Metadata (Group 2)

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Metadata

Libraries possess thousands of resources that need to be catalogued based on the needs of individual genres. In order to effectively organize these resources, it is necessary to make unique notations, known as metadata, that correspond with each piece of information. Librarian Karen Coyle (2005) points out that “just as there is no single kind of map that serves all needs, there is no one kind of metadata for documents or other information objects” (p. 160). Depending on the needs of each genre, different metadata standards, or schemas are utilized, such as Machine Readable Cataloguing (MARC), Metadata Encoding Transmission Standards (METS), Bibliographic Framework (BIBFRAME), and Dublin Core (DC) (Taylor & Joudrey, 2009, p. 116). In order to connect these schemas together, metadata crosswalks are established from one standard to another. However, familiarity in both schemas is necessary in order to make full use of all available resources (Barroso, Hartmann, & Ribeiro, 2015, p. 37). Some genres may choose to combine elements of various metadata schemas within an application profile that meets the needs of their organization. In order to make schemas as interoperable as possible, however, it is important to establish registries with definitions and usage information for all materials incorporated into a collection (Baker, Dekkers, Heery, Patel, & Salokhe, 2006). Unfortunately, the creation of these registries is still a work-in-progress for libraries, but once they are fully realized, they will be able to share metadata application profiles for each schema, which include definitions of terms utilized by the library and how schemas relate to one another (Taylor & Joudrey, 2009, p. 116).

There are three different types of metadata that need to be considered when establishing a catalog, including administrative, structural, and descriptive metadata (Lopatin, 2010, p.717). Administrative metadata documents how items are stored and the frequency of their use; this is helpful when determining what items should be weeded from a collection. This metadata type has numerous subcategories that focus on particular administrative aspects, such as technical, preservation, rights and access, and meta-metadata (Otto, 2014, p. 4). Libraries, such as Kent State University Library, are increasingly relying on administrative metadata to help them determine what resources should be purchased. Kent State established a patron-driven acquisition (PDA) system within their library's cataloging system that provides users with access to e-books; when the e-books have been sufficiently utilized, the library will automatically order a print copy of the book (Urbano, Zhang, Downey, & Klingler, 2015, p. 412).

In addition to administrative data, library catalogs also rely on structural and descriptive metadata. With thousands of metadata entries in a catalog, it is necessary to be able to rapidly transition from one record to another by incorporating navigational tools, such as forward and back buttons. Navigation between metadata entries is part of structural metadata (Taylor & Joudrey, 2009, p.92). Within individual resources, structural metadata also includes documenting how pages are structured to form chapters (National Information Standards Organization [NISO], 2004, p. 3). While administrative and structural metadata are important, there is also a need for descriptive metadata in order for users to be able to obtain the information that they are looking for. Descriptive metadata utilizes a controlled vocabulary, such as an author and a title, in order to help users locate information (Taylor & Joudrey, 2009, p.92). As users become more tech-savvy, they add descriptive metadata of their own to catalogs, such as adding reviews, uploading photos, and adding tags or ratings for library resources; this user interaction on the web is referred to as web 2.0 (Lopatin, 2010, p. 734; Rolan, 2015, p. 43). For instance, the Broward County, FL library website allows users to rate books out of five stars.

This could help users unsure of what resources to utilize to make a more informed selection (browardlibrary.org).

Since there are numerous platforms that enable users to obtain information, there needs to be a structural interoperability among metadata. For instance, information needs to be accessible for users whether they utilize a Macintosh or a personal computer; whether they use a desktop computer or a mobile device. This is essential in order to for users to obtain information and participate in the realm of web 2.0 (Rolan, 2015, p. 43). With an array of metadata schemas, such as MARC and BIBFRAME, there also needs to be a way of relating controlled vocabulary terms from one metadata standard to another (Barroso et al., 2015, p. 41). This type of syntactic interoperability is essential for crosswalks to be established between schemas. Metadata descriptions also require a degree of flexibility, so that they can be directed towards a particular target audience, such as historians or scientists (National Information Standards Organization, 2004, p. 3). Since the research needs of these communities are vastly different, catalogers may need to add qualifiers to a particular collection in order to meet the searching habits and needs of a particular community (NISO, 2004, p. 3).

The most common metadata standard utilized within libraries is Machine Readable Cataloging (MARC). In the 1960s, Henriette Avram and the Library of Congress established MARC to create bibliographic records of printed materials, such as books and journals (Spicher, 1996; Tharani, 2015, p. 16). When it was invented, Machine Readable Cataloging revolutionized library cataloging as it enabled computers to read bibliographic records and for libraries to share these records with one another. According to librarian Betty Furrie (2003), "MARC enables libraries to acquire cataloging data that is predictable and reliable. If the library were to develop a "home-grown" system that did not use MARC records, it would not be taking advantage of an industry-wide standard whose primary purpose is to foster communication of information" (p. 4). Likewise, MARC records enable libraries to make use of widely available automation systems to manage library operations.

While MARC is the most commonly used metadata schema in libraries, it is important to note that there are many different versions of the schema, including country specific and LITE versions. In 1999, the U.S. and Canada merged their national MARC formats (USMARC and CAN/MARC) to create a new system for the 21st century, MARC 21. Following this successful merger, in 2004, the British Library adopted MARC 21 and the German National Library announced plans to utilize it in the future. MARC 21 is now the most commonly used version, and has five different formats for different types of data, which include bibliographic, authority, community information, holdings, and classification data formats (Taylor, 2009, pp. 137-139).

MARC has enjoyed longevity for over five decades, but with rapid technological advancements prompted by the internet, questions exist about its viability as an industry standard for the coming decades. When MARC was initially invented, computers were not as powerful as they are not today, nor did they have as much storage space. MARC was created around these limitations, and consequently, the MARC format utilizes a simple three digit numeric code to identify its fields. These three digit codes, referred to as "tags," aid the computer in interpreting the bibliographic data. The numbers for each field range from 001 to 999. Within each bibliographic entry, there are fields, such as author and title, which can then be divided into sub-fields (Furrie, 2003, p. 5). In addition to the limitations posed by these tags, MARC also creates bibliographic records that are virtually locked into the library catalog/community because of its format, which cannot easily be shared or searched through alongside information available on the internet (Gonzales, 2014, p. 11).

According to librarian Brighid M. Gonzales (2014), “MARC’s rigidity may also be a reason why the format is not generally used outside of the library environment…[as] information contained in MARC format cannot be exchanged with information from non-library environments” (p. 11). Others find MARC’s size limitations and its inability to convey hierarchical or complex relationships among entities to be problematic. Some dislike MARC’s inability to embed related objects in the record (e.g., book covers), and see this as symptomatic of MARC’s antiquated data structure. Many have suggested that XML schema should replace MARC (Taylor, 2009, p. 141). In response to these criticisms, BIBFRAME (Bibliographic Framework) is currently being created by the Library of Congress to eventually replace MARC in the future.

Responding to the limitations of MARC in today’s environment, the Library of Congress developed the Bibliographic Framework, or BIBFRAME, for bibliographic description based on the concept of Linked Data that is used in the Semantic Web (Tharani, 2015, p. 5). The Semantic Web is a web of data; in addition to needing access to data, it also requires established relationships among the data in order to be functional. Linked Data is the term used by the World Wide Web Consortium (W3C) to describe these interrelated datasets. BIBFRAME intends to use Linked Data so that libraries can integrate bibliographic and authoritative data with the user-generated data already available on the web. BIBFRAME has the potential to create a rich world of data, available to anyone seeking information on the web, because using Linked Data will connect the information cataloged by libraries with other relevant outside sources through metadata relationships (Gonzales, 2014, p. 14).

For a successful transition to BIBFRAME, the data contained in library catalog systems must be first translated to a more flexible and usable format than the one currently used by

MARC (Gonzales, 2014, p. 16). The design of the MARC data system makes determining relationships between entities difficult because data is described in different fields (p. 11). Linked Data will need to be made available in a language that can be integrated with the web and able to be queried so that it can meet the emerging needs of information seekers (Gonzales, 2014, p.14; Tharani, 2015, p. 16).

BIBFRAME uses XML, or Extensible Markup Language, which was developed by the World Wide Web Consortium (WC3), as the preferred markup language for "the encoding and exchange of structured data" (Duval, Hodgins, Sutton, and Weibel, 2002; Gonzalez, 2014, p. 14; NISO, 2004, p. 2; Tharani, 2015, p. 16). It is an extended form of HTML (Hypertext Markup Language), which was developed as a simplistic way to create Web pages (NISO, 2004, p. 2; Taylor & Joudrey, 2009, p. 143). Whereas HTML is primarily descriptive, XML is far more geared towards the structural aspect of web page creation and has better functionality since it is able to accommodate multimedia files and identify the formats of encoded elements (Taylor & Joudrey, 2009, p. 144). XML's use of structural metadata as well as XML schemas allows it to remain fairly easy to use while having a high level of interoperability and is expected to "[play] an increasingly crucial role in the exchange of a variety of information on the Web" (Duval, et al., 2002; NISO, 2004, p. 3).

Standard mechanisms, such as a Universal Resource Identifier, or URI need to be used as part of BIBFRAME (Gonzales, 2014, p.13). Hypertext Transfer Protocol (HTTP) URIs are used so that users can look up resources, but unlike a typical web address, or Universal Resource Locator (URL), if a resource named as a URI is relocated or changes occur in server technology, there is no impact on the URI; it does not become a dead link or an invalid extension (Gonzales, 2014, p. 13; Tharani, 2015, pp. 8-9).

Another BIBFRAME requirement is the use of Resource Description Framework (RDF) to create and publish Linked Data on the web. Much like how a sentence is structured, RDF makes use of three elements to compose the unit of description for a resource. These three elements are subject, predicate and object; in RDF terminology, they are called a triple (Tharani, 2015, pp. 8-9). RDF triples are used to map the relationships between each item possessing a unique URI, and can be linked to other resources, creating a web of interrelated data. A framework, such as RDF needs to be used because it allows for interoperability with data and resources from other parts of the web to be merged with the library data (Gonzales, 2014, p. 13).

The intent of the Library of Congress is to have BIBFRAME replace MARC and create a system to connect library catalogs, but it is not an equivalent one-to-one replacement system. BIBFRAME will allow libraries to share their catalogs and bibliographic data over the web. In addition to a seamless exchange of metadata among libraries, BIBFRAME is capable of making connections to outside sources to provide access to cultural information and non-print materials (Tharani, 2015, p. 5). MARC packages description information about resources into a record, which poses a likelihood of information being duplicated across multiple records. To avoid useless replication, the BIBFRAME model is reliant on the relationships between resources (Library of Congress).

The BIBFRAME model uses four classes of information resources in which relationships may be established: work, instance, authority and annotation. While using similar data found in MARC, the BIBFRAME model allows freedom to these classes to interact with the information already on the web, as well as grants permission for system updates to be performed when any of the classes of resources they reference have been updated (Library of Congress).

Sharing their metadata through BIBFRAME will provide numerous benefits to libraries, as well as users seeking information. Internet search engines, such as Google, are often the first place users search for information. BIBFRAME will grant library databases visibility on the web where users, who do not normally rely on the library, will be able to access them (Gonzales, 2014, p. 14). For those specifically searching library records, Linked Data will guide users to related materials allowing them to discover meaningful resources they were not intentionally looking for and may not have been aware that they existed (Tharani, 2015, pp. 4-5).

BIBFRAME will increase the visibility of libraries, making their collections universally accessible on the web in one system. It will keep libraries technologically current with the modern information world and increase the relevance of the library in the minds of those actively seeking Linked Data information. BIBFRAME may contribute to reduced data storage costs and eliminate the extra work that libraries undertake in replicating data records since they will be able to be shared on the web (Gonzales, 2014, pp. 14-15).

In the early days of the Internet, cataloging rules could not be effectively applied to web resources because it was costly, and it required a professional to understand the schemas and rules of the cataloging elements. Another reason was that cataloging required considerable time to effectively insert the proper elements for the schemas, not to mention the details that were required to describe the elements (Chan, p. 116, 2007). This issue was raised at the 2nd International World Wide Web Conference in October of 1994 in Chicago, Illinois. At this conference, Yuri Rubinsky, Stuart Weibel, Eric Miller, Terry Noreault and Joseph Hardin brainstormed ways to fix this problem. Based on their ideas, the National Center for Supercomputing Applications (NCSA) and the Online Computer Library Center (OCLC) came together for a workshop the following year in Dublin, Ohio (DCMI History of the Dublin Core

Metadata Initiative, 2015). At this workshop there was a discussion on how to develop "an international consensus on a simple resource description format" (Miller, p. 49, 2011). From this workshop, a set of 15 core descriptive metadata elements materialized, called the Dublin Core Metadata Element Set (DCMES), or referred simply as Dublin Core (DC).

The name was created in honor of the city that hosted the workshop, while the word "core" was utilized because these 15 elements, including contributor, coverage, creator, date, description, format, identifier, language, publisher, relation, rights, source, subject, title, and type, were broad and generic enough that they could be applied to a wide range of resources. In order to better understand how the original Dublin Core elements, known as the Simple (unqualified) Dublin Core, are utilized, please see the table on the following page (Miller, p. 52, 2011).

Table 2.13. Simple Dublin Core Record Example

Element	Value
Title	Metadata Demystified
Creator	Brand, Amy
Creator	Daly, Frank
Creator	Meyers, Barbara
Subject	Metadata
Description	Presents an overview of metadata conventions in publishing.
Publisher	NISO Press
Publisher	The Sheridan Press
Date	2003-07
Type	Text
Format	application/pdf
Identifier	http://www.niso.org/standards/resources/Metadata_Demystified.pdf
Language	en

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After the workshop in Dublin, Ohio, the Dublin Core Metadata Initiative (DCMI) was established as the group that would oversee everything pertaining to the DC metadata schema. After some time, however, it was realized that the 15 core elements were too broad to include every resource (Miller, 2011). Consequently, three new elements were added to the original elements, including audience, provenance, and rights holders. In addition to these 3 additional elements, this modified Dublin Core, known as Qualified Dublin Core, includes a group of other qualifiers that “refine the semantics of the elements” (Chan, p. 120, 2007). These groups are usually divided into two large categories, including element refinement and encoding scheme.

The first group of qualifiers, element refinement, helps refine the meaning of elements, or helps make them more specific (Chan, p. 120, 2007). The second group of qualifiers, the encoding scheme, employs a controlled vocabulary, or standardized syntax that helps an individual understand an element's value. Essentially, it describes what the item actually is. An example of the Qualified Dublin Core in use is shown below in Table 2.15 (Miller, p. 55, 2011).

Table 2.15. Qualified Dublin Core Representation Example

Local Element Name	DC Element	Refinement	Scheme	Value
Date of Creation	Date	Created	W3CDTF	1696-09-28
Dimensions	Format	Extent		3.5 x 5.3 meters
Type of Art Work	Subject		TGM	Landscape paintings
Place Depicted	Coverage	Spatial	TGN	Flanders

Dublin Core was originally created to "define a set of descriptive elements simple enough for non-catalogers…to describe web resources" (Chan, p. 117, 2007). This made it easier for non-professionals to create web pages using simple encoding descriptors. Unfortunately, Dublin Core did not catch on in the way that its creators had envisioned. The creators of DC intended for website creators to add a richer amount of descriptors to the simple HTML meta tags (Taylor, p. 144, 2009). Unfortunately, more often than not, website creators who utilized Dublin Core used the elements incorrectly and commonly used inaccurate values in describing their elements (Miller, p. 55, 2011). However, those that did apply the DC elements to their websites had more mischief on their minds than giving the searcher accurate resources (Taylor, p. 144, 2009). Dublin Core, nevertheless, is popularly used worldwide for other purposes.

All over the world, libraries use DC as their base metadata element set. Many information professionals make use of DC for a wide variety of their collections, especially their digital collections. Other trusted institutions use DC as a starting point for their element schemas and then customize additional elements to fit their own needs. One of the most important and long-term uses of DC was the ability to accommodate richer schemes like MARC and Dublin Core. This accommodation provided for an easier method to distribute information among systems that may not recognize richer schemes (Miller, p. 56, 2011). While there are other metadata schemes out there that can be used for many different purposes, DC is universal in its application. Due to the DC's universality many countries all over the world can use it to accommodate their own schemes in their own languages. The DCMI registry reports that the DC already uses 20 languages in its schema and it is working to include more languages as the use of DC becomes more prevalent (DCMI History, 2015).

While several descriptive metadata schemas, such as the Dublin Core were created primarily to focus on the discoverability and identification of electronic resources, there were not many options regarding metadata standards that could satisfactorily manage complex digital objects (NISO, 2004, p. 4). One such schema that was created to deal with this disparity was the Metadata Encoding and Transmission Standard (METS). Fine-tuned by the Digital Library Federation (DLF) to build upon past structural metadata initiatives, it is an XML language "for encoding structurally complex digital objects into a single document that includes descriptive, administrative, and structural metadata" (NISO, 2004, p. 4; Taylor & Joudrey, 2009, p. 101).

Comprised of seven elements, including the METS header, descriptive metadata, administrative metadata, the file section, the structural map, structural links, and behavior metadata, it standardized structural metadata so that digital objects could be opened by information organizations that had no part in creating them (Taylor & Joudrey, 2009, pp. 101-102). These elements are specific enough to enable interoperability, flexible enough to be used with other metadata schemas, but still simple enough for digital object creators to implement. (Taylor & Joudrey, 2009, p. 102)

METS has replaced both the Electronic Binding DTD schema (Ebind) and the Making of America Project II (MOA2) as a favored structural metadata schema (Taylor & Joudrey, 2009, p. 101). Its foundations are based on the MOA2 schema, which “proposed a standard encoding for digital objects,” by providing an encoding format for metadata in regards to textual and image-based works (Taylor & Joudrey, 2009, p. 19). After the collaboration of many research libraries that resulted in the MOA2, the DLF built upon their work and created METS, “a standard schema for providing a method for expressing and packaging together... metadata for objects within a digital library” (NISO, 2004, p. 4). Another successful example of how structural metadata may be used is the page-turner model; it is still used today for resources “with contents that must be ordered in a definite sequence” (Taylor & Joudrey, 2009, p. 101).

METS' flexibility stems from the many options available for the descriptive and administrative metadata elements. For these two sections, “METS does not define the elements to be included” and instead “allows the creators to choose from a number of extension schemas” (Taylor & Joudrey, 2009, p. 102). Additionally, regardless of the extension schemas used, creators can also choose if they would like to store the metadata record within a METS document, or outside of it. The remaining four elements list all the files used to create the digital objects, how they fit together and in relation to each other, and how the entire object is to perform (Taylor & Joudrey, 2009, p. 102).

With the coming reality of linked data, it is important for schemas to accommodate and connect with other schemas. Without a link between schemas, users unfamiliar with a particular schema would be unable to access metadata entries contained within it. Tools for managing metadata and facilitating this accommodation create "metadata interoperability." Librarians Caryn Neiswender and Ellyn Montgomery (2009) explain that this is "the ability of two or more information systems to exchange metadata with minimal loss of information" (para. 1). Simply put, interoperable metadata is metadata from a given resource that can be used by another (Neiswender & Montgomery, 2009). While "interoperability" is conceptually simple, implementing it without losing or altering data in the exchange can be highly challenging (Zeng & Chan, 2006).

In order to create this interoperability, it is necessary to establish a crosswalk between various schemas that enable users to understand how one element within a metadata scheme relates to an element in a different scheme (Caplan, 2003; Dublin Core Metadata Initiative, 2005). According to librarian Priscilla Caplan (2003) crosswalks have been developed for many of the predominant metadata schemes. Providing a practical illustration of the necessity of crosswalks, librarian Teressa M. Keenan (2010) explains that when the University of Montana-Missoula chose to subscribe to the *U.S. Congressional Serial Set 1817-1994,* the library was faced with the quandary of either spending $25,000 to receive MARC records for all 262,000 publications in the set or receiving Dublin Core format records for free (Kennan, 2010, para. 3). With limited funding available, the library chose to use free MARC editing tools, in combination with Dublin Core to MARC crosswalks available from the Library of Congress, among others, to create MARC records. This effort created records that were discoverable in their existing ILS platform, Voyager, and saved the library a considerable amount of money (Keenan, 2010, para. 3).

However, there are challenges associated with using crosswalks. Most notably, the mappings are one directional. Even when crosswalks in the reverse direction do exist, restoration of the original metadata is highly unlikely. The Library of Congress explains in its discussion of its crosswalk from MARC to Dublin Core that whereas the Dublin Core to MARC crosswalk "maps a Dublin Core element to a single MARC field," in the MARC to Dublin Core crosswalk "multiple MARC fields are mapped to a Dublin Core element" (Development and MARC Standards Office, Library of Congress, 2008, para. 1). It is easy to see if one were to crosswalk records from a more detailed metadata scheme like MARC to Dublin Core and then attempt to crosswalk the same records back to MARC, data would likely be left out. In fact, the Library of Congress (2008) explicitly states, "Once MARC data is converted to Dublin Core, not enough information is retained to allow for mapping back to MARC accurately. This is inevitable when mapping a complex set of data elements to a simpler set" (para. 3). For users to better understand how such a crosswalk works, it is important to review the following table, which includes a crosswalk from MARC to the Simple (unqualified) Dublin Core (Development and MARC Standards Office, Library of Congress, 2008):

MARC to Dublin Core Crosswalk (Unqualified)

- Conventions:
    - 1."$" is used to specify the subfield used. If none is specified, use all subfields.
    - 2. DC element is repeated if multiple MARC fields are used.

MARC fields	**DC Element**	**Implementation Notes**
100, 110, 111, 700, 710, 711	Contributor	
720		
651, 662	Coverage	
751, 752		

	Creator	Creator element not used.
008/07-10	Date	
260cg		
500-599, except 506, 530, 540, 546	Description	
340	Format	
856$q		
020$a, 022$a, 024$a	Identifier	
856$u		
008/35-37	Language	
041abdefghj		
546		
260ab	Publisher	
530, 760-787ot	Relation	
506, 540	Rights	
534$t	Source	
786ot		
050, 060, 080, 082	Subject	
600, 610, 611, 630, 650, 653		
245, 246	Title	Repeat dc:title for each. Some applications may wish to include 210, 222, 240, 242, 243, and 247.
Leader06, Leader07	Type	See Appendix 2 for Leader-Type rules.
655		

While many metadata schemes exist, there are circumstances where choosing a single one among them cannot adequately serve the organizational needs of a user group as applied to the information that group collects. In fact, there may be elements of various existing information schemes that if combined a certain way, would be optimal. Synthesizing elements from various metadata schemes, rather than infusing new ones is referred to as an application profile (Taylor & Joudery, 2009; Baker, Dekkers, Heery, Patel, & Salokhe, 2006). One example of an application profile that is in development is the Dublin Core Library (DC-Lib) Application Profile. This profile is intended to clarify the use of the Dublin Core Metadata Element set as utilized in library and library-related applications (DCMI-Libraries Working Group, 2004). The DCMI Libraries Application Profile Task Group controls the ongoing development of this application profile. Its goal is to provide guidelines that allow users to easily create catalog records for materials normally found in library environments, while still supporting interoperability (DCMI Libraries Application Profile Task Group, 2010). Maintaining rules and guidelines are necessary for ensuring interoperability between schemas, which is a task that requires a strong commitment (Heery & Patel, 2000). Librarians Rachel Heery and Manjula Patel (2000) assert that if brand new data elements are introduced, a new scheme must be created and the implementer must "take responsibility for 'declaring' and maintaining [it]" (What is an information profile? section, para. 4).

Creating registries helps to foster interoperability among schemas. Registries promote interoperability by providing a repository of authoritative information regarding the definitions of each element utilized within a metadata scheme (Caplan, 2003). Registries help system designers achieve increased standardization by providing information on available metadata terms, usage notes, and more (Baker, Dekkers, Heery, Patel, & Salokhe, 2006). Unfortunately, few metadata registries exist at this time (Caplan, 2003). Those that do, follow a voluntary international standard, called ISO/IEC 11179 that outlines naming and identification principles, data definitions, and several other standards (Home Page for ISO/IEC 11179 Information Technology -- Metadata registries, 2014). While registry creation is still in its infancy, a common characteristic of existing registries is that they are human-readable; machine-readability is a long term goal of the registry community (Caplan, 2003; Taylor & Joudrey, 2009, p. 116).

The Dublin Core Metadata Initiative has taken the lead in the creation of registries through its DCMI Registry Community. This community's stated goals are to "foster a common approach to [the] use of data models and standards, handling multi-lingual vocabularies, sharing and exchanging registry data, vocabulary mapping; and to promote interaction between affiliated registries" (DCMI Registry Community, n.d.). With its versatility, versions of Dublin Core have been established in twenty different languages, including French, Russian, and Polish, making it one of the most widely used schemas around the world (http://dublincore.org/archives/2001/02/purl-dc-website/index.htm).

Since every genre has different informational needs, there are a multitude of metadata schemes that are utilized to organize information into catalogs. For half a century, MARC was the industry standard in libraries, but that scheme does not enable researchers to find relevant online resources. The Library of Congress hopes to fix that problem with the creation of BIBFRAME, which will make it possible to link data between libraries and the World Wide Web. Nations around the world, however, are increasingly enjoying the simplicity of Dublin Core and its ability to adapt to different languages. Like Dublin Core, METS offers great flexibility and it is able to be utilized with other schemas. Libraries will oftentimes combine schemas together into an application profile that fits their needs. Once registries are fully implemented within the library community, it will make it easier to share these application profiles and to understand terminology included within each profile. With linked data on the horizon, registries will make it easier to connect one schema to another, which will be the next step in the fulfillment of the library's mission of making information accessible to users.

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