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Metadata And The Cataloguer In Electronic Environment: Analysis Of Conceptual Framework

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Abstract
This paper discusses Metadata as an essential building block in facilitating effective resource discovery, access, and sharing across ever-growing distributed digital collections. It examines what cataloguers do and observes that whether it is called cataloguing, indexing, or metadata, the concept is a familiar one for information professionals. It highlights the fact that the electronic world has finally discovered it because of its importance for both authors and seekers of electronic information, while also noting that it is hard to find a publication about electronic resources that ignores it. The paper discusses types and uses of metadata and takes a look at the schemas. The principles of metadata were examined along with creation and implementation. The paper concludes that metadata is crucial to searching and leaves a pathway for users to follow to find the information they need-all in one place.

Keywords: *Metadata, cataloguing, information access, resource descriptions, digital collections*

1.0 Introduction

Information professionals over the past hundred years have primarily been responsible for the creation and management of metadata in their cataloguing, classification, and indexing duties. But as information resources are increasingly put online by the general public, a new vocabulary has crept into their lexicon and that term is known as Metadata. *Metadata,* literally "data about data," according to Gilliland, (2008) has become a widely used yet still frequently underspecified term that is understood in different ways by the diverse professional communities that design, create, describe, preserve, and use information systems and resources.

"Metadata" was coined in 1968 by Philip Bagley, in his book *"Extension of programming language concepts".* Wikipedia, (2013) In the book, Bagley, (1968) uses the term in the ISO 11179 "traditional" sense, which is "structural metadata" i.e. "data about the containers of data"; rather than the alternate sense "content about individual instances of data content" or metacontent, the type of data usually found in library catalogues. Since then, the fields of information management, information science, information technology, librarianship and Geographical Information Systems (GIS) have widely adopted the term. The term metadata, as adopted by professionals in these disciplines according to Greenberg, (2005) in its simplest form, is frequently defined as "data about data" or "information about information". Thus in libraries, the process of cataloguing are the

process of creating metadata. Any summary of the contents of a library or archive, like a card catalogue, contains metadata. It is the preferred term of the digital community to refer to "card-catalogue" data, and it will, therefore, become increasingly used as more digital tools are developed. While the basic idea behind metadata may be old, the rise of the internet will allow it to become more useful than it ever has been since metadata will be much more accessible than before--and if metadata is more accessible, then resources of all kinds will also be more accessible.

The rapid changes in the means of information access occasioned by the emergence of the World Wide Web have spawned an upheaval in the means of describing and managing information resources. With the unprecedented growth of digital resources, it is anticipated that metadata will become increasingly more important for supporting resource discovery in digital libraries. Metadata remains a useful resource retrieval tool but there appears to be some confusion about how metadata can be integrated into the information systems. But the varying conceptions and sometimes conflicting definitions of metadata among communities can easily create confusion as to what qualifies as metadata. How is it created? Who manages it? Can different metadata standards be used together in a given environment? How can it be used and exchanged? These and more are what this paper tries to unravel.

1.1 Concepts of Metadata

Conceptually, there is little new about metadata and, while many librarians may not be quite familiar with thinking about metadata as we know it, we create it and make use of it every day in the performance of our duties (Good, 2002). Whatever nomenclature it comes up with according to Milstead & Feldman (1999), is it cataloguing, indexing, or metadata, the concept is a familiar one for librarians and information professionals. "Metadata" – in many ways – according to Baca, (2008): can be seen as: "*a late 20th-early, 21st-century synonym for "cataloguing"—is seen as an increasingly important (albeit frequently sloppy, and often confounding) aspect of the explosion of information available in electronic form, and of individuals' and institutions' attempts to provide online access to their collections.*"

Now the electronic world has finally discovered it. Until quite recently, only a few philosophers had ever heard of the word "metadata." Today, it is hard to find a publication about electronic resources that ignores it. Metadata as a term is in itself, a fusion of the words 'meta' and 'data'. Whereas Meta derives from Greek origin, meaning after, beyond, or along with (Merriam-Webster's Online Dictionary, 2012); data on the other hand is the plural of the Latin word datum, meaning something given or a fact (Dictionary.com,2002). The term metadata therefore can be interpreted as referring to something that is associated with a fact or data. In the library environment, Chuttur (2011) observes that the definitions of metadata more often than not, focuses on the representation of information resources, where an information resource refers to any digital or non-digital material bearing information, whether textual or non-textual, that can be made explicit. Examples of information resources include books, web pages, video recordings, images, and cartographic materials. Within this context, therefore, the definitions of metadata as provided by information professionals often specify both the type of resources for which metadata is used and the purpose(s) it serves, such that, over time, what constitutes metadata has grown in scope to suit the needs of multiple groups. Metadata as a term is more profoundly used in library science despite tracing its origins in computer science

(Caplan, 2003). Further expanding the definition, he characterizes metadata as "structured information about an information resource or any media type or format". Notwithstanding its old background, the term "metadata" is used particularly in the context of modern information systems and electronic networks.

Tim Berners Lee (1997) the creator of the World Wide Web (www) defines metadata as "machine-readable information about electronic resources or other things". From this point of view, observe Yousefi & Yousefi, (2007), this simple but direct definition addresses metadata as applied to electronic resources and refers to "data" in a broader scope that includes not only textual, but non-textual information such as graphics, music, or anything likely to appear in an electronic format. It is clear that metadata can be deployed for non-digital objects too. But as mentioned, it most commonly refers to digital information especially on the Web. Metadata according to Reitz (2005) is structured information used to describe information resources/ objects for a variety of purposes. For Miller, (2004), metadata is the "extra baggage" associated with a resource that aids a user in finding that resource (find); discover where, and by whom it was created (identify); decide whether the resource is of value to the user (select); and conclude whether there is feasible access to the resource (obtain). Hudgins, Agnew, & Brown, 1999 observe that while the most basic definition of metadata ("data about data") can be applied to traditional library metadata such as the information on the cards in a card catalog and the information in a bibliographic record displayed in an online public access catalog (OPAC), when metadata is mentioned today, it usually alludes to data that facilitates the description, discovery, and retrieval of networked electronic resources. Metadata, therefore, is a piece of information describing a resource (examples of resources are books, web sites, and videos), the subject, the authors or creators, how it can be stored and accessed, as well as the copyright or legal rights. It could be safely stated here that the bibliographic record in the card-catalogue about a book is a simple example of metadata describing the characteristics of the information resource such as:

Nwosu, Moses. C. (2013). Understanding the principles of *Cataloguing and Classification* Uturu: Whytem -Press.

Z
693.3
.C38 Nwosu, M. C.
N992 Understanding the principles of Cataloguing and Classification / M. C. Nwosu . – Uturu: Whytem Press, 2013.
iv, 234p.: ill.; 26cm+CD-ROM.
Includes index
ISBN: 978-044-222-066 (Cased).
1. Cataloguing 2. Classification I. Title

The example above represents information about a book--that is, data about data. Something important to note about a reference like the above is that we understand the information it is trying to convey by convention. The element sets are five. The first element is the author's name, the second the year, the third the title, the fourth the city and the fifth the publisher. Our understanding of basic cataloguing presents a clear picture of the above description as a book. The above example of metadata can be further represented as indicated below:

Type of Document	Book
Last name of author	Nwosu
First name of author	Moses
Publication Year	2013
Title	**Understanding the principles of Cataloguing and Classification**
City	Uturu
Publisher	Whytem Press

The two citations in the tables above are representations of the same metadata in different ways. The element sets in the two examples provide easy means of appreciating the categories of information in the information resource cited above. Therefore, metadata is a term which the cataloguer will get used to in the electronic environment.

2.1 Different Categories and Distinct Classes of Metadata

Within the library community metadata can be grouped into two broad categories. In the first category, metadata is identified solely with the values used to represent an information resource. Thus, metadata according to Haynes, (2004) is defined as "data that describes the content, format or attributes of a data record or information resource". The purpose of metadata is simply to describe information resources and that the "metadata" is the actual value used for the description. Dublin Core Metadata Initiative (DCMI) similarly, defines metadata as "data associated with either an information system or an information object for purposes of description, administration, legal requirements, technical functionality, use and usage, and preservation" (Woodley, Clement, & Winn, 2005). In this case, DCMI considers metadata to be the value(s) associated with a resource, but this definition also specifies a set of purposes for which metadata can be used. The perception of these two definitions focus on the values associated with a resource without specification of what those values actually represent.

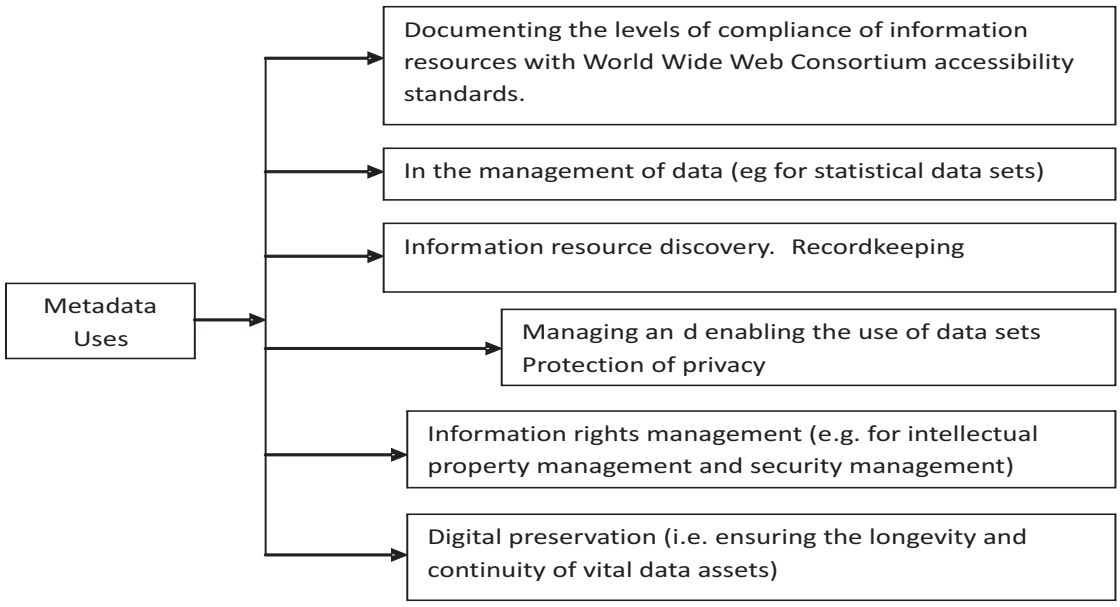
Metadata in the second category is conceptualized as data that specifies the relationship between a value and the information resource it describes. Gill, (2008) and Caplan, (2003) argue that metadata is more than a set of randomly accumulated values. The authors define metadata as the structured description of information resources. The Association for Library Collections and Technical Services (ALCTS) Task Force on Metadata defines metadata as "structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities" (ALCTS-TF (2000).

The metadata application is manifold and covers a large variety of fields of application. Two distinct classes of metadata can be distinguished as follows: structural/control metadata and guide metadata. Bretheron & Singley (1994) state that s**tructural metadata** are used to describe the structure of database objects such as tables, columns, keys and indexes. **Guide metadata,** on the other hand, are used to help humans find specific items and are usually expressed as a set of keywords in a natural language. According to Kimball, (2008)

metadata can be divided into two similar categories: technical metadata and business metadata. Whereas technical metadata correspond to internal metadata business metadata correspond to external metadata. There is a third category described as process metadata. On the other hand, NISO (2004) distinguishes among three types of metadata: descriptive, structural and administrative. While descriptive metadata are used to search and locate objects such as title, author, subject, keyword, publisher; structural metadata on their part give a description of how the components of the object are organised. Similarly, administrative metadata refer to the technical information including file type. Administrative metadata are subdivided into two namely: rights management metadata and preservation metadata.

2.2 Metadata and Their Use

From our understanding of metadata in can be stated that they are used to find, gather, and maintain resources over long periods of time. The most important use of metadata is to locate a resource. Thus, it is clear to note that the element sets of a book are designed to give enough information to allow someone to find that book. The other primary use of metadata is resource *discovery*--that is, finding resources relevant to one's research but which one is unaware of through serendipity. The subject index of a card catalog in a library is a metadata collection which is good for such a purpose. The advent of new technologies brought along with it many new possibilities of information resources discovery. Metadata is critical to the documentation and maintenance of interrelationships between information resources. In the library environment, metadata has been used in various forms as a means of cataloguing archived information. The Dewey Decimal Classification Scheme employed by libraries for the classification of library materials is an early example of metadata usage. Traditional library catalogues use 3x5 inch cards to display bibliographic information about a book's title, author, subject matter, and a brief plot synopsis along with an abbreviated alpha-numeric identification system (call number) which indicated the physical location of the book within the library's shelves. Such data help classify, aggregate, identify, and locate a particular book (Wikipedia, 2013). In summary, Metadata are used as follows:



According to Higgins, (2007) different types of metadata standards are used interdependently to achieve the following aims:

Table 1. Types of Metadata Standards and Reasons for Use

S/N	Metadata Standards- Structure, Content, Functionality and Links	Reasons for Use
1	Metadata structure standards	To ensure consistent structure across individual entries; enable data searching to be implemented and data sharing across a discipline.
2	Metadata content rules	To enable consistent data entry for effective searching. Content rules include: vocabularies and semantic rules as well as authority files, thesauri, classifications and ontologies.
3	Metadata mark-up standards	To ensure that metadata is machine readable and that automated searches can be undertaken.
4	Metadata packaging standards	To define the link s between digital objects and their metadata while binding the components into archival packages as defined by the OAIS Reference Model (Open Archival Information Systems Reference Model - ISO 14721:2003)

Source: *Adapted from Higgins, S. (2007).*

3.1 Metadata Schemes (Schema)

Discussing Metadata in the literature is replete with the terms such as "schema", "scheme", and "element set" and are being used interchangeably to refer to metadata standards. According to Greenberg, (2005) schema *sets of metadata elements designed for a specific purpose, such as describing a particular type of information resource.* In practice, the word "schema" according to Chan and Zeng, (2006) usually refers to an entire entity including the semantic and content components (which are usually regarded as an "element set") as well as the encoding of the elements with a markup language such as SGML (Standard Generalized Markup Language) and XML (Extensible Markup Language). It is important for metadata regimes to comply with accepted industry standards because machines need predictability to successfully process metadata. Interoperability is a necessary perquisite in this regard.

3.2 Metadata Standards

Metadata standards standardize one or more of four main aspects of metadata:

1. **Structure** (how the metadata is structured – often into elements of information or 'properties' consistent with an explicit data model or ontology);
2. **Semantics** (what the metadata elements or properties and their refinements mean);
3. **Syntax** (how the metadata is written/expressed/encoded using common mark-up languages such as HTML and XML and data values consistent with designated controlled vocabularies and encoding schemes), and,
4. **Content** – declarations or instructions of what and how values should be assigned to the elements.

For each element defined, a metadata standard usually provides content rules for

how content should be included (for example, how to identify the main title), representation rules for content (for example, capitalization rules or standards for representing time), and allowable content values (for example, whether values must be taken from a specified controlled vocabulary or can be author-supplied, derived from text, or added by metadata creators working without a controlled term list.) Although Anglo American Cataloguing Rule (AACR2) Machine Readable Catalogue (MARC) cataloguing is formally metadata, the term according to Reitz (2004), is generally used in the library community for non-traditional schemes such as the Dublin Core Metadata Element Set, the Visual Resources Association Core Categories (VRA), or the Encoded Archival Description (EAD).

3.3 Dublin Core Metadata Schema

Dublin Core is a metadata standard that emerged as the outcome of a series of workshops attended by librarians, archivists, information professionals, and other parties interested in describing Internet resources at the National Center for Supercomputing Applications (NCSA) at the Online Computer Library Center (OCLC) in Dublin, Ohio. The major objective was to create a core set of elements that could be used for categorizing Web-based resources. The conference agreed on a set of metadata elements 13 initially and later increased to 15 intended to represent information that is 'core' across all knowledge domains. These 15 element sets are known as the Dublin Core Metadata Element Set and they include title, subject, description, source, language, relation, coverage, creator, publisher, contributor, rights, date, type, format, and identifier. The simplicity of these elements is continually extended and the level of details is increasing to meet the needs of specialized groups. All elements are optional and repeatable. Yousefi, & Yousefi, (2007) relate that in addition to the 15 elements, Dublin Core also has 3 qualifiers that give additional information for interpretation of elements and enable it to function in an international context:

- Language: specifies the language of the element value (and not the resources itself). Example: Title LANG=en.
- Scheme- this provides a clear context for the explanation of a given element. Such a qualifier also indicates the set of regulations, standards, conventions or norms from which a term in the content of the element has been taken.
- Sub-Element: Refines the meaning of element. It specifies a facet of a given field. For example a sub-element for "title" can be "journal title = The Research Librarian."

The results of the Dublin Workshop met with considerable level of interest and in order to build on these results a follow-up workshop was held in Warwick U.K. in April, 1996. This time it was sponsored by OCLC and the United Kingdom Office for Library and Information Networking (UKOLN) with two stated goals:

- ✓ promote semantic interoperability across disciplines and languages, and
- ✓ define mechanisms for extensibility to support richer descriptions and linkages to other description models (Lagoze, Lynch,& Daniel, 1996)

The Warwick Framework is a set of design principles that have guided the development of the Dublin Core since the Second Dublin Core Metadata Workshop in Warwick, UK. It provides a metadata-based school of thought that believes different kinds of metadata can be used to describe the same resource in disparate ways to accomplish different goals. The Dublin Core Metadata Initiative (DCMI) is the organization responsible for the development and management of the Dublin Core. Coleman,

(2005) however notes that when the sixteenth element is used, along with refinements such as qualifiers, the level of Dublin Core use is called Qualified.

4.0 Types of Encoding Systems Infrastructure

4.1 Encoded Archival Description (EAD)

The idea behind the development of EAD standard was to allow finding aids to be searched and displayed online. Caplan (2002) observes that while EAD can be used to describe web-accessible collections, its primary purpose is to improve awareness of archival holdings in all formats. The EAD standard is maintained jointly by the Library of Congress and the Society of American Archivists (http://www.loc.gov/ead/). Hodge (2001) notes that although it is easier to put finding aids on the Web by simply marking them up in HTML, libraries and archives investing in EAD creation hope that using this metadata scheme will encourage consistency in encoding and give them some measure of search interoperability (Yousefi, & Yousefi, 2007).

4.2 Document Type Definition (DTD)

The Document Type Definition (DTD) is a nonproprietary standard for encoding in SGML or XML the finding aids (registers inventories, indexes, etc) used in archives, libraries, museums and other repositories of manuscripts and primary sources to facilitate use of their materials (Reitz, 2004).

4.3 Resource Description Framework [RDF]

RDF is the framework and XML is the syntax used for expressing metadata. RDF (Resource Description Framework) is an infrastructure that enables the encoding, exchange, and reuse of structured metadata. According to Lassila, & Swick, (1999) 'RDF is a foundation for processing metadata; it provides interoperability between applications that exchange machine-understandable information on the Web'. RDF, the authors' further state, can be used in a variety of application areas; in *resource discovery,* in *cataloguing,* in *content rating*, in describing *collections of pages* for describing *intellectual property rights* of Web pages, and for expressing the *privacy preferences* of a user as well as the *privacy policies* of a Web site. RDF and XML are complementary to each other and as such RDF relies on the support of XML. Thus, RDF uses the XML encoding as its interchange syntax. The RDF specifications support the exchange of knowledge on the Web .

4.4 Extensible Mark-up Language (XML)

The acronym XML stands for Extensible Markup Language much the same as HTML. It is designed to describe data, not to display data and the XML tags are not predefined. It means that one must define one's own tags. XML consists of a set of rules for designing text formats, producing files that are easy to generate and are readable by both machines and humans . XML extends HTML without the complexities of SGML. It is the underlying syntax for the transmission of structured data over the Internet. It is a simplified subset of SGML which Sieber, (2010) refers to as *'the mother of all markup languages'*. It is a universal format for structured documents and data on the web and it is used to markup or describe data. XML relies on Document Type Definition (DTD). As a result XML can be deployed at various levels to describe data. Since it already exists in the system it is not dependent on the server or vendor and can be extended by the user. This extensibility, which is a principle of metadata, can however cause problems, as users may freely invent incompatible and or unique meta-tags.

5.0 Principles of Metadata

Whereas principles are concepts common to all domains of metadata and these inform the design of metadata schema or application, p*racticalities* on the other hand, are the rules of thumb, which include constraints and infrastructure issues. For Parmentier, (1999) metadata principles include: accessibility, interoperability adaptability, reusability, durability, affordability, accessibility, discoverability, interchangeability, manageability, and reliability. It is becoming generally accepted in the information community that interoperability stands out from the other basic metadata principles such as simplicity, modularity, reusability, and extensibility. These principles inform metadata database design as well as other system-dependent developments. From the very beginning of a metadata project, the principles that enable user-centered and interoperable services should be foremost in design and implementation.

5.1 Interoperability

Interoperability is one of the most important principles in metadata implementation. In recent times, a great deal has been written about achieving interoperability among different metadata schemas. The concept of interoperability has been variously defined. (NISO, 2004) defines interoperability as the ability of multiple systems with different hardware and software platforms, data structures, and interfaces to exchange data with minimal loss of content and functionality. Interoperability according to (CC:DA, 2000) is the ability of two or more systems or components to exchange information and use the exchanged information without special effort on either system. For Taylor (2004) interoperability is the compatibility of two or more systems such that they can exchange information and data and can use the exchanged information and data without any special manipulation. Such systems must however conform to Z39.50 which is an information retrieval protocol. Z39.50 servers can provide data about the databases they make accessible and the facilities they support through an 'explain' database. This might include something about terms of availability or more technical data about supported searches, and so on to allow a client to make sensible decisions. Other basic metadata principles include;

5.2 Simplicity of Metadata

Simplicity of metadata does not mean not providing essential features, not being unsophisticated; not lacking performance or rather not a position of compromise; but more importantly, it is a position of strength. Penchant for simplicity often leads to elegance, robustness, and ease-of-use.

5.3 Modularity

Metadata modularity according to Duval, Hodgins, Sutton, & Weibel, (2002) 'is a key organizing principle for environments characterized by vastly diverse sources of content, styles of content management, and approaches to resource description. It allows designers of metadata schemas to create new assemblies based on established metadata schemas and benefit from observed best practice, rather than reinventing elements anew'.

5.4 Multilingualism

One of the metadata principles is multilingualism. It recognizes and respects linguistic and cultural diversity. Because the Web affords users unprecedented access to resources of global scope the multilingual principle of metadata makes such resources available to users in their native languages. Therefore, without the workability of this multilingual principle the Web would have failed to achieve its potential as a global information repository system.

5.5 Refinement

Element refinements are qualifiers that make the meaning of an element narrower or more specific. Smith, Breytenbach & Groenewald, (2007) are of the opinion that Qualified Dublin Core employs additional qualifiers to the basic 15 elements to further refine the meaning of an element. Qualifiers increase the precision of the metadata. A refined element as Kemman, (2010) opines shares the meaning of the unqualified element, but with a more restricted scope. A client that does not understand a specific element refinement term should be able to ignore the qualifier and treat the metadata value as if it were an unqualified (broader) element.

5.6 Extensibility

Simply, extensible means having the potential to be expanded in scope, area or size. Metadata schemas should be capable of accommodating additional domain requirements, while at the same time maintaining standard schema structure. Extensibility according to Han, Lee, & Jeong, (n. d.) comes in two forms: the addition of new data elements and the mechanism for the accommodation of specified applications or local requirements. As a metadata principle it is necessary that particular needs of a given application can be accommodated. Duval, Hodgins, Sutton, S. & Weibel, (2002) opine that *some metadata elements are likely to be found in most metadata schemas (the concept of creator or identifier of an information resource, for example) .Others will be specific to particular applications or domains (degree of cloud cover, for example, in remote sensing data).*

5.7 Reusability

The characteristic of "predisposition to reuse" must be further analyzed to derive properties that are more concrete. Learning object specifications often refer to: 1) durability; 2) interoperability; 3) accessibility; and 4) reusability. The first three characteristics are essentially of a technical nature. "Durability" and "interoperability" are characteristics related to software and hardware platform independence, which can be obtained by adhering to public Web languages and conventions. The third characteristic, "accessibility," is understood in this context as the capability of being searched for and located, which is achieved by the presence of an appropriate searchable metadata record.

Consequently, the fourth characteristic, "reusability" remains the most difficult to define, since it is related mainly to instructional design, and not to digital formats or content structure that are the main concern of interoperability and accessibility. Additionally, the desirable "granularity" of a learning object is determined by the imposed reusability requirements; therefore, objects must be decoupled from each other (Boyle, 2003) to achieve both educational context independence and technical independence (i.e., not being linked to other digital contents).

6.0 Creation and Implementation of Metadata Standards Policy

Metadata can be created at the time of creation of an object, either by or under the auspices of its creator. It can also be added later as part of the traditional cataloguing process. The former mode of creation is expected to predominate, largely because the traditional third-party methods (cataloguing and indexing) simply cannot cope with the massive and rapidly growing number of electronic objects in existence. In the creation and implementation of metadata regimes, there are issues and considerations that should be addressed. These, according to Cunningham, (n.d.) and Higgins (2007) include:

❖ Cataloguers generally dislike creating

metadata manually, as they often regard it as an onerous imposition on their already busy schedules. It is therefore important for metadata creation and management to be as automated as possible.

- The context in which the metadata will be created and used — best practice is to use a standard which has been developed with a particular community in mind. Communities have implemented standards such as: ISAD(G)2 (International Standard Archival Description (General), 2nd Edition) - a structure standard for describing archival materials, AACR2 (Anglo-American Cataloguing Rules, 2nd Edition) - a content standard for cataloguing book materials.
- Close attention needs to be given to metadata quality assurance. It is generally not difficult to create good metadata, but it is also very easy to create bad metadata. Bad metadata is worse than no metadata.
- Metadata implementations need to give careful consideration to what metadata needs to be created and maintained. All metadata creation and maintenance come at a cost, and all such costs need to be justified by business needs. The creation of metadata should be targeted at being able to be deployed for effective resource discovery.
- Even though metadata regimes can be simple they can also be highly complex. Generally speaking, the more simple the metadata the better because complex metadata is expensive to maintain and more difficult to quality assure. However, simple metadata may not always deliver the desired business outcomes – so, greater levels of complexity and precision may be pursued when justified by clearly understood business drivers.
- Because public sector information is dynamic and ever evolving, it is important for metadata to be kept up to date to reflect the changing nature of the information resources to which the metadata relates. Metadata should not be static, but rather should be actively maintained, managed and updated.
- As a general rule the technical infrastructure supporting metadata implementation should rely on flexible rather than hard-wired enterprise architectures. Service Oriented Architecture (SOA), for example, promises to provide an ideal approach to implementing flexible, dynamic, interoperable and reusable metadata.

Others include:

- The format of the information resource being described,
- The budget,
- The metadata capture method, and,
- The storage and delivery

Conclusion

Metadata as a term has become debased by overuse and means so many different things in different communities and contexts. Today, it is now virtually meaningless without extensive qualification. Unfortunately however, in the digital world metadata has increasingly assumed the status of something one cannot do without in matters of information resource discovery. The importance of metadata however cannot be overstated. With respect to information discovery, metadata is a crucial element for effective retrieval. In the absence of full text indexing, using metadata is the only way a system can search for and provide access to various kinds of digital information resources. Image and video collections, in particular, frequently lack textual information making their discovery highly dependent on metadata. Metadata has the potential to assist effective human use of resources as well as be essential for effective programmatic use of resources.

In conclusion therefore, it can be said without equivocation that metadata is knowledge which allows human and automated users behave intelligently.

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