A COMPARATIVE ANALYSIS ON DUBLIN CORE (DC) AND METADATA OBJECT DESCRIPTION SCHEMA (MODS)

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Abstrak

Artikel ini membahas tentang asal-usul dan perkembangan dua skema utama metadata, Dublin Core Metadata Element yang dikembangkan oleh Dublin Core Metadata Initiative (DCMI) dan Metadata Object Description Schema (MODS) yang dibuat oleh Library of Congress sebagai versi sederhana MARC 21 yang berbasis XML. Eksplorasi literatur tentang perkembangan dan pemanfaatan metadata dijadikan sebagai titik tolak analisis terhadap kedua skema tersebut di atas yang meliputi penjelasan tentang unsur-unsur masing-masing skema dimaksud.

Keywords: Metadata, Dublin Core, Object Description Schema (MODS)

A. INTRODUCTION

There are many metadata schemas or standards which are being developed, which 'each serves distinct needs and audiences'.[1] If each standard serves different needs and audiences, the interoperability of the schemas are questioned.

One of the important efforts to apply metadata is the development of the Dublin Core metadata schema. The idea to create Dublin Core was inspired by discussions among OCLC staff and the National Center for Supercomputing Applications in October 1994. The discussions centered around the difficulty to find resources on the Web and the possibility of improving searches by a set of semantics. This later lead to the workshop in Dublin, Ohio, March 1995 to discuss metadata semantics. The Dublin Core was intended to facilitate information search and

[1] National Information Standards Organization (NISO) (2004). *Understanding metadata*, USA : NISO Press. Retrieved November 10, 2004, from www.niso.org/standards/resources/UnderstandingMetadata.pdf

retrieval by categorizing the web using a set of semantics. The DC was meant to be simple and avoid sophisticated structure.[2]

Later it was found that Dublin Core has some weaknesses. The major weakness is its simplicity which results in a loss of specificity, thus making it difficult to convert it into other systems or to transfer other data from different systems (Beall, 2004). It also lacks standards on how the data to go in the elements is to be identified and structured. The danger of this is the inconsistency of data input into each element. This inconsistency can cause the aim to categorize and catalogue information for better resource discovery to fail. A dilemma is experienced in this situation. To improve the specificity will contradict the first intention to create a simple set of metadata. The application of a standard may cause the loss of flexibility.

Therefore, an effort should be made to find a compromise which will remove that contradiction. The big question is whether it is possible to maintain the simplicity and apply consistency at the same time? Some effort to do this has been made. Recently, the Library of Congress has released Metadata Object Description Schema (MODS) which includes a subset of MARC fields and uses language-based tags rather than numeric ones and regrouping elements from the MARC 21 bibliographic format.[3] MODS promises standard and specific data elements and wide interoperability.[4] However, since the experimentation with MODS is just beginning, it is too early to say that MODS will satisfy the need of implementers and end users. A comparison of MODS and DC will therefore be useful.

Research Method

[2] DCMI. (2004). *History of the Dublin Core Metadata Initiative*. Retrieved March 25, 2005, from http://dublincore.org/about/history/

[3] Guenther, R., & McCallum, S. (2003). New metadata standards for digital resources: MODS and METS. *Bulletin of American for Information Science and Technology, 29*(2). Retrieved March 10, 2005 from http://www.asis.org/Bulletin/Dec-02/guenthermccallum.html

[4] Beall, J. (2004). Dublin Core: an obituary. *Library Hi Tech News*, 21(8), 40-41. Retrieved November 9, 2004 from http://taddeo.emeraldinsight.com/

In gathering data, information from various sources was collected to investigate the nature of Dublin Core and MODS concentrating on the following elements:

- idea and principles behind the development of Dublin Core and MODS
- development stages of Dublin Core and MODS
- areas where these schemas are applicable
- principles and divisions of their elements set
- the interoperability of the schemas

The main sources were the official websites of the Dublin Core Metadata Initiative (http://dublincore.org/) and MODS (http://www.loc.gov/standards/mods/). Other data was collected from documents or literatures which discuss both schemas.

In analyzing the schema, cataloging principles and standards such as AACR2 and ISBD were used as a standard of comparison. The following metadata principles from NISO[5] were also used as a checklist:

1. Good metadata should be appropriate to the materials in the collection, users of the collection, and intended, current and likely use of the digital object.
2. Good metadata supports interoperability.
3. Good metadata uses standard controlled vocabularies to reflect the what, where, when and who of the content.
4. Good metadata includes a clear statement on the conditions and terms of use for the digital object.
5. Good metadata supports the long-term management of objects in collections.
6. Good metadata records are objects themselves and therefore should have the qualities of good objects, including authority, authenticity, archivability, persistence, and unique identification.

B. DUBLIN CORE METADATA ELEMENT SET (DCMES)

1. Dublin Core History and the Idea behind Its Development

[5] NISO Framework Advisory Group (2004). *A framework of guidance for building good digital collections*. Retrieved May 7, 2005, from http://www.niso.org/framework/framework2.html

The first initiative to create Dublin Core emerged from the 2nd International World Wide Web Conference in Chicago, 1994. Many participants were concerned with how the Web content might be easily retrieved. Among the participants, Stu Weibel and Terry Noreault of OCLC, Joseph Hardin of NCSA, and the late Yuri Rubinski of Softquad had a discussion around the difficulty of finding resources on the Web and how the discovery might be facilitated. They then took the initiative to organize a workshop in March 1995.[6]

The workshop which was officially named OCLC/NCSA Metadata Workshop took place in Dublin, Ohio in March 1995.[7] The workshop resulted in an elements set of thirteen data elements, which was called the 'Core Metadata Elements Set': Title, Subject, Identifier, Author, Other Agent, Publisher, Date, Object Type, Form, Language, Coverage, Relation, and Source.[8]

The idea behind the creation of DC was 'categorizing the Web for easier search and retrieval'.[9] DC was meant to be so simple to apply that ordinary people who are not cataloguers or have not been trained in bibliographic description can make use of it. Weibel et al. say in their OCLC/NCSA Metadata Workshop report:

> 'Since the Internet will contain more information than professional abstractors, indexers and catalogers can manage using existing methods and systems, it was agreed that a reasonable alternative way to obtain usable metadata for electronic resources is to give authors and information providers a means to describe the resources themselves, without having to undergo the extensive training required to create records conforming to established standards.'[10]

The statement above shows clearly that Dublin Core is originally intended for untrained people. The effectiveness of resource description when undertaken by non-trained authors is doubted in library community. In library tradition, cataloguing is so

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[6] DCMI. (2004). *History of the Dublin Core Metadata Initiative*. Retrieved March 25, 2005, from http://dublincore.org/about/history/

[7] Ibid.

[8] Caplan, P., & Guenther, R. (1996). Metadata for internet resources: the Dublin Core Metadata Elements Set and its mapping to USMARC. *Cataloging & Classification Quarterly, 22*(3/4), 43-58.

[9] See DICMI, History of…

[10] Weibel, S., Godby, J., Miller, E., & Daniel, R. (1995). *OCLC/NCSA Metadata Workshop Report*. Retrieved April 27, 2005, from http://dublincore.org/workshops/dc1/report.shtml#Guenther

complex that it 'requires a high level of skill'.[11] During the same period as DC was being developed, the traditional cataloguing code was continually edited and became more complex.

2. Development stages of Dublin Core

Dublin Core was originally intended for the description of "the most common type of resource sought in the Internet" which were called by the 1st DC workshop participants "document-like objects" or DLOs. This concept of the DLO lacks details in definition as can be seen in the following quotation from Weibel's report: *"DLOs were not rigorously defined, but were understood by example. For example, an electronic version of a newspaper article or a dictionary is a DLO, while an unannotated collection of slides is not."*.[12] It was realized that DLOs could be very complex in the Web environment because they might consist of text with images, audio or video clips, or combined with other hypertext documents. However, the participants did not attempt to give clear definition except limiting what was to be included by saying that a DLO is primarily text. Therefore, the description of the DLOs could be similar to a traditional catalog entry that describes printed text. This traditional catalog-like metadata would then be embedded in the Web documents.[13]

The first original elements set of Dublin Core consisted of 13 data elements. The following are the elements and their description:

- **Subject**: The topic addresses by the work
- **Title**: The name of the object
- **Author**: The person(s) primarily responsible for the intellectual content of the object
- **Publisher**: The agent or agency responsible for making the object available
- **Other Agent**: The person(s), such as editors and transcribers, who have made other significant intellectual contributions to the work
- **Date**: The date of publication

[11] Caplan, P., & Guenther, R. (1996). "Metadata for…", pp. (1996: 43-58).
[12] Weibel, S., Godby, J., Miller, E., & Daniel, R. *OCLC/NCSA Metadata Workshop…*, 1995.
[13] *Ibid.*

- **ObjectType**: The genre of the object, such as novel, poem, or dictionary
- **Form:** The data representation of the object, such as Postscript file or Windows executable file
- **Identifier:** String or number used to uniquely identify the object
- **Relation:** Relationship to other objects
- **Source:** Objects, either print or electronic, from which this object is derived, if applicable
- **Language:** Language of the intellectual content
- **Coverage:** The spatial locations and temporal durations characteristic of the object

The second meeting was held at Warwick University in April 1996. Participants in the workshop realized that "no single element set will satisfy all metadata requirements. Different communities of users or different application areas will require data of different elements and levels of complexity." Therefore, to satisfy that need, the participants reached a consensus that an architecture for the interchange of metadata packages was required. This resulted in Warwick Framework, a container architecture for aggregating metadata objects for interchange. But this is remained as a concept and not fully implemented.

In the fourth workshop, held at the National Library of Australia, Canbera, there was a tension between those who were willing to maintain a minimum set of DC elements and those who cried out for the need to extend the element sets to facilitate detailed description. This moment was also known as the Minimalist vs. Structuralist tension.[14] Eventually, it seems later that the structuralist group dominated the development of DCMES. An indication to this can be seen by the establishment of qualifiers and application profiles.

The 13 elements were revised and modified throughout the workshops. The formal standardization for this unqualified DC elements was established in DC-5 workshop, Helsinki. This final consensus for the unqualified elements is commonly

[14] Weibel, S., Ianella, R, Cathro, W (1997) The 4th Dublin Core Metadata Workshop Report. *D-Lib Magazine*, June 1997. Retrieved 10 June 2005 from http://www.dlib.org/dlib/june97/06contents.html

popularized by DCMI as the Finnish Finish. Some definitions of the elements were changed. These elements were later officially called 'Simple DCMES'.

Refinements and additions to the fifteen elements were called Qualified DCMES, which was formally approved in the DC-8th workshop in Ottawa, in 2000 after an intense discussion in DC-7th workshop in Frankfurt. These qualified elements arose as users began to realize the inadequacy of the fifteen elements in describing more complex materials. This theme of the desirability or otherwise of simplicity will be explored further later in this study. In this DC-8th workshop, an idea of application profiles (data elements drawn from one or more schemas combined together for a particular local application) was introduced. The application profiles were expected "to facilitate the need for combining DC with other metadata element sets and thus support the possibility of richer descriptions drawn from different metadata communities".[15]

3. Applicable Area of Dublin Core

Dublin Core elements were originally intended for use with information objects (DLOs: document-like objects) available on the Web environment; and it is widely accepted that are mostly ephemeral. Milstead & Feldman state that "resources whose value is ephemeral may warrant only minimal description, while those of permanent research or commercial value may need much fuller description".[16] Therefore, DC as simple schema would be more applicable in the online network environment.

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[15] Weibel, S & Koch, T (2000) The Dublin Core Metadata Initiative: mission, current activities, and future directions. D-Lib Magazine, December 2000. Retrieved 20 June 2005 from ***http://www.dlib.org/dlib/december00/weibel/12weibel.meta.xml***

[16] Milstead, J. & Feldman, S. (1999, January). Metadata: Cataloging by any other name. *Online*. Retrieved November 10, 2004, from http://www.onlinemag.net/OL1999/milstead.html.

4. Principles and Divisions of Dublin Core Elements Set

In DC 1 workshops report, Weibel et al. explain the principles which lie behind the Dublin Core Element Set. Those principles are intrinsicality, extensibility, syntax-independence, optionality, repeatability and modifiability.[17]

a. Intrinsicality

Dublin Core concentrates on describing intrinsic properties of the object. Intrinsic data refers to the properties of the work that could be discovered by having the work in hand, such as its intellectual content and physical form. This is distinguished from extrinsic data, which describes the context in which the work is used. For example, the "Subject" element is intrinsic data, while transaction information such as cost and access considerations are extrinsic data. Though extrinsic data may be important for a complete description of an object, it is handled by the extension mechanisms available within the Dublin Core system.[18]

b. Extensibility

In addition to its use in dealing with extrinsic data, the extension mechanism will allow the inclusion of intrinsic data for objects that cannot be adequately described by a small set of elements.

Extensibility is important because users may wish to add extra descriptive material for site-specific purposes or specialized fields. In addition, the specification of the Dublin Core itself may change over time, and the extension mechanism allows revisions while maintaining some backward compatibility with the originally defined element set.[19]

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[17] Weibel, S., Godby, J., Miller, E., & Daniel, R. (1995). *OCLC/NCSA Metadata Workshop Report*. Retrieved April 27, 2005, from http://dublincore.org/workshops/dc1/report.shtml#Guenther

[18] *Ibid.*

[19] *Ibid.*

c. Syntax-Independence

Dublin Core is intended to be used in a wide range of information areas and within different computer applications. Therefore, any applicable syntax can be used with it. Unlike metadata schema like the Encoded Archival Description(EAD), which is based on the SGML markup language, DC does not define tags in any markup language.

d. Optionality

Some elements may not applicable to an object. For example, implementers may wish to ignore the element 'publisher' if an object has no publisher. In traditional cataloging, a cataloguer must indicate the absence of publisher information by putting the code *s.n* (*sine nomine*) in the description area.

Another reason for optionality is not to burden the creators by mandating a complex description for all materials. This is based on the thought that "a simple description is better than no description". Unfortunately, this principle might be abused by creators to ignore any elements which is subjectively difficult from their point of view.[20]

e. Repeatability

This principle means that all elements are repeatable. For example, the creator element is repeatable if a resource has more than one author.

f. Modifiability

To satisfy the need of different communities or stakeholders, each element can be modified by the value of the optional qualifier. 'If no qualifier is present, the element has its common-sense meaning'.[21]

[20] *Ibid.*
[21] *Ibid.*

Other principles which have been applied to DC are the ‘dumb-down principle’ and the ‘one-to-one principle’

g. Dumb-down Principle

This principle relates to the qualifiers. The qualifiers can be ignored but, if qualifiers are not used, the basic DC element should still make sense. An qualifier which refines an element can narrow the meaning of an element but may not extend or change it. “Thus, ignoring a qualifier ("dumbing down" the qualifier) may cause a loss of precision, but the resulting value should still be of some use to an application or user”.[22]

h. One-to-one principle

This principle is related to the concept of ‘cataloging the item-in-hand’. For example, a painting and a digital image of the painting are described by separate metadata records. The creator of the item is the maker of the image in this case, not the original painter. The relationship element can be used to link the metadata for the image and the metadata for the original. However, this rule might be very difficult to apply on web documents especially those in multiple format.

Dublin Core is syntax-independent. This means that any syntax can be used as its container. But this might lead to compatibility problems with other systems. Dublin Core is intended particularly for resource discovery and *not* for resource description .

The following are the elements of Dublin Core and its qualifiers. (http://dublincore.org/documents/usageguide/qualifiers.shtml)

DCMES Element	**Element Refinement(s)**	**Element Encoding Scheme(s)**

[22] *Ibid.*

1. Title	Alternative		-
2. Creator	-		-
3. Subject	-		LCSH
			MeSH
			DDC
			LCC
			UDC
4. Description	Table Of Contents		
	Abstract		
	-		
5. Publisher	-		
-			
6. Contributor	-		-
7. Date	Created		
	Valid		
	Available		
	Issued		
	Modified		
	Date Copyrighted		
	Date Submitted		DCMI Period
			W3C-DTF
8. Type	-		
DCMI Type Vocabulary			
9. Format	-		
IMT			
	Extent		-
	Medium		-
10. Identifier	-		
URI			
	Bibliographic Citation		
11. Source	-		
URI			
12. Language	-		
ISO 639-2RFC 3066			
13. Relation	Is Version Of		URI
	Has Version		
	Is Replaced By		
	Replaces		
	Is Required By		
	Requires		
	Is Part Of		
	Has Part		
	Is Referenced By		
	References		
	Is Format Of		
	Has Format		
	Conforms To		
14. Coverage	Spatial		
DCMI Point			
	ISO 3166		

	DCMI Box	
	TGN	
	Temporal	DCMI
Period		
		W3C-DTF
15. Rights	Access Rights	-
Audience	Mediator	
	Education Level	-

DCMI claim that the DC elements are self-explanatory. Although definitions and comments are given to make them clearer, some terms are still ambiguous.

The definition of each element (http://dublincore.org/documents/dces/):

1. Element Name: Title

Label: Title
Definition: A name given to the resource.
Comment: Typically, Title will be a name by which the resource is formally known.

Some terms in the definition and comment are not clear and are ambiguous. The word 'resource' in the definition is itself not defined clearly. In the Reference Description of DCMES, 'resource' is defined as "anything that has identity" but this does not help to explain clearly what 'resource' is.

Another vague term is 'formally known'. What is the meaning of 'formally known'? What is the limitation of 'formal' here? This term might imply that a title can be taken from any source even NOT from the object itself.

In AACR2, a title must be taken from prescribed sources of information displayed. The main source of title for a book, for example, must be taken from the title page (rule 2.0B AACR 2002 revision : 2004 update).

2. Element Name: Creator

Label: Creator
Definition: An entity primarily responsible for making the content of the resource.
Comment: Examples of Creator include a person, an organization, or a service. Typically, the name of a Creator should be used to indicate the entity.

Dublin Core does not give guidelines on how the creator should be stated. There is no specific rule about how to state the name of a person, whether the name should be inverted or not and how to state multiple authors. There is no specific method used to separate persons from an organization or a service.

Main source for the creator information is not prescribed. It is only stated in the comment "typically, the name of a creator should be used to indicate the entity". This explanation does not help much in defining the creator. Furthermore, it may lead implementers to put the name of creator in the way they like without following any authority list of names. In cataloging tradition, names must be taken from authority lists to maintain consistency of data entries.

3. Element Name: Subject

Label: Subject and Keywords
Definition: A topic of the content of the resource.
Comment: Typically, Subject will be expressed as keywords, key phrases or classification codes that describe a topic of the resource. Recommended best practice is to select a value from a controlled vocabulary or formal classification scheme.

The element 'subject', based on the comment above, can be expressed as keywords or classification codes. The use of controlled vocabulary is only recommended rather than compulsory, which may lead to inconsistency. If a standard is used it is possible to state what that scheme is as an element refinement. However, this does not deal with the problem of inconsistency.

4. Element Name: Description

Label: Description
Definition: An account of the content of the resource.
Comment: Examples of Description include, but is not limited to: an abstract, table of contents, reference to a graphical representation of content or a free-text account of the content.

The definition of ‘description’ is quite vague. Based on the comment, it can be an abstract, table of contents, or a free-text account of the content and, to make it worse, it is not limited by this definition or the comment. Therefore, implementers may write anything about the content in any format and can choose to use keywords or phrases.

5. Element Name: Publisher

Label: Publisher
Definition: An entity responsible for making the resource available
Comment: Examples of Publisher include a person, an organization, or a service. Typically, the name of a Publisher should be used to indicate the entity.

This element does not include the place of publishing, identification of which might be important for some users. This kind of information might be required by national libraries and other authorities to identify where an object or document was published.

6. Element Name: Contributor

Label: Contributor
Definition: An entity responsible for making contributions to the content of the resource.
Comment: Examples of Contributor include a person, an organization, or a service. Typically, the name of a Contributor should be used to indicate the entity.

The role of contributor should be explained. No guidance is given whatsoever as to who or what organisation should be identified as a contributor. Cataloguers have never attempted to record all contributors and instruction is needed in how to distinguish contributors which it would be useful to record.

7. Element Name: Date

Label: Date
Definition: A date of an event in the lifecycle of the resource.

Comment: Typically, Date will be associated with the creation or availability of the resource. Recommended best practice for encoding the date value is defined in a profile of ISO 8601 [W3CDTF] and includes (among others) dates of the form YYYY-MM-DD.

It is not clear what 'a date of an event in the lifecycle' means. It is important that DC uses definitions which are easily understandable by those who are not familiar with cataloguing. Again the standard mentioned is only recommended. Another point worth making is that the standard is for dates which have a specific day. Many published information items only have a year and often this is not definite. There is no indication as to how you deal with uncertainty, unlike in AACR.

DC here provides a list of element refinements:

Created
Valid
Available
Issued
Modified
Date Copyrighted
Date Submitted

The applicability of some of these is also not clear: for example the meaning of valid or submitted.

8. Element Name: Type

Label: Resource Type
Definition: The nature or genre of the content of the resource.
Comment: Type includes terms describing general categories, functions, genres, or aggregation levels for content. Recommended best practice is to select a value from a controlled vocabulary (for example, the DCMI Type Vocabulary [DCT1]). To describe the physical or digital manifestation of the resource, use the FORMAT element.

The DCT1 list of types is given below. The definitions of these terms given in the standard are generally inadequate and there is a particular confusion between the meaning of the term *Image* and that of *StillImage.*

Collection
Dataset
Event
Image
Interactive resource
Moving image
Physical object
Service
Software
Sound
StillImage [sic]
Text

9. Element Name: Format

Label: Format

Definition: The physical or digital manifestation of the resource.

Comment: Typically, Format may include the media-type or dimensions of the resource. Format may be used to identify the software, hardware, or other equipment needed to display or operate the resource. Examples of dimensions include size and duration. Recommended best practice is to select a value from a controlled vocabulary (for example, the list of Internet Media Types [MIME] defining computer media formats).

It should be recognised that the MIME standard is complex and technical, unlike the other standard lists of descriptors recommended by DC.

10. Element Name: Identifier

Label: Resource Identifier

Definition: An unambiguous reference to the resource within a given context.

Comment: Recommended best practice is to identify the resource by means of a string or number conforming to a formal identification system. Formal identification systems include but are not limited to the Uniform Resource Identifier (URI) (including the Uniform Resource Locator (URL)), the Digital Object Identifier (DOI) and the International Standard Book Number (ISBN).

URI describes a resource in terms of its current location. URL, which is one of URI classes, is location-based nature and this is where lies its major weakness for resource identification. URL is not persistent. When the location of a resource is changed in a database/server or moved to a different database/server, all links to this resource can become broken. To avoid this, DC should warn users in advance on the danger of using poor identifiers.

11. Element Name: Source

Label: Source
Definition: A Reference to a resource from which the present resource is derived.
Comment: The present resource may be derived from the Source resource in whole or in part. Recommended best practice is to identify the referenced resource by means of a string or number conforming to a formal identification system.

This is an extremely difficult element to apply as it is not made clear how the source will be identified if it does not carry a formal identification number.

12. Element Name: Language

Label: Language
Definition: A language of the intellectual content of the resource.
Comment: Recommended best practice is to use RFC 3066 [RFC3066] which, in conjunction with ISO639 [ISO639]), defines two- and three-letter primary language tags with optional subtags. Examples include "en" or "eng" for English, "akk" for Akkadian", and "en-GB" for English used in the United Kingdom.

13. Element Name: Relation

Label: Relation
Definition: A reference to a related resource.
Comment: Recommended best practice is to identify the referenced resource by means of a string or number conforming to a formal identification system.

The relationship between this element and the Source element is not expressed in a way which is easy to interpret, even with the assistance of the element

refinements listed below. What is a version or a format of another information item? Do these words imply substantive change to content?

Element refinements:

Is Version Of
Has Version
Is Replaced By
Replaces
Is Required By
Requires
Is Part Of
Has Part
Is Referenced By
References
Is Format Of
Has Format
Conforms To

14. Element Name: Coverage

Label: Coverage

Definition: The extent or scope of the content of the resource.

Comment: Typically, Coverage will include spatial location (a place name or geographic coordinates), temporal period (a period label, date, or date range) or jurisdiction (such as a named administrative entity). Recommended best practice is to select a value from a controlled vocabulary (for example, the Thesaurus of Geographic Names [TGN]) and to use, where appropriate, named places or time periods in preference to numeric identifiers such as sets of coordinates or date ranges.

This element is one of the most difficult to apply consistently as so many standards of different kinds can be applied to it. The recommendation to use names for time periods and places rather than the more specific date ranges or coordinates is somewhat difficult to understand.

15. Element Name: Rights

Label: Rights Management

Definition: Information about rights held in and over the resource.

Comment: Typically, Rights will contain a rights management statement for the resource, or reference a service providing such information. Rights information often encompasses Intellectual Property Rights (IPR), Copyright, and various Property Rights. If the Rights element is absent, no assumptions may be made about any rights held in or over the resource.

Overall, Dublin Core does not give clear definition to its elements which may lead to confusion for implementers. Despite widespread criticism, DCMI seem to have ignored the request that. DC elements are meant be self-explanatory. The core problem is what data to put and how to put them into the elements. DC is obviously not sufficient as a scheme for resource description since the elements can not cover all data or information which is necessary for that purpose, nor does it assist those unfamiliar with cataloguing to decide what information might be necessary.

DCMI acknowledges the shortcomings of DC from this point of view. In the usage guide published on the DCMI web site, Diane Hillman (2003) states 'In the diverse world of the Internet, Dublin Core can be seen as a "metadata pidgin for digital tourists": easily grasped, but not necessarily up to the task of expressing complex relationships or concepts'. The problem is whether it can, in fact, be easily grasped.

C. METADATA OBJECT DESCRIPTION SCHEMA (MODS)

1. The Idea behind the Development of MODS

MODS was created to reconcile the dual demands of interoperability and precision which have reduced the usefulness of Dublin Core (Gartner: 3, 2003). Over the years people have expressed concerns about the number of data elements in MARC and their complexity. Some have suggested use of the Dublin Core Metadata Element Set (http://dublincore.org), although that set is intended to satisfy a broader range of purposes and communities than MARC 21. In order to address these concerns about MARC and also allow for a rich description, the Library of Congress

developed MODS, an XML schema with language-based tags that includes a subset of data elements derived from MARC 21. It is intended to carry selected data from existing MARC 21 records as well as to enable the creation of original resource description records. In other words, MODS is a short version of MARC 21 XML.

2. The Development of MODS

MODS was developed in the Library of Congress' Network Development and MARC Standards Office with the participation initially of a variety of external experts. After the initial draft, an open discussion list was established to elicit feedback. Version 2.0 was a result of much discussion between participants from diverse institutions. Version 3.0 was recently issued, and also was a result of collaboration between LC and implementers and other interested experts. Thus it is a product of broad consensus among interested parties. LC expects that changes made will be on the basis of need in the user community.

The MODS discussion list currently contains members from over 20 countries. LC is considering establishing an editorial board in the future. The Library of Congress will provide the function of maintenance agency for this standard by providing documentation, continuing to receive feedback about the standard's use, and modifying

the schema where appropriate. LC will also provide tools to enable the conversion to and from MODS to other metadata formats.

MODS was officially made available in June 2002 and was frozen for a six month trial.[23] Version 1.2 has been trialed out from June to December 2002. Version 2.0 released in mid of January 2003. In this version, titleInfo element was determined as mandatory element. When version 3.0 was released in the mid of 2003, the mandatory requirement for title was taken out; instead, at least one element is

[23] Guenther, R., & McCallum, S. (2003). New metadata standards for digital resources: MODS and METS. *Bulletin of American for Information Science and Technology, 29*(2). Retrieved March 10, 2005 from http://www.asis.org/Bulletin/Dec-02/guenthermccallum.html

required but not necessarily title. MODS 3.2 has just been released in June 2006. The developers also have prepared a list of more substantive changes which will be distributed as candidates for MODS 4.0

MODS is revised regularly based on the feedbacks from implementers and those who actively participate in the MODS Listserv mailing list (http://listserv.loc.gov/listarch/mods.html). This fact implies that MODS is unstable and experimental in nature. As Karen Coyle (in Information Today, 2004) comments: "MODS has the potential to develop in a number of different directions, depending on the feedback of early adopters".

3. Applicable Area of MODS

MODS was originally designed to fulfill the need for metadata format without specific adherence to complex library standards, but that would still have richer elements than simple metadata formats like Dublin Core (Karen Coyle in Information Today, 2004). MODS would be suitably applied for describing complex objects like music and cartographic materials. MODS may also be applicable in institutions that need to collect and convert MARC records into their databases.

4. Principles and Divisions of MODS Elements Set

MODS which is based on MARC21 use AACR2R as a content standard. It uses XML as syntax for encoding the elements. Unlike MARC, MODS uses natural language which is relatively easy to understand. However, as with DC, it must be judged on whether a clear definition or explanation is available to help implementers understand the meaning of the element name.

MODS consists of 19 top level elements and 2 root elements

Top elements	Root elements
1. titleInfo	1. mods
2. name	2. modsCollection

3. typeOfResource
4. genre
5. originInfo
6. language
7. physicalDescription
8. abstract
9. tableOfContents
10. targetAudience
11. note
12. subject
13. classification
14. relatedItem
15. identifier
16. location
17. accessCondition
18. extension
19. recordInfo

Some of those elements have *sub elements* and *attributes*. *Sub elements* are refinements of the elements while the *attributes* are used for specifying syntax within individual elements. All the elements and attributes are optional and repeatable. "No element is mandatory in a MODS record, however, every MODS record requires at least one element. Applications may wish to develop profiles specifying mandatory elements as needed." (http://www.loc.gov/standards/mods/v3/mods-userguide-intro.html)

If we look at MODS User Guidelines, we will see that the guidelines frequently refer to MARC21. To some extent this is understandable since MODS is the derivative of MARC21, but this is also might be confusing for those who are not familiar with MARC21.

Not every element in MODS will be discussed in detail. A sample of the elements is given here with comment.

1. titleInfo

Subelements:

title
subTitle
partNumber

partName
nonSort

Attributes:

ID
type (abbreviated, translated, alternative, uniform)
authority (see: www.loc.gov/marc/sourcecode/authorityfile/authorityfilesource.html)
displayLabel
xlink
lang
xml:lang
script
transliteration

MODS is claimed to be a derivative of MARC21 and MARC21 is a subset of MARC. The description in the MARC fields strictly follows the rules set out in AACR2 and ISBD(G) and this is also reflected in the structure of tags and subfields. In MARC, the title proper, GMD (general material designation), and statement of responsibility are wrapped in one field 245 and separated into subfields with certain codes/signs like $ sign and or letters. If MODS is the derivative of MARC then why is the authorship statement separated in different elements and not included as a sub-element of the titleInfo?

In AACR2 'title proper' includes the 'responsibility' aspect because this implies that the title of a work can not be separated from those responsible for its authorship since title and responsibility are the main aspect of a work. In metadata schema like MODS and DC, title and responsibility are separated and treated as optional elements which may make it more difficult for those using these schema to make reasoned decisions about who to record as a contributor or author.

This fact may indicate that MODS itself wishes to avoid the use of AACR2 as content standard for simplicity reason. This indication is supported by a statement in MODS user guidelines that "any set of cataloging rules may be used with MODS, as is the case with MARC 21" (http://www.loc.gov/standards/mods/v3/mods-userguide-

intro.html). It might be questioned whether this is the case as the structure of MARC is so much based on AACR2.

2. name

Subelements:

namePart

Attribute: type (date, family, given, termsOfAddress)

displayForm

affiliation

role

roleTerm

Attributes: type (code, text); authority (see: www.loc.gov/marc/sourcecode/relator/relatorsource.html)

description

Attributes:

ID

type (personal, corporate, conference)

authority (see: www.loc.gov/marc/sourcecode/authorityfile/authorityfilesource.html)

xlink

lang

xml:lang

script

transliteration

One thing that might mislead implementers here is the term used for the element: *name*. If the main purpose of using 'natural language' for encoding tags (instead of numeric codes as in MARC) is to make the meaning of data elements clearer or more understandable, then this does not seem to have been achieved in this case. A name can be of any person or body and does not have a clear relationship to the item being described. Why not continue to use a term like "Statement of responsibility" which might be more familiar to most cataloguers.

3. typeOfResource

Enumerated values:

text
cartographic
notated music
sound recording-musical
sound recording-nonmusical
sound recording
still image
moving image
three dimensional object
software
multimedia
mixed material

Subelements:

[none]

Attributes:

collection (yes)

manuscript (yes)

The use of 'resource' in the element name might be confusing. If 'resource' is determined to be a new generic term for all kinds of information objects, then, it should be defined in the user guidelines. AACR does not use this term. In the Library of Congress website for standards (http://www.loc.gov/standards/), there is an inconsistency of term usage for information objects: materials, objects, items, resource, and documents. In this case, LC should provide a glossary or list of definitions. It may be said that the term resource is easily understandable by common sense. Yes, but this is a standard, there shouldn't be ambiguous/vague terms. Every single word must be crystal clear.

4. genre

Subelements:

[none]

Attributes:

authority (see: www.loc.gov/marc/sourcecode/genre/genresource.html)

lang

xml:lang

script

transliteration

The *MODS User Guidelines* state that:

> “"genre" contains a category that characterizes a particular style, form, or content, such as artistic, musical, literary composition, etc. Terms used in this element give more specificity than the broad terms used in <typeOfResource>”.[24]

Examples of the terms used in the element are: *motion picture, abstract or summary, art original, art reproduction, atlas, autobiography, bibliography, biography* and *book, as* listed in the MARC 21 genre source code list mentioned above. Why is genre separated from ‘typeOfResource’ element? It is not immediately obvious what the distinction is. Genre is a term which is more familiar in art or literary subjects. In music, for example, genre is used to differentiate types of music such as jazz, rock, or pop. The terminology in the MARC 21 list for genre does not conform to this normal definition.

14. relatedItem

Subelements

(Any MODS element/subelement may be used as defined)

titleInfo

name

typeOfResource

genre

originInfo

language

physicalDescription

abstract

tableOfContents

[24] Library of Congress (2004). *MODS user guidelines version 3.0: detailed description of MODS elements*. Retrieved May 10, 2005, from http://www.loc.gov/standards/mods/mods-userguide-elements.html

targetAudience

note

subject

classification

relatedItem

identifier

location

accessCondition

extension

recordInfo

part (may be used if type="host")

detail

number

caption

title

Attributes: type (suggested values: part, volume, issue, chapter, section, paragraph, track); level

extent [ordered]

start

end

total

list

Attribute: unit (suggested values: pages, minutes)

Date

Attributes: encoding (w3cdtf, iso8601, marc); point (start,end); qualifier (approximate, inferred, questionable)

Text

Attributes: xlink; lang; xml:lang; transliteration; script; displayLabel; type

Attributes:

type (preceding, succeeding, original, host, constituent, series, otherVersion, otherFormat, isReferencedBy)

Xlink

displayLabel

ID

This element is a container element under which any MODS element can be repeated and may be used as sub element. It is worth noting here that if all elements in MODS are repeatable and can be used as sub-elements, there might be unnecessarily long records. The MODS User Guidelines admit this potential problem that "for purposes of interoperability, deep recursion may be counter-productive".

D. THE INTEROPERABILITY OF THE SCHEMES

Both schemas have developed crosswalks to other schemas. DCMI have focused on mapping to rules for transfer syntax but have done little to match for semantics and content as can be seen in CC:DA Final Report, 1998. Dublin Core elements are not written to match specific syntax models unlike MODS, which is expressed in XML markup. Semantic crosswalks are the most important necessity if metadata is to be shared. The Library of Congress has published a mapping between DC and MODS.

DCMES mapping to MODS (http://www.loc.gov/standards/mods/dcsimple-mods.html):

DC element	MODS element	Notes
Title	<titleInfo><title>	
Creator	<name><namePart>	1. MODS puts all names in a repeated<name> with type of contribution included in <role>. If desired to retain creator or contributor distinction, use <name><namePart><role>creator 2. MODS assumes structured form of name; non-structured is in <name><displayForm> 3. MODS allows distinguishing name as personal, corporate, conference in type attribute. 4. MODS allows <name> subelements to be parsed: <namePart>, <displayForm>, <affiliation>, <role>,

		<description>
Subject	<subject><topic>	Data in MODS may be included in a more specific subelement: <topic>, <geographic>, <temporal>, <name>, <titleInfo>, <hierarchicalGeographic>, <coordinates>
Description	<abstract> <note> <tableOfContents>	Multiple elements in MODS
Publisher	<originInfo><publisher>	
Contributor	<name>	See notes under Creator
Date	<originInfo><dateIssued>	Multiple elements in MODS. Default to <dateOther> or <dateIssued>
	<originInfo><dateCreated>	
	<originInfo><dateCaptured>	
	<originInfo><dateOther>	
Type	<typeOfResource> <genre>	MODS uses high level types in <typeOf Resource> (controlled list); more specific genre terms in <genre> (may be a controlled list)
Format	<physicalDescription><internetMediaType> <physicalDescription><extent> <physicalDescription><form>	Multiple elements in MODS
Identifier	<identifier>	MODS includes a type attribute to specify the identifier type, e.g. <identifier type="uri">
Source	<relatedItem type="original"> + subelements	See notes under Relation
Language	<language>	
Relation	<relatedItem> + subelements	Data parsed into subelements (any MODS element may be used). For example, if a reference to a resource: <relatedItem><identifier> *or* title of a resource: <relatedItem><titleInfo><title>
Coverage	<subject><temporal> <subject><geographic> <subject><hierarchicalGeographic> <subject><cartographics> <classification>	Multiple elements in MODS. Default spatial coverage to <subject><geographic>
Rights	<accessCondition>	

As can be seen from this table, there are great difficulties in matching between these two schemas. Often DC is mapped to multiple elements or sub-elements in MODS. It has frequently been necessary to choose a default element to use in MODS and such elements may not be the most appropriate.

E. CONCLUSION

Based on the analysis, it can be concluded that both schemas have a simplistic approach to bibliographic description. DC was originally developed to facilitate resource discovery on the Web environment, while MODS was created to fill the gap between the simplicity of DC and the complexity of MARC. This may create an impression that MODS was developed as competitor of Dublin core.

Dublin Core started out as a very simple schema but with its element refinement qualifiers is becoming complex. This can be seen, for example, in the qualifiers for 'relation' element which are quite complicated. Meanwhile, MODS is simplifying MARC, which is known to be very complex. Such simplification can be seen in the 'titleInfo' element which has separated statement of responsibility as a different element from the title proper of a resource. In creating the element Name, MODS has probably simplified to an unhelpful extent.

In both schemas, there is reluctance to define terms carefully and to give many and varied examples of implementation. The various validation lists for terminology to use in elements are neither comprehensive nor based on careful analysis.

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