of heterogenous resources in EU project Renardus*. Paper presented at the DC-2001, International Conference on Dublin Core and Metadata Applications, Tokyo. Available at URL: <http://www.nii.ac.jp/dc2001/proceedings/product/paper-21.pdf>

Schwartz, C. (2001). Metadata. In *Sorting out the web: approaches to subject access*. Westport, Conn.: Ablex. Pp. 9-45.

St. Pierre, M., and LaPlant Jr., W. P. (1998). *Issues in crosswalking content metadata standards*. National Information Standards Organization (NISO). Available at URL: <http://www.niso.org/press/whitepapers/crswalk.html>

State and University Library at Gottingen, Germany (SUB). (2003). *Metadata Server*. Available at URL: <http://www2.sub.uni-goettingen.de/index.html>

Thornely, J. (2001). *Metadata - What is it?* State Library of Queensland. Available at URL: <http://www.slq.qld.gov.au/pub/staff/metadata.htm>

UKOLN Metadata Group. (1999). *A review of metadata: A survey of current resource description formats*. Work Package 3 of Telematics for Research project DESIRE. Available a URL: <http://www.ukoln.ac.uk/metadata/desire/overview/>

UK Office of Library and Information Networking. (2002). *UKOLN Interoperability Focus*. Available at URL: <http://www.ukoln.ac.uk/interop-focus/>

Woodley, M. (2000, May 07). Crosswalks: The path to universal access? In Baca, M., ed. *Introduction to Metadata: Pathways to Digital Information, Version 2*. Los Angeles, CA: Getty Research Institute. Available at URL: [http://www.getty.edu/research/institute/standards/intrometadata/2\\_articles/woodley/index.html](http://www.getty.edu/research/institute/standards/intrometadata/2_articles/woodley/index.html)

World Wide Web Consortium. (2003). *Resource Description Framework*. Available at URL: <http://www.w3.org/RDF/>

## APPENDIX I

### CORE ATTRIBUTES AND THEIR PRESENCE IN SELECTED METADATA SCHEMAS

<i>SCHEMAS</i> ----- <i>ELEMENTS</i>	<i>MARC</i> <i>21</i>	<i>UNI</i> <i>MARC</i>	<i>DC</i>	<i>TEI</i>	<i>EAD</i>	<i>VRA</i>	<i>CSDGM/</i> <i>FGDC</i>	<i>CIMI</i>	<i>GILS</i>	<i>ONIX</i>
<b>Subject</b>	X	X	X	X	X	X	X	X	X	X
<b>Date</b>	X	X	X	X	X	X	X	X	X	X
<b>Conditions of use</b>	X	X	X		X		X	X		X
<b>Publisher</b>	X	X	X	X	X <sup>*</sup>		X	X	X	X
<b>Name assigned to the resource</b>	X	X	X	X	X	X	X	X	X	X
<b>Language/ Mode of expression</b>	X	X	X	X	X				X	X
<b>Resource identifier</b>	X	X	X	X		X	X	X	X	X
<b>Resource type</b>	X	X	X	X	X	X	X	X	X	X
<b>Author/ Creator</b>	X	X	X	X	X	X	X	X	X	X
<b>Version</b>	X	X	X	X			X			X

- at the collection level

## APPENDIX II

### Core Attributes in Metadata Schemas (by Frequency of Occurrence)

*Attributes that occur in all 10 schemas:*

#### **Name assigned to the resource**

Examples of labels used: Title

Comment:

#### **Name of Author/Creator**

Examples of labels used: Author; Main entry (personal name); Main entry (Corporate name); Creator

Comment: Name(s) of organization(s) or individual(s) responsible for creating or compiling the intellectual or artistic content of the work. May include a brief statement indicating the nature of the responsibility

#### **Subject/content indicator**

Examples of labels used: Keywords; Subject; Classification; <textClass>; <controlaccess><subject>; Theme

Comment: In different metadata schemes, the element “subject” may pertain to different facets. In some cases, the term “subject” is used to mean topic or theme; in others, it may be used as a collective term implying various facets such as topic, time, place, etc. In the broad sense, it is defined as “what a resource is *about*.”

#### **Type of Resource**

Examples of labels used:

Comment:

#### **Date of creation/manufacture/issue/modification**

Examples of labels used:

Comment:

*Attributes that occur in 9 of 10 schemas:*

**Name of publisher/manufacturer/distributor**

Examples of labels used: Publisher; Name of publisher; Publication, Distribution, etc (Imprint); Name of Publisher, Distributor, etc.; <publicationStmt><publisher>; <publicationStmt><distributor>; <archdesc> <repository>; <acqinfo>; distributor; <ImprintName>; Source of acquisition

Comment: an individual, group, or organization named in the manifestation as being responsible for the publication, distribution, issuing, or release of the manifestation. (FRBR); an entity responsible for making the resource available.

**Resource location/identification**

Examples of labels used: Identifier; Standard identifier; <unitid>; <idno>; ID Number; rendition-resourceIdentifier; renditionIdentifier; international and/or standard numbers; <identifier scheme="ident.scheme">; <ProductWebsiteLink>; <DOI>

Comment: Includes "Identifier" as a record identifier; "Identifier" as other systems control number/identifier; "Identifier" as identification of the entity being described (resource itself); "Identifier" as identification of a location from where a document can be retrieved (location of the resource)

*Attributes that occur in 7 of 10 schemas:*

**Conditions/rights controlling use of and access to resource**

Examples of labels used:

Comment:

**Language/Mode of expression**

Examples of labels used:

Comment:

*Attribute that occurs in 6 of 10 schemas:*

**Versioin/edition/adaptation**

Examples of labels used: Edition; Edition statement; Relation | isVersionOf;  
<EditionTypeCode>; <EditionNumber>; <EditionStatement>

Comment: "Version" information includes anything that expresses "version/edition/adaptation" of a resource; certain user communities are not as interested in "version/edition" information or may have differing definitions of version or edition.