

## Hitting a Moving Target: Cataloguing in the Age of Emerging Technologies

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### **Abstract:**

*The proliferation of content in electronic format and other emerging technologies was a chief impetus in the creation of the Functional Requirements for Bibliographic Records, the ISBD Area 0, and the development of RDA: Resource Description and Access. RDA in particular relies upon extensive sets of small vocabularies used in bibliographic data elements to describe carriers and content.*

*These vocabularies provide a foundation for universal bibliographic control that supports Linked Data. However, some established technologies do not have appropriate vocabulary terms in RDA, relegating these resources to an undocumented area of description that inhibits universal bibliographic control.*

*In conclusion, there are some methods for updating data element vocabularies in RDA. Review of emerging technologies by a committee designated for such oversight may aid universal bibliographic control as technologies are introduced and adopted.*

**Keywords:** universal bibliographic control; data elements; vocabularies; RDA: Resource Description and Access; ISBD Area 0.

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## **1 INTRODUCTION**

Universal bibliographic control is dependent upon a shared understanding of how we define a resource. Cataloguers of yore could rely on the constancy of the handful of formats that were available prior to the emergence of digital technologies, knowing that when they woke up each morning a book was still paper and a motion picture was still film. In our present time emerging technologies have changed our expectations and assumptions about the constancy of formats. They challenge our definitions of formats and our descriptive cataloguing rules driving such responses as the *International Standard Bibliographic Description* (ISBD) area zero and *RDA: Resource Description & Access*. In today's world a

cataloguer can be faced with such resources as slotMusic, PlayAway sound recordings, PlayAway Views, and three-dimensional Blu-ray video discs. In the near future a cataloguer will be faced with a variety of information resources accessible from everything from eyeglasses to clothing to a 3D user interface. At times our vocabularies and descriptive rules are nimble enough to accommodate new technologies, and at other times they fail to express the actual nature of the resource, which can then impact bibliographic control. The confluence of emerging technologies and universal bibliographic control raises the question of the ability of our current bibliographic control methods, specifically *RDA: Resource Description and Access*, to accurately and universally describe information content delivered in an emerging technology.

## 2 EMERGING TECHNOLOGY

“Emerging technology” is a term used very differently in library and information science (LIS) than it is in the technology sector. As recently discussed and defined at the 2010 American Library Association annual meeting at the Library Information Technology Association (LITA) Emerging Technologies Interest Group Program, an emerging technology is defined as a technology that has low but climbing performance and adoption rates. The technology exists somewhere between bleeding-edge and mature, or in terms of the Gartner Hype Cycle, between the peak of inflated expectations and the trough of disillusionment (figure 1) (Erdman and Kim 2011, 340).

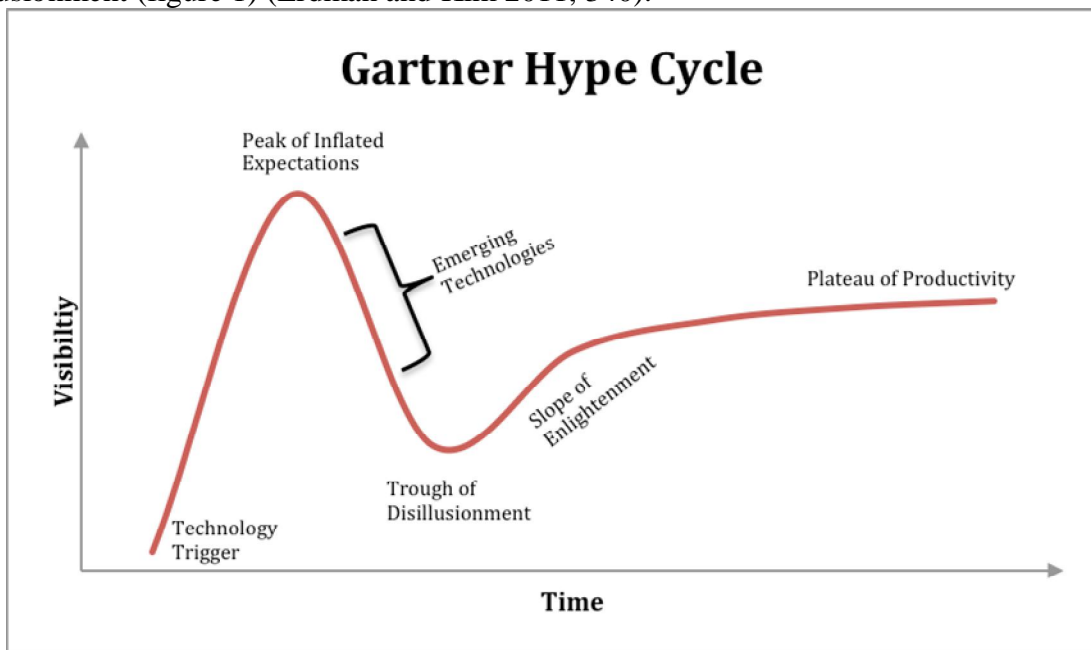


Figure 1 Gartner Hype Cycle  
**Source: Adapted from (O’Leary 2008)**

Examples of emerging technologies include nanotechnology, biotechnology, human enhancement, and augmented reality.

In LIS the term “emerging technology” has a completely different meaning, where we associate it with Web 2.0 technology. Social media, chat reference, mobile apps, mobile Web pages, Web-scale discovery services and other similar services are all examples of emerging technologies. In effect, an LIS emerging technology can be any technology or new delivery system on the Internet or mobile devices that empowers the user in their interaction with information resources (Erdman and Kim 2011, 341).

Certainly the clay tablet with cuneiform script, Egyptian papyrus, the invention of paper in China, and the use of animal skins in medieval Europe were all forms of emerging technologies at one time. It was not until the twentieth century that humans began to store information in a variety of other emerging technologies, the growth of which remained relatively slow. We saw visual information stored on moving image film and later magnetic tape including the Betamax, Umatic, and VHS formats, audio information stored on magnetic tape in the form of reels, eight-track cassettes, and compact cassettes, and print information stored on microform. In the mid-1990s we moved away from magnetic carriers in particular, and began transferring and producing information to digital formats using optical discs to store visual, sound, and even textual information.

Now well into the first quarter of the twenty-first century we have begun to move away from the optical carriers in favor of digital computer files stored on remote servers or non-volatile computer storage media such as flash memory. Contemporary examples include high-definition streaming videos from Netflix or Amazon Prime and the PlayAway View, which uses flash memory to store the moving image file.

Our technology is growing so fast that some of these emerging technologies are a blip in time, such as the SanDisc slotMusic cartridge, a technology for pre-loaded MP3 music files that collapsed before it was really able to get started (Malik 2008). Currently the 3-D televisions require the use of 3-D Blu-ray players; it is surely only a matter of time before the 3-D Blu-ray disc becomes obsolete, replaced by a streaming 3-D high definition video file.

Looking to the future we will see a variety of media primarily conveying content in some kind of electronic carrier, such as printed electronics (Bennett 2012, Sanchez 2012) that allow you to touch paper and hear audio, or wearable computers composed of e-textiles (McCue 2011) that could conceivably allow you to telephone or text people or to watch videos on your shirt sleeve. Consider LonelyPlanet (Cameron 2012) or Fodor's Travel Guides (Fleming 2012), that already publish augmented reality content that you access using your smart phone's camera, being published for and streamed to Google Glass, or even your Ray-Ban sunglasses.

### **3 UNIVERSAL BIBLIOGRAPHIC CONTROL**

With very little imagination we can see that these marketplace emerging technologies will have major impacts on the LIS emerging technologies, if we view LIS emerging technologies as new information delivery systems. As with almost every other information system developed in the past, these future systems or technologies will be acquired by libraries and thus require bibliographic control. In our globalized society, that bibliographic control would be best if it were universal.

Universal bibliographic control has been a goal of the library and information science profession since it was first discussed at the Copenhagen International Meeting of Cataloguing Experts in 1969 (Chaplin 1970) and explained by Kaltwasser (1972) and Anderson (1982). One first step in universal bibliographic control was the crafting of the International Cataloguing Principles in 1961 and the development by the International Federation of Library Associations' (IFLA) Committee on Cataloguing Working Group on the International Standard Bibliographic Description of the ISBDs, first published in 1971 (Anderson 1982, 11). In the English-speaking community the development and use of the *Anglo-American Cataloguing Rules*, second edition (AACR2) published in 1978 incorporated the ISBD structure as a fundamental framework of the rules (American Library Association et al. 1978, Rule 0.22). AACR2 continues today in the form of RDA. While RDA is based on the *Functional Requirements for Bibliographic Records* theoretical model, many of the rules

in RDA are based upon or are nearly identical to rules in the 2002 revision of AACR2 (Oliver 2010, 4, 38-45).

Dunsire, Hillman, and Phipps (2012) recently addressed universal bibliographic control in the context of the Semantic Web. They suggest that the underlying assumption in universal bibliographic control, which is based on shared standards and the traditional descriptive record model, is not important in the Semantic Web model. However, library systems will continue to create metadata in a manner that Karen Coyle has termed the “dumb down” method for the foreseeable future (2009).

The desire in LIS for universal bibliographic control over our bibliographic data in our current time is logical and practical. The vast majority of bibliographic data are electronic and can be manipulated with a variety of encoding standards. We worry less about duplication of efforts in recording bibliographic data (Roberts 1989, 4) and more about interoperability of data within a resource description framework (RDF) ontology for use in the Semantic Web (Dunsire, Hillmann and Phipps 2012, 166-168).

#### 4 BIBLIOGRAPHIC DATA ELEMENTS FOR CONVENTIONAL TECHNOLOGIES

The ISBDs and AACR2 both made use of the general material designation (GMD), a cataloguer-supplied term that immediately followed the title proper. Its purpose was to define a class of material to which a resource belonged at an early point in the description. AACR2 provided two short lists of terms available for use as a GMD, list 1 with 13 terms for use by British agencies, and list 2 containing 27 terms for use by Australian, Canadian, and United States agencies (table 1). Similar to the AACR2 list 1 for British agencies, the ISBD offered a dozen general terms (table 2). More helpfully the ISBD correlated its GMDs with a list of specific material designations used in the physical description area (ISBD Review Group 2007, Appendix C). AACR2 has similar correlations, however the cataloguer has to select the proper GMD offered in a specific chapter with the suggested specific material designations offered in the physical description area rules for the same chapter. For example, when describing a moving image resource, the choice of GMD is either videorecording or motion picture. The specific material designation associated with a video recording in AACR2 is videocartridge, videocassette, videodisc, or videoreel. For a motion picture, the choices are film cartridge, film cassette, film loop, or film reel. Alternatively the cataloguer could supply a common usage term such as VHS cassette or DVD-video.

Table 1: AACR2 General Material Designations

List 1 (AACR2 1.1C1)	List 2 (AACR2 1.1C1)
braille	activity card
cartographic material	art original
electronic resource	art reproduction
graphic	braille
manuscript	cartographic material
microform	chart
motion picture	diorama
multimedia	electronic resource
music	filmstrip
object	flash card
sound recording	game
text	kit
videorecording	manuscript

	microform
	microscope slide
	model
	motion picture
	music
	picture
	realia
	slide
	sound recording
	technical drawing
	text
	toy
	transparency
	videorecording

Table 2: ISBD General Material Designations

<b>ISBD Appendix C General Material</b>
Cartographic resource
Electronic resource
Graphic
Hologram
Microform
Motion picture
Multimedia resource
Notated music resource
Printed text
Sound recording
Videorecording
Visual projection

However, this method of description began to show distinct limitations with the advent of electronic resources. Videorecordings sound recordings, cartographic resources, and graphic materials were all suddenly available in electronic form beginning in the mid 1990s. Because the *general carrier* for these types of resources is electronic, the choice of GMD following AACR2 rules is always “electronic resource,” which effectively nullifies the usefulness of the GMD to indicate the general nature of the resource as audio, video, cartographic, or picture. The preliminary consolidated edition of the ISBD (ISBD Review Group 2007) is silent on the application of the GMD for electronic resources that are video, audio, cartographic, or graphic in nature, however, the point became moot in 2009 with the approval of the new Area 0 Content Form and Media Type Area that was incorporated into the ISBD consolidated edition (IFLA Cataloguing Section 2011).

Another aspect of ISBD and AACR2 descriptive cataloguing is their reliance on textual data strings, which is a logical application for rules that were developed for the creation of records on standard 12.5 x 7.5 cm cards. The presence of sound or colour is indicated in the ISBD and AACR2 Area 5, Physical Description Area by simply recording those terms: *sound* and *colour*. Specific and technical details for technology resources, such as playing speed, languages, resolution or aspect ratio are given in general notes. The introduction of the MARC format on bibliographic data was a small step in identifying data elements, but the purpose of MARC was chiefly for formatting and printing cards. Despite its

granularity for a variety of data elements, such as defining system requirements in field 538 or language data in field 546, the current MARC 21 format as used with ISBD and AACR2 does little to bring universal bibliographic control to metadata about technical details.

## 5 BIBLIOGRAPHIC DATA ELEMENTS FOR EMERGING TECHNOLOGIES

The ISBD Area 0, developed by the ISBD Material Designations Study Group (MDSG) from 2003-2009, is meant to address the problem of describing resources that are inherently electronic and some other medium. The Area 0 solution to this problem is to provide up to three terms that describe both the content and the carrier. The construction of a term requires a Content Form term optionally qualified in parentheses by a single or multiple Content Qualification terms and followed after a space-semicolon-space with as many Media Type terms as are necessary. For example, a cataloguer would record an Area 0 designation for a three-dimensional online moving image as “Image (moving ; 3-dimensional) : electronic” (IFLA Cataloguing Section Standing Committee 2009).

ISBD Area 0’s nimble approach to dealing with some types of emerging technologies is paralleled in RDA’s element set, specifically the 3.2 RDA Carrier Term, 3.3 RDA Media Term, and 6.9 RDA Content Term elements (Joint Steering Committee for Development of RDA 2010). The RDA approach is different, as it does not instruct the cataloguer how to combine data elements for display (Joint Steering Committee for Development of RDA 2010, 0.1 RDA); the terms are simply selected from the supplied vocabulary and recorded. The function of these elements in RDA is also distinctly different from the ISBD Area 0. The ISBD Area 0 is so named specifically to place a constructed designation at the top of a record display presented in area order to give the user an early warning for the identification and selection of a resource, just as the GMD did (IFLA Cataloguing Section Standing Committee 2009, i). In striking contrast, the RDA carrier, media, and content terms are meant only for machine manipulation and not for human interpretation (U.S. RDA Test Coordinating Committee 2011, 20). Thus following RDA rules, a cataloguer would record a media type of *video*, a carrier type of *online resource* and a content type of *three-dimensional moving image* for the same three-dimensional online moving image we see in the Area 0 example above, but an RDA public display should omit these terms from view.

RDA moves bibliographic description a step closer to universal bibliographic control because it makes use of many different vocabularies for many of its data elements. While the carrier, media, and content data elements may be the most recognizable and oft discussed vocabularies in RDA, there are quite a few more. 2.14 RDA Frequency provides a list of frequencies for continuing resources, 3.4.2 RDA Extent of Cartographic Resource, 3.4.4 RDA Extent of Still Image, and 3.4.6 RDA Extent of Three-Dimensional Form all provide specific carrier-based vocabularies to use in lieu of the 3.3 RDA Carrier Type vocabulary that doubles as the standard Extent vocabulary. 3.6 RDA Base Material, 3.7 RDA Applied Material, 3.9 RDA Production Method, 3.10 RDA Generation, 3.11 RDA Layout, 3.12 RDA Book Format, 3.13 Font Size, 3.14 Polarity, and so on, all provide specific mini-vocabularies cataloguers record as applicable to describe the carrier of the resource. The elements for the description of content have a smaller variety of mini-vocabularies, including 7.13 RDA Form of Notation, 7.15 RDA Illustrative Content, 7.19 RDA Aspect Ratio, and 7.20 RDA Format of Notated Music. Additionally, there are extensive vocabularies in the RDA appendices for defining relationships to and between persons, families, corporate bodies, works, expressions, manifestations, and items.

The majority of all of these mini-vocabularies now have designated MARC 21 tags and subfields that define these data elements with explicit granularity. However, aspect ratio and format of notated music are both recorded in a general 500 note, and illustrative content

vocabulary continues to be recorded in a comma separated list in the 300\$b. Some of the instructions for these data elements allow for substitution of terms with another concise term, such as 3.6 RDA Base Material or 3.7 RDA Applied Material. However, the vast majority of these vocabularies require either the use of the term *other* when none of the supplied vocabulary terms are apply and *unspecified* when a concept cannot be ascertained, such as for the media and carrier vocabularies, or the recording of a general note to explain the details of the data element when the vocabulary fails, such as for the aspect ratio or format of notated music.

## 6 APPROACHING UNIVERSAL BIBLIOGRAPHIC CONTROL IN RDA

As noted in 0.1 RDA, RDA is designed to be flexible and extensible and to “take advantage of the efficiencies and flexibility in data capture, storage, retrieval, and display made possible with new database technologies.” It is easy to see, particularly when viewing RDA vocabularies in the context of the element set vocabularies in the Open Metadata Registry (The RDA (Resource Description and Access) Vocabularies 2010) the importance of a strict reliance on the vocabulary terms provided when it comes to supporting universal bibliographic control. The registry allows for vocabulary terms in English to be directly correlated to terms (or labels) in other languages, such as the registry entry for the RDA Carrier Type vocabulary concept in English of *audiotape reel* and its German language label *Tonband*. The registry also allows for notes to provide specific definitions and scopes to accurately define the vocabulary terms to avoid confusion.

This system works well when vocabulary terms exist, but the “literary warrant” approach to creating and maintaining vocabulary terms in RDA and the culture of expediency that inhibits review and updating of already-catalogued resources may doom many early emerging technologies to a nether region in the data element soup to a dark and jumbled area where anything defined as *other* or described using notes over data elements never rises to a status equal with sibling resources described after vocabulary terms have been adopted.

For example, electronic media, both audio and visual, on PlayAway devices have no appropriate vocabulary terms for their carriers, thus relegating them to the distinction of *other*. These carriers can hardly be called emerging any longer since the audio form has been available since 2005 and the video form since 2010. There is a wealth of content available in electronic format for use on mobile devices that does not require any connection to the Internet to use or interact with the content. While it is true that the Internet connection is required for initial delivery of the electronic file to the device, there is no 3.3 RDA Carrier Term that can be used for or applied to media on mobile devices that do not require a connection to a communications network, which is the definitive criterion of an *online resource* according to the RDA Glossary.

## 7 CONCLUSION

Universal bibliographic control is a worthy and necessary goal for the description of resources in any environment, but significantly for a Linked Data environment. A key aspect of universal bibliographic control must be the quick development of vocabulary terms for emerging technologies of bibliographic resources as they emerge, regardless of a given technology’s shelf life or existence in the marketplace. If libraries and cultural heritage institutions will collect and preserve these formats, it follows that our descriptive rules should be able to accommodate and accurately describe them as they emerge lest they be lost to ill-conceived, generic descriptions limited to notes and terms like *other* or *unspecified*.

It may serve universal bibliographic control if our descriptive cataloguing rules were to have a closer and stronger tie to the metadata registries. There is certainly support for this

given that the Joint Steering Committee for Development of RDA has instituted the “Fast Track” procedure for revisions to RDA specifically for such issues as changes and updates to vocabularies (Association for Library Collections and Technical Services. Committee on Cataloging: Description and Access 2011), and it requires metadata and catalogue librarians to step up and make proposals. Also, a standing committee or group tasked with reviewing the marketplace for emerging technologies and creating and adding vocabulary to accommodate changes brought about by emerging technologies would be one method to maintain proactively the universal bibliographic control that will be needed in a Linked Data future.

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