

# RDA implementation and the emergence of BIBFRAME

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**Received:** 10 October 2017; **Accepted:** 31 October 2017; **First Published:** 15 January 2018

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## ABSTRACT

RDA (Resource Description and Access) has been adopted and is widely used as the standard for descriptive cataloging by libraries and related institutions. Since its implementation, RDA continues to evolve and grow to meet the end user needs. These developments brought into focus some of the shortcomings of MARC 21 as a description tool. Recognizing the need to create a more effective vehicle for bibliographic description, the Library of Congress developed BIBFRAME, a linked data alternative to MARC 21. In my article, I will discuss the evolution of RDA and the challenges of implementing the system, highlight the issues with MARC 21 in its relation to RDA and the role that BIBFRAME can play in the newly emerging information model.

## KEYWORDS

EURIG; RDA.

## CITATION

El-Sherbini, M. "RDA implementation and the emergence of BIBFRAME". *JLIS.it* 9, 1 (January 2018): 66-82. doi: [10.4403/jlis.it-12443](https://doi.org/10.4403/jlis.it-12443).

## Introduction

RDA (Resource Description and Access) has been adopted and is widely used as the standard for descriptive cataloging by libraries and related institutions. Since its implementation, RDA and its related tools continue to evolve and grow to meet the demands of the end user. These developments brought into focus some of the shortcomings of MARC 21 as a description tool. Recognizing the need to create a more effective vehicle for bibliographic description, the Library of Congress developed the idea of BIBFRAME, a linked data alternative to MARC 21.

In my presentation, I will discuss the evolution of RDA and the challenges of implementing the system, highlight the issues with MARC 21 in its relation to RDA and the role that BIBFRAME can play in the newly emerging information model.

## The evolution of RDA

The RDA Toolkit was made available for the U.S. RDA Test Coordinating Committee in 2010. The Coordinating Committee was designated by the senior management at the Library of Congress (LC), the National Library of Medicine (NLM), and the National Agricultural Library (ANL). Final recommendations from the Coordinating Committee were issued in June, 2011. These recommendations asked for improvement of the languages of RDA instructions and the RDA Toolkit itself. At that time, several libraries worldwide had already adopted RDA for bibliographic description. However, the LC announced that the adoption of RDA would take place in March of 2013 (Library of Congress 2013). Today, RDA is the worldwide cataloging standard and millions of records created by the library community have been added to OCLC.

Every year, new revisions and changes are issued by the RDA Steering Committee. Since its adoption in 2010, RDA has been updated six times (2012-2017.) These updates come in response to formal proposals from the cataloging community to the RDA Steering Committee for Development of RDA.

One of the most important changes was implemented in the revision of 2015 where new instructions were created for RDA Chapter 23 “General Guidelines on Recording Relationships Between Works and Subjects” and Appendix M. The new instructions are in alignment with FRBR/FRAD + FRSAD (Functional Requirements for Bibliographic Records/Functional Requirements for Authority Data + Functional Requirements for Subject Authority Data) (Glennan 2016). The objectives of Chapter 23 are twofold:

- “The data recorded to reflect the subject relationship should enable the user to find all works about a particular subject.” (RDA 23.2)
- “To ensure that the data created using RDA meet that functional objective, the data should reflect all significant subject relationships.” (RDA 23.2)

Another important section in Chapter 23 deals with the methods of presenting subject relationships by either an identifier, an authorized access point, or a description that indicates what the work is about. This allows the cataloger to link to outside subject thesauri or even classification systems, or any other identifier.

Another significant development of RDA is the replacement of the FRBR models with the IFLA Library Reference Model (LRM) (Dunsire 2016). This model introduces three new entities that will be added to RDA: Collective Agent, Nomen, and Time-span. Two other entities that are already implicit in RDA, Agent and Place, will be added and consolidated.

One of the most important statements in the LRM model is the one that refers to the methods of representing the attribute using URI to point to an external source.

“While entities, and the relationships between them, provide the structure of the model, attributes are what gives flesh to the description of an instance of an entity. The logical repeatability or non-repeatability of attributes is not prescribed by the model. There are basically two ways to represent an attribute in an actual implementation:

- an attribute can be represented as a mere literal (a string, a number...): this is what OWL regards as “datatype properties”;
- *an attribute can be represented as a URI pointing to an external source (a referential or normative document of any kind, such as an authority file, or a list of coded values), in which case it could have been modelled as a relationship rather than a mere attribute, but the model is meant to remain agnostic as to the way it is to be implemented: this is what OWL regards as “object properties”* (Riva, Le Boeuf and Žumer 2017).

## RDA Implementation at the Ohio State University Library

OSUL has been involved with RDA developments since 2007, as this author was a member of the RDA Advisory Group. OSUL staff were members of the U.S. RDA Test Group. These activities prepared the catalogers for a smooth transition to RDA. After the conclusion of the test period, some of the catalogers continued to contribute RDA records to OCLC. In the spring of 2012 the actual, formal training for all the catalogers was offered. About 25 catalogers from across the OSU libraries participated in this training. The training consisted of weekly workshops that included hands on training and many quizzes. Each week was devoted to only one module so that the catalogers would have sufficient time for practice. After completing all modules, a final exam was given. Completing the training was a celebration where a certificate of completion was presented to each cataloger.

The Collection Description and Access Department conducted periodic refresher sessions to help catalogers to keep pace with the annual RDA revisions and changes. When the catalogers implemented RDA, there was expectation that the toolkit and RDA instructions will evolve and change as the need arises. Since the expected revisions to the rules would be made available through the RDA Toolkit, the catalogers were encouraged to use the online RDA Toolkit in their work. It is worth noting that all the training was developed and conducted by cataloging experts from the OSUL (Collection Description and Access at OSUL 2013).

## The Impact of RDA on cataloging of foreign language materials

As RDA came to be used by everyone, some catalogers started to recognize that RDA can have a great impact on the way the foreign language materials, specifically the non-English languages materials,

could be cataloged. Some of the RDA rules and instructions provide interesting alternatives to cataloging these materials. For example:

RDA Purpose and Scope (RDA 0.0):

- **Purpose 1:** RDA provides a set of guidelines and instructions on recording data to **support resource discovery**.
- **Purpose 2:** The data created using RDA to describe a resource are designed to assist users performing the following tasks: **Find, Identify, Select, Obtain**
- **Purpose 3:** Data created using RDA to describe an entity associated with a resource (an agent, concept, etc.) are designed to assist users in performing the following tasks: **Find, Identify, Clarify, Understand**

For names found in a non-preferred script, RDA provides options:

- If the name of a person is found in a script that differs from a preferred script of the agency creating the data, transliterate the name according to the scheme chosen by the agency. (RDA 9.2.2.5.3)
- If there is a well-established form of name in reference sources in a language preferred by the agency creating the data, choose that form of name as the preferred name.
- If different forms are found in reference sources in a language preferred by the agency creating the data, choose the form that occurs most frequently.
- Record the other forms of the transliterated name as **variant names**

Thanks to these options, information recorded in the LC Authority File in non-Roman scripts can be displayed in the authority record. (Figures 1 and 2).

Rec stat	c	Entered	19801021	Replaced	20161202091217.0
Type	z	Upd status	a	Enc lv	n
Roman	■	Ref status	b	Mod rec	■
Govt agn	■	Auth status	a	Subj	a
Series	n	Auth/ref	a	Geo subd	n
Ser num	n	Name	a	Subdiv tp	n
				Rules	z
010		n	80093577		
040		DLC #b eng #e rda #c DLC #d DLC #d OCoLC #d UPB #d DLC			
046		#f 19180115 #g 19700928			
100	1	Nasser, Gamal Abdel, #d 1918-1970			
370		Alexandria, Egypt #b Cairo, Egypt #c Egypt			
374		General #a Politician #a National leader			
375		male			
377		ara			
400	1	Naser, Gamal' Abdel', #d 1918-1970			
400	1	Abdul Nasser, Gamal, #d 1918-1970			
400	1	Abdel Nasser, Gamal, #d 1918-1970			
400	1	Nasir, Gamal Abdul, #d 1918-1970			
400	1	'Abd al-Nāṣir, Jamāl, #d 1918-1970			
400	1	Nasser, Gamal Abdel, #c Pres. United Arab Republic, #d 1918-1970 #wnnaa			
400	1	Naser, G. A., #d 1918-1970			
400	1	גמאל עבד אלנאסר,			
400	1	اصى جمال عبد ال			
400	1	جمال عبد الناصر			
400	1	جمال عبد الناصر, #d 1970-1918			

Figure 1. Various forms of the name in Arabic and Hebrew

Rec stat	c	Entered	19861107	Replaced	20130719073737.0
Type	z	Upd status	a	Enc lv	n
Roman	■	Ref status	b	Mod rec	■
Govt agn	■	Auth status	a	Subj	a
Series	n	Auth/ref	a	Geo subd	n
Ser num	n	Name	a	Subdiv tp	n
				Rules	z
010		n	85329170		
040		DLC #b eng #e rda #c DLC #d DLC #d OCoLC #d InU			
046		#f 1955			
100	1	Kim, Ik-tu, #d 1955-			
400	1	김 익두, #d 1955-			
400	1	김익두, #d 1955-			
667		Machine-derived non-Latin script reference project.			
667		Non-Latin script references not evaluated.			
670		Nammin. 1985: #b colophon (Kim Ik-tu) p. 11. (b. 1955)			

Figure 2: Various forms of the name in Korean

## RDA provides alternative linguistic forms of name for a place (RDA 16.2.3.7)

Instruction 16.2.3.7 of RDA states as follows: If the name recorded as the preferred name for a place has one or more alternative linguistic forms, record them as variant names. The authority record in Figure 3 shows many place names have been recorded in the various linguistics forms as variant names.

151	Cairo (Egypt)
368	#b Cities and towns #b Capitals (Cities) #2 lcsb
370	#c Egypt #2 naf
451	Kairo (Egypt)
451	Kair (Egypt)
451	Qāhirah (Egypt)
451	Kahirah (Egypt)
451	Caire (Egypt)
451	Le Caire (Egypt)
451	Kahir (Egypt)
451	القاهرة (Egypt)
451	al-Qāhirah (Egypt)
451	القاهرة (مصر)
451	al-Qāhirah (Misr)
451	قاهرة (Egypt)
451	O Caire (Egypt)
451	Lo Cayiro (Egypt)
451	Lo Quêro (Egypt)
451	Каир (Egypt)
451	Qahirā (Egypt)
451	Горад Каир (Egypt)
451	Horad Kair (Egypt)
451	Kaip (Egypt)
451	Кайро (Egypt)
451	El Caire (Egypt)

Figure 3: Place name is recorded in various languages

As RDA develops, it also provides catalogers with several opportunities to enhance access by subject to help our users discover unique library collections.

### Opportunity # 1: User's need

- Users can search the library catalogue by **subject terms** in their preferred languages, e.g., Arabic, Chinese, Japanese, etc.
- OSUL continued to assign subject headings using the Library of Congress Subject Headings. However, it was very difficult to use external subject terms for external sources and link them to the LCSH terms. To overcome the obstacle, OSUL also assigns Faceted Application of Subject Terminology (FAST) terms and links them to the equivalent term in the language of the work. FAST is simple and can be used with MARC 21. It easily links to other subject terms in different languages via subfield \$2 (that is a code that identifies the source document or list from which numbers, terms, or codes appearing in the field were assigned) and the subfield \$0 (the system control number of the related authority record or a standard identifier). For example:

		The source		Chinese geographical subject access point with the control number of the related Chinese authority record	
651	7	中國. #2 lcsht #0	<a href="http://catld.ncl.edu.tw/subject/sh0001067">http://catld.ncl.edu.tw/subject/sh0001067</a>		
651	7	China. #2 fast #0	(OCoLC)fst01206073		

For recording subject terms in the languages of the script, OSUL identified foreign national thesauri that can be used via open sources. Selecting a national thesaurus will provide continuity by maintaining controlled vocabulary subject headings. The following thesauri are used to assign subject terms:

- Autoridades de la Biblioteca Nacional de España (Madrid: Biblioteca Nacional de España)
- *Sharing* 국가서지:도서(서지), 온라인 자료, 기사 색인 및 주제명, 저자명, 그리고 도서관 정보 Linked Open Data에 대한 탐색 서비스를 만나보세요!
- Ndlsh: governed by Japan National Diet Library and freely available<sup>1</sup>
- List of Chinese Subject Terms from the National Central Library of Taiwan (國家圖書館鏈結資源 = National Library Link Resources)<sup>2</sup>

Examples of records that include subjects in non-Latin scripts (Figure 4):

245	0	0	موسوعة جمال عبد الناصر في اللغة الاسلامي.
245	0	0	Mawsū'at Jamāl 'Abd al-Nāṣir fī al-fiqh al-Islāmī.
246	1	#1	Volumes 11-30 have title: #a الموسوعة الاسلامي
246	1	#1	Volumes 11-30 have title: #a Mawsū'at al-fiqh al-Islāmī
264	1	1	القاهرة : #b المجلس الاعلى للشؤون الاسلامية, #c 1386- [1966-
264	1	1	al-Qāhirah : #b al-Majlis al-A'lā li-Shu'ūn al-Islāmiyah, #c 1386- [1966-
650	0	0	Islamic law #v Encyclopedias.
650	0	0	Islamic law #v Terminology.
650	0	0	Islamic law #x Dictionaries #x Arabic.
650	7	7	اللغة الاسلامي. #2 qrmak
650	7	7	Islamic law. #2 fast #0 (OCoLC)fst00879949
655	7	7	معاجم. #2 qrmak
655	7	7	Dictionaries. #2 fast #0 (OCoLC)fst01423826
655	7	7	دوائر معارف. #2 qrmak
655	7	7	Encyclopedias. #2 fast #0 (OCoLC)fst01423798
655	7	7	مصطلحات. #2 qrmak
655	7	7	Terminology. #2 fast #0 (OCoLC)fst01423880
710	1	1	مصر. #b المجلس الاعلى للشؤون الاسلامية مصر.
710	1	1	Egypt. #b Majlis al-A'lā li-Shu'ūn al-Islāmiyah.

Figure 4: Subjects in Arabic linked to FAST

337	unmediated #b n #2 rdamedia
338	volume #b nc #2 rdacantier
490	1 外国语言文学研究学术论丛
490	1 Wai guo yu wen xue yan jiu xue shu lun cong
504	Includes bibliographical references.
650	0 Chinese literature #x History and criticism.
600	1 0 Owen, Stephen. #d 1946- #x History and criticism.
600	1 0 Hanan, Patrick. #x History and criticism.
600	1 0 Lee, Leo Ou-fan. #x History and criticism.
600	1 0 Wang, Dewei. #x History and criticism.
650	0 Sinologists #x United States #x History and criticism.
600	1 7 Lee, Leo Ou-fan. #2 fast #0 (OCoLC)fst00053138
600	1 7 Wang, Dewei. #2 fast #0 (OCoLC)fst00251819
650	7 中国文学. #2 lcst #0 http://catld.ncl.edu.tw/subject/sh0001074
650	7 Chinese literature. #2 fast #0 (OCoLC)fst00857595
650	7 汉学. #2 cct
650	7 Sinologists. #2 fast #0 (OCoLC)fst0119626
651	7 美国. #2 lcst #0 http://catld.ncl.edu.tw/subject/sh0007934
651	7 United States. #2 fast #0 (OCoLC)fst01204155
655	7 文学评论. #2 lcst #0 http://catld.ncl.edu.tw/subject/sh0002036
655	7 批评, 解释等. #2 csht
655	7 Criticism, interpretation, etc. #2 fast #0 (OCoLC)fst01411635
700	1 王德威. #d 1961- #e author.
700	1 Wang, Zui, #d 1961- #e author.
830	0 外国语言文学研究学术论丛
830	0 Wai guo yu wen xue yan jiu xue shu lun cong.

Figure 5: Subjects in Chinese

<sup>1</sup> <http://id.ndl.go.jp/auth/ndla>

<sup>2</sup> <http://catld.ncl.edu.tw/index.jsp>



Figure 6: Subjects in Spanish

Figure 7: Subjects in Japanese

The screenshot shows the Ohio State University Libraries website. A red box highlights the search bar with the text "Search by Arabic subject" and a red arrow pointing to the search input field. The search input field contains the text "Arabic subject". The search results show a list of books, with the first result being "Arabic subject" by the Library of Congress. The search bar is located at the top of the page, and the search results are displayed below it.

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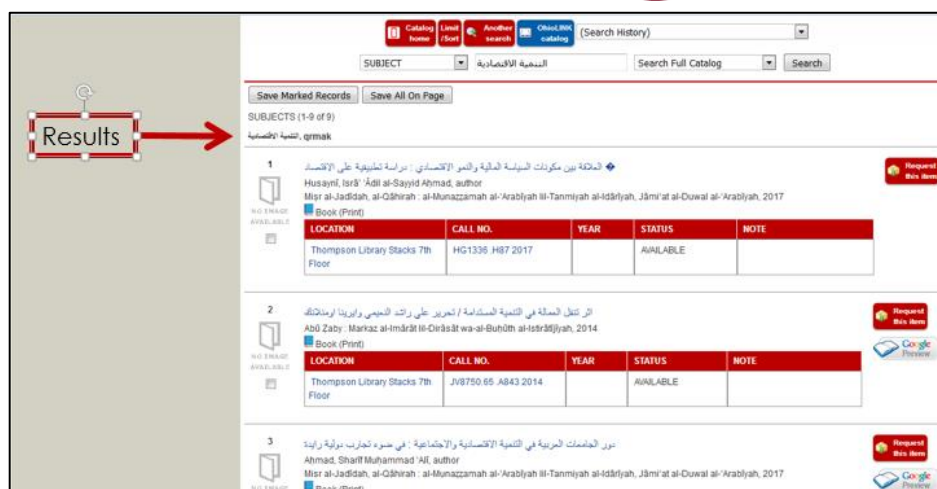


Figure 9: Shows the results of all the Arabic records in the online catalog under this subject.



Figure 10: In displaying the record, users discover that the Arabic subject term is linked to the FAST term. The user can also expand the search by clicking on the FAST term to retrieve other records in other languages.

## Opportunity #2: The Library Reference Model (LRM)

LRM provided an opportunity by which an attribute can be represented as a URI pointing to an external source. Although it is difficult to apply this method now with the current Integrated Library System (ILS), the OSUL found a way of not replacing the attribute by the URI. Instead, the URI that connects to the external source of the non-Roman language subject terms is added in subfield \$ 0. It is a simple step in the cataloging process and can be done through the use of the MarcEdit software.

These are the steps to follow: catalog as normal using OCLC Connexion; save the bibliographic record in the local save file in Connexion; use MarcEditor to bring the record from OCLC Connexion; edit the record; and, finally, add external links using the “linked data tools” in MarcEdit. The external links are links to VIAF, the National Thesauruses; FAST; LCSH; the MARC 21 tags 336, 337, 338; and other sources. These links are live in OCLC Connexion, but are only stored in the bibliographic records

in the OSUL online catalog, a step that will need to be explored in the future. Figure 11 shows the links to external sources whenever that source is available. Linking to external sources is not restricted to non-English access points, but catalogers can add a URI to almost any record.

		Before	After adding
049	OSUU		
100	1	أبو العلاء إبراهيم عبد المنعم سلامة	100 1 أبو العلاء إبراهيم عبد المنعم سلامة
100	1	Abū al-'Ujā, Ibrāhīm 'Abd al-Mun'im Salāmah, #e author.	100 1 Abū al-'Ujā, Ibrāhīm 'Abd al-Mun'im Salāmah, #e author. #0 <a href="http://id.loc.gov/authorities/names/sh201302130">http://id.loc.gov/authorities/names/sh201302130</a>
245	1 0	أربع بلاد الأندلس وحضارتها منذ الفتح الإسلامي حتى نهاية عصر المرابطين، ٥٢٠-١١٦٦ م	245 1 0 أربع بلاد الأندلس وحضارتها منذ الفتح الإسلامي حتى نهاية عصر المرابطين، ٥٢٠-١١٦٦ م / ٩٢٠-١١٦٦ م
245	1 0	Malāmiḥ min tārikḥ bilād al-Andalus wa-hadāratuhā mundhu al-fath al-Islāmī hatt	245 1 0 Malāmiḥ min tārikḥ bilād al-Andalus wa-hadāratuhā mundhu al-fath al-Islāmī hattā nihāyat 'aṣr al-Murā
264	1	الإسكندرية : #b دار المعرفة الجامعية، #c 2015.	264 1 الإسكندرية : #b دار المعرفة الجامعية، #c 2015.
264	1	al-Iskandarīyah : #b Dār al-Ma'rifaḥ al-Jāmi'īyah, #c 2015.	264 1 al-Iskandarīyah : #b Dār al-Ma'rifaḥ al-Jāmi'īyah, #c 2015.
300		343 pages ; #c 24 cm	300 343 pages ; #c 24 cm
336		text #b bt #2 rdacontent	336 text #b bt #2 rdacontent #0 <a href="http://id.loc.gov/vocabulary/contentTypes/bt">http://id.loc.gov/vocabulary/contentTypes/bt</a>
337		unmediated #b n #2 rdamedia	337 unmediated #b n #2 rdamedia #0 <a href="http://id.loc.gov/vocabulary/mediaTypes/n">http://id.loc.gov/vocabulary/mediaTypes/n</a>
338		volume #b nc #2 rdacarrier	338 volume #b nc #2 rdacarrier #0 <a href="http://id.loc.gov/vocabulary/carriers/nc">http://id.loc.gov/vocabulary/carriers/nc</a>
504		Includes bibliographical references (pages 319-338).	504 Includes bibliographical references (pages 319-338).
651	7	إسبانيا. #2 qmak	651 7 إسبانيا. #2 qmak
651	7	الأندلس. #2 qmak	651 7 الأندلس. #2 qmak
651	0	Andalusia (Spain) #x History.	651 0 Andalusia (Spain) #x History. #0 <a href="http://id.loc.gov/authorities/subjects/sh2008114191">http://id.loc.gov/authorities/subjects/sh2008114191</a>
651	0	Spain #x History #y 711-1516.	651 0 Spain #x History #y 711-1516. #0 <a href="http://id.loc.gov/authorities/subjects/sh85126074">http://id.loc.gov/authorities/subjects/sh85126074</a>
651	7	Spain. #2 fast #0 (OCoLC)fst01204303	651 7 Spain. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01204303">http://id.worldcat.org/fast/fst01204303</a>
651	7	Spain #z Andalusia. #2 fast #0 (OCoLC)fst01217626	651 7 Spain #z Andalusia. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01217626">http://id.worldcat.org/fast/fst01217626</a>
651	7	الأندلس. #2 qmak	651 7 الأندلس. #2 qmak
651	4	Andalusia (Spain) #x History.	651 4 Andalusia (Spain) #x History.
650	7	المرابطون. #2 qmak	650 7 المرابطون. #2 qmak
650	7	الحضارة الإسلامية. #2 qmak	650 7 الحضارة الإسلامية. #2 qmak
648	7	العصر الإسلامي. #2 qmak	648 7 العصر الإسلامي. #2 qmak
648	7	711-1516 #2 fast	648 7 711-1516 #2 fast
655	7	تاريخ. #2 qmak	655 7 تاريخ. #2 qmak
655	7	History. #2 fast #0 (OCoLC)fst01411628	655 7 History. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01411628">http://id.worldcat.org/fast/fst01411628</a>

Figure 11: The URI links to external sources. (Notice in Figure 11 that the Arabic subject does not have an external link because the thesaurus is not available via open access.)

245	0 0	Tangos, el exilio de Gardel / #c directed and script by Fernando E. Solanas ; photography by Felix Monti ; music by Astor Piazzolla, José Luis Castineira De Dios, and Fernando E. Sol
260		Switzerland : #b Trigon-Film, #c 2010.
300		1 videodisc (121 min.) : #b sound, color ; #c 4 3/4 in.
336		two-dimensional moving image #b tdi #2 rdacontent #0 <a href="http://id.loc.gov/vocabulary/contentTypes/tdi">http://id.loc.gov/vocabulary/contentTypes/tdi</a>
337		video #b v #2 rdamedia #0 <a href="http://id.loc.gov/vocabulary/mediaTypes/v">http://id.loc.gov/vocabulary/mediaTypes/v</a>
338		videodisc #b vd #2 rdacarrier #0 <a href="http://id.loc.gov/vocabulary/carriers/vd">http://id.loc.gov/vocabulary/carriers/vd</a>
538		DVD; PAL.
546		In Spanish with German, French and English subtitles.
511	1	Marie Laforet, Philippe Léotard, Miguel Ángel Solá, Marina Vlady, Georges W
520		Story of the Parisian exile of a group of Argentinians.
500		"Grand special Jury Prize, Festival Venezia."--Front of container.
500		Trigon-Film DVD-edition 43.
650	0	Argentines #z France #v Drama.
650	0	Political refugees #z France #v Drama.
650	0	Musicals. #0 <a href="http://id.loc.gov/authorities/subjects/sh85089018">http://id.loc.gov/authorities/subjects/sh85089018</a>
650	0	Foreign films. #0 <a href="http://id.loc.gov/authorities/subjects/sh89005676">http://id.loc.gov/authorities/subjects/sh89005676</a>
650	0	Motion pictures, Spanish. #0 <a href="http://id.loc.gov/authorities/subjects/sh20010034">http://id.loc.gov/authorities/subjects/sh20010034</a>
650	7	Argentines. #2 fast #0 <a href="http://id.worldcat.org/fast/fst00814307">http://id.worldcat.org/fast/fst00814307</a>
650	7	Argentinos. #2 abne #0 <a href="http://datos.bne.es/resource/XX530422">http://datos.bne.es/resource/XX530422</a>
650	7	Foreign films. #2 fast #0 <a href="http://id.worldcat.org/fast/fst00931835">http://id.worldcat.org/fast/fst00931835</a>
650	7	Cine extranjeros. #2 localOSU
650	7	Motion pictures, Spanish. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01027502">http://id.worldcat.org/fast/fst01027502</a>
650	7	Cine español. #2 localOSU
650	7	Musicals. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01030814">http://id.worldcat.org/fast/fst01030814</a>
650	7	Musicales. #2 abne #0 <a href="http://datos.bne.es/resource/XX6258049">http://datos.bne.es/resource/XX6258049</a>
650	7	Political refugees. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01069673">http://id.worldcat.org/fast/fst01069673</a>
650	7	Refugiados. #2 abne #0 <a href="http://datos.bne.es/resource/XX524772">http://datos.bne.es/resource/XX524772</a>
651	7	France. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01204288">http://id.worldcat.org/fast/fst01204288</a>
651	7	France. #2 abne #0 <a href="http://datos.bne.es/resource/XX4576499">http://datos.bne.es/resource/XX4576499</a> #0 <a href="http://id.loc.gov/authorities/subjects/sh85061596">http://id.loc.gov/authorities/subjects/sh85061596</a> lch
655	7	Feature films. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01710384">http://id.worldcat.org/fast/fst01710384</a>
655	7	Largometrajes. #2 localOSU
655	7	Drama. #2 fast #0 <a href="http://id.worldcat.org/fast/fst01423879">http://id.worldcat.org/fast/fst01423879</a>
655	7	Drama cinematográfico. #2 abne
655	7	Feature films. #2 lqft #0 <a href="http://id.loc.gov/authorities/genreFormafst021026247">http://id.loc.gov/authorities/genreFormafst021026247</a>
700	1	Solanas, Fernando E. #0 <a href="http://id.loc.gov/authorities/names/sh79140809">http://id.loc.gov/authorities/names/sh79140809</a> #1 <a href="http://id.loc.gov/authorities/names/sh79140809">http://id.loc.gov/authorities/names/sh79140809</a>
700	1	Laforet, Marie. #0 <a href="http://id.loc.gov/authorities/names/sh81046094">http://id.loc.gov/authorities/names/sh81046094</a>
700	1	Léotard, Philippe. #0 <a href="http://id.loc.gov/authorities/names/sh80600161">http://id.loc.gov/authorities/names/sh80600161</a>
700	1	Solá, Miguel A. #0 <a href="http://id.loc.gov/authorities/names/sh8032513">http://id.loc.gov/authorities/names/sh8032513</a>
700	1	Vlady, Marina. #0 1998- #0 <a href="http://id.loc.gov/authorities/names/sh79140809">http://id.loc.gov/authorities/names/sh79140809</a> #1 <a href="http://id.loc.gov/authorities/names/sh79140809">http://id.loc.gov/authorities/names/sh79140809</a>
700	1	Mont, Félix. #0 <a href="http://id.loc.gov/authorities/names/sh2000027281">http://id.loc.gov/authorities/names/sh2000027281</a>
700	1	Wilson, Georges. #0 <a href="http://id.loc.gov/authorities/names/sh81160459">http://id.loc.gov/authorities/names/sh81160459</a> #0 <a href="http://id.loc.gov/authorities/names/sh81160459">http://id.loc.gov/authorities/names/sh81160459</a>
700	1	Castileira de Dios, José Luis. #0 <a href="http://id.loc.gov/authorities/names/sh85372919">http://id.loc.gov/authorities/names/sh85372919</a>
700	1	Piazzolla, Astor. #0 <a href="http://id.loc.gov/authorities/names/sh85079728">http://id.loc.gov/authorities/names/sh85079728</a> #0 <a href="http://id.loc.gov/authorities/names/sh85079728">http://id.loc.gov/authorities/names/sh85079728</a>
710	2	Trigon-Film. #0 <a href="http://id.loc.gov/authorities/names/sh2000758686">http://id.loc.gov/authorities/names/sh2000758686</a> #1 <a href="http://id.loc.gov/authorities/names/sh2000758686">http://id.loc.gov/authorities/names/sh2000758686</a>

Figure 12: Spanish record with URI links to external sources. Notice in this record that almost all the MARC 21 fields are linked via URI except the 5xx.

## Challenges in implementing RDA

One of the most challenging aspects in implementing RDA is the ambiguity of the FRBR entities “expression” and “manifestation”. Having taught RDA for quite a long time, I have encountered countless questions about these FRBR concepts. Comments such as “my head's been swimming since 2013 with trying to understand FRBR, RDA and linked data” are not uncommon. Nearly everyone points to the following issue - “I am not still sure if it is an expression or a manifestation.” Many students raise questions about the clarity of some of the RDA instructions. One example illustrates this point - “Does anyone have an idea as to why we correct typographical errors in serials but not in monographs?”

Challenges in RDA implementation fall into several categories. The first involves the current ILS systems and their failure to display properly RDA records. Another difficulty has to do with navigating the RDA Toolkit. Perhaps the biggest challenge in implementing RDA is the use of MARC 21. MARC 21 uses both ISBD punctuation and MARC 21 subfields. This information is redundant For example:

264 \_1 Columbus : \$b Library unlimited, 2017

The structure of MARC 21 does not provide for robust interoperability between the semantic web and linked data. This will require the catalogers and the metadata community to experiment with other mechanisms to make their records searchable via the web.

The drawback of MARC 21 is that “MARC may hinder the separation of elements and ability to use URIs in linked environment.” (Report and Recommendations of the U.S. Test Coordinating Committee—Summary 2011) (Library of Congress 2011).

MARC 21 organizes the data field by field. Data are recorded in multiple places. For example:

008 (positions 35-37) Arabic

240 10 \$l Arabic

546 In Arabic

One positive aspect of MARC 21 is that it includes many updates to accommodate RDA (LC MARC Updates 2014).

As RDA evolves and changes are made to the standard, MARC 21 continues to be updated on a regular basis. The most noticeable change to MARC 21 is the addition of three new tags: (336) for RDA content types, (337) for RDA media types, and (338) for RDA carrier types. These three new fields will replace the General Material Designators (GMDs) or subfield “h” in the 245 tag.

Other updates include:

- 264 – To replace 260
- 344, 345, 346, 347 – New bibliographic format fields to represent carrier characteristics
- 046, 368, 371, 372, 373, 374, 375, 376, 378 –New MARC 21 Authority Fields for name attributes.

- 046, 370, 377, 380, 381, 382, 384 –New MARC 21 Authority and Bibliographic fields for work and expression attributes.
- \$e and \$4 in 1xx, 6xx, 7xx, 8xx –relationship name to resources

Another advantage of using MARC 21 is the ability of catalogers to record subject terms from an international language thesaurus and link it to FAST terms. This will provide the users with multilingual subject access (as we have seen in opportunity #1). MARC 21 can be used with MarcEdit to create identifiers for all access points to convert them to linked data (As we have seen in opportunity #2).

## **Role that BIBFRAME can play in the newly emerging information model**

The RDA design is based on the FRBR entity relationships and is intended to be used to some extent with the MARC 21 encoding schema. RDA was designed for the online environment, and it covers new emerging resources (digital & database technologies); provides a more flexible framework for description; uses the FRBR model to bring together work-sets; provides a means to map hierarchical relationships between records and allows users to retrieve clusters rather than long lists of titles.

The idea behind the development of RDA was that bibliographic data would not be contained in a single record that included all the elements describing a manifestation as we know it today.

However, using MARC 21 as an encoding schema to encode RDA records raised concerns from the library community (Guerrini and Possemato 2016). MARC 21 was designed to convert the card catalog to a machine readable format. It was developed in an age when computers were large and complex, and when memory, storage and processing power were very expensive. When cataloging a work using MARC 21, catalogers bundle elements of the work in one bibliographic record. All the elements of a manifestation are recorded in a single bibliographic record, including elements relating to work, expressions, and items, as well authorized access points. In addition, library systems depend on system matching of text strings to establish relationships. This model creates a large amount of duplication.

Having said that, MARC 21 has fulfilled its purpose and goals. Until today, catalogers still embrace MARC 21 and acknowledge its success in helping libraries to have their materials searchable in a database environment. However, new technologies continue to provide libraries with other options. The obstacles created by the limitations of computers have been resolved, but MARC 21 as an encoding schema seems incapable of migrating the library catalog from the ILS to the Internet environment. The library community needs to find a replacement for MARC 21 and find a way to connect the users of the Internet to their collections. Efforts are underway to give cataloging a greater presence on the web and to repackage MARC 21 differently to overcome its weaknesses. Catalogers began to think about a replacement for MARC 21, not only to accommodate RDA implementation, but also to establish a firm library presence on the Web.

In 2013, Attig (2013) envisioned a model in which the RDA elements can be described and recorded using a different encoding system. His idea is to replace the bibliographic record by presenting a collection of data elements that are related to a particular entity, for example, a person, a work, a manifestation. This collection of data elements would then be linked to indicate relationships. This

concept is based on breaking out the bibliographic record into three components (Manifestation, Work, and Person) and the links are used to represent relationships among the collection of data.

Tillett (2011), in her presentation at the Library of Congress RDA training for Georgia Cataloging Summit August 9-10, 2011 stated that “By clearly identifying the entities and showing relationships among them, we can improve the users’ experience as they look for information. Cataloging rules based on FRBR will identify the works and expressions in our resources and enable us to better gather together our resources in our search systems. When applied to future cataloging systems, it will make it easier to link related works, and to link new manifestations to existing works and expressions that we have in our collections and to save time and effort for example by re-using the subject analysis done once for a work as we get new manifestations to link to that work in our collections. FRBR also positions us to operate better in the Internet environment by clearly identifying the elements and relationships necessary for navigating our bibliographic universe and making those elements available on the Web for much more versatile displays that fit the users’ interests.”

During the same training program mentioned above, in her presentation related to Module 3 “Identifying Works and Expressions – slide #9” Kuhagen (2011) explained the reason why the RDA rules outlined in Chapter 6 of RDA start with identifying the work and expression and only later discuss the authorized access point. “In the future we will not be creating the access points ahead of time; we’ll be giving elements that identify the different entities and our systems will put them together as needed by the user. But, we’re not there yet and so we will create authorized access points for use in bibliographic records and in 1XX fields of authority records.”

One of the major recommendations of the U.S. RDA Test Coordinating Committee is to “Demonstrate credible progress towards a replacement for MARC” (2013) as the primary carrier of library data. Some of the reasons for replacing MARC 21 is that MARC 21 does not allow for a full implementation of RDA and integrating library data with the Web.

BIBFRAME stands for Bibliographic Framework Initiative. It was initiated by the Library of Congress in late 2011 as a possible replacement for MARC 21. In 2011 the Library of Congress, along with the consulting company Zepheria, set out to create a new bibliographic framework called BIBFRAME to make library records conform to Web standards. BIBFRAME is a web-first Linked Data model intended to make library records accessible to the Web at large. This new initiative serves as the foundation for the future of bibliographic description, both on the web and the broader networked world. BIBFRAME promises to better accommodate RDA and its vocabulary than MARC 21. It is still under experimentation. The library community, specifically catalogers, need to be aware of the development of BIBFRAME and experiment with the BIBFRAME editor.

The key difference between MARC 21 and BIBFRAME is that the MARC 21 structure is based on bundling of all the information about a resource (Work) in a single record. On the other hand, BIBFRAME depends on relationships among entities, such as Work-to-Work relationships; Work-to-Instance relationships; Instance-to-Work relationships, Instance-to-Instance relationships; Work-to-Agent relationships. These relationships are represented by using controlled identifiers for things (people, places, languages, etc.). The controlled identifier is a number or code that uniquely identifies an entity. An example of an identifier is the Library of Congress Control Number (LCCN). As a general



concept, BIBFRAME will deconstruct MARC 21 records and create relationships among entities. In the case of the author's name, instead of recording the author's name in many bibliographic records, a link to the authority record will serve as a source of author data. The relationship is expressed as an RDF triple, i.e. subject/property/object.

In the summer of 2016, the LC introduced BIBFRAME 2.0 which consists of three high-level classes, or entities:

- **BIBFRAME Work** identifies the conceptual essence of something (e.g. the author of the work, the languages and what it is about, i.e. the subject of the work).
- **BIBFRAME Instance** reflects the material embodiment of a Work (e.g. particular published form, publisher, place, date of publication).
- **BIBFRAME Item** is an actual copy (physical or electronic) of an Instance (e.g. held by, location, shelf, barcode).
- These three classes or entities represent the core levels of abstraction. In addition to these core entities, the BIBFRAME Model defines additional key concepts that have relationships to these core classes:
- **Agents:** These are people, organizations, jurisdictions, etc., that are associated with a Work or Instance through roles such as author, editor, artist, photographer, composer, illustrator, etc.
- **Subjects:** These are the subjects of the work. Concepts that may be subjects include topics, places, temporal expressions, events, works, instances, items, agents, etc.
- **Events:** Occurrences, the recording of which may be the content of a Work.

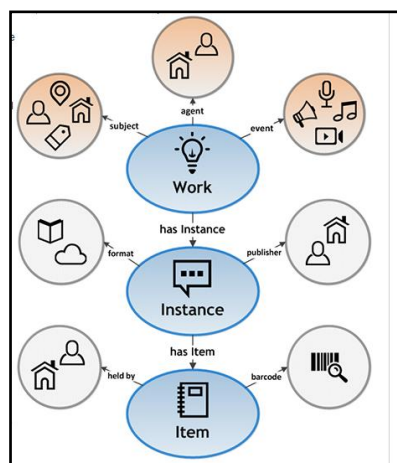


Figure 13: BIBFRAME MODEL 2.0<sup>3</sup>

BIBFRAME is expressed in Resource Description Framework (RDF). The three main classes of BIBFRAME can be mapped to the FRBR Entities Model as follows (Table 1):

<sup>3</sup> Figure from LC BIBFRAME website <http://www.loc.gov/bibframe/docs/bibframe2-model.html>

FRBR	BIBFRAME
Work	Work
Instance	Manifestation and expression (Since both FRBR and BIBFRAME have been expressed in RDF, interoperability between the two models is technically possible) (Zapounidou; Sfakakis; Papatheodorou 2013)
Item	Item

*Table 1: Mapping BIBFRAME to FRBR Entities*

BIBFRAME's current draft specification is version 2.0. In this version, LC developed the BIBFRAME 2.0 vocabulary list. This single-page view presents the entire vocabulary on one page with an ordered list of classes and properties.<sup>4</sup> Each class includes the label of the term, definition, subclasses of, used with, and change notes. (Figure 14)

<b>Property:</b>	<b>barcode</b>
Label:	Barcode
Definition:	Optical machine-readable representation of data relating to the item, to which it is attached.
Used with:	<a href="#">Item</a>
Expected Value:	<a href="#">Barcode</a>
Change Notes:	2016-04-21 (New)

*Figure 14: BIBFRAME Class List*

Some documentation that will help catalogers to keep up with the BIBFRAME Initiative:

The BIBFRAME website is the best source of information about BIBFRAME.<sup>5</sup>

The BIBFRAME Pilot (Phase One—Sept. 8, 2015 – March 31, 2016): Report and Assessment.<sup>6</sup> This test was conducted by the LC “The Network Development & MARC Standards Office (NDMSO) and the Cooperative & Instructional Programs Division (COIN) of the Acquisitions & Bibliographic Access Directorate”. They planned and developed a pilot to test the efficacy of BIBFRAME, the Library of Congress’s approach to linked data. The report concluded that the pilot was a success and based on this, the BIBFRAME 2.0 model and vocabulary have been released and will form the basis of the next phase of a pilot in the fall of 2016. Data created under 2.0 will be different than data created in Pilot 1 with more measurement and assessment.

<sup>4</sup> <http://id.loc.gov/ontologies/bibframe.html>

<sup>5</sup> <http://www.loc.gov/bibframe/docs/index.html>

<sup>6</sup> <http://www.loc.gov/bibframe/docs/pdf/bibframe-pilot-phase1-analysis.pdf>



A good explanation of BIBFRAME was given in an ALCTS webinar titled “From MARC to BIBFRAME: An Introduction” by Victoria Mueller from Zepheira and Carolyn Hansen (2015) from the University of Cincinnati.

Other resources that help catalogers to keep track of the development are:

- BIBFRAME Editor: Open source editing software downloadable from Github.<sup>7</sup>
- BIBFRAME Listserv: Bibliographic Framework Transition Initiative Forum.<sup>8</sup>
- BIBFRAME.ORG: Is an index site to BIBFRAME Initiative, Model & Vocabulary, and Implementation and Testing sites.<sup>9</sup>
- BIBFRAME FAQ: frequently asked questions and answers from the Library of Congress.<sup>10</sup>
- Bibliographic Framework Initiative: Library of Congress website with official BIBFRAME information, specifications, FAQ, tools, news, and more.<sup>11</sup>
- Zepheira: Linked Data and BIBFRAME training from the company which was consulted by the Library of Congress to develop the BIBFRAME specifications.<sup>12</sup>

## Conclusion

- RDA gave us the ability to enrich bib records with new data
- MARC 21 remains a useful tool until a replacement is found
- MarcEdit facilitates the generation of URI's for almost all access points and also links terms to external sources
- Overall, BIBFRAME continues to be an initiative, but there is great progress that is reported via ALA, ALCTS, LC, and other venues.
- Bibframe can create an environment for libraries to create datasets that can stand alone or be integrated with other datasets

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<sup>7</sup> <https://github.com/lcnetdev/bfe>

<sup>8</sup> <http://www.lsoft.com/scripts/wl.exe?SL1=BIBFRAME&H=LISTSERV.LOC.GOV>

<sup>9</sup> <http://bibframe.org/>

<sup>10</sup> <http://www.loc.gov/bibframe/faqs/>

<sup>11</sup> <http://www.loc.gov/bibframe/>

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