UNIMARC – Understanding the past to envision future

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Abstract:

The context of major changes that are envisaged for the bibliographic standards environment demands a reflection on the nature and specification of MARC and its adequacy for the integration of bibliographic discovery systems into the larger world of networked information and systems. From this starting point, this paper provides an overview of the evolution of UNIMARC and the practices of its maintenance, collecting knowledge that may be useful as a first contribution to inform future steps in redesigning bibliographic data standards.

1. Introduction

In the library community, the development and future of the library catalog as a discovery system has been the central focus of professional attention, especially since the provision of library services in a web-based environment. Cataloguing principles and codes have evolved alongside models for the functional requirements of records with a potential for significant advances in renewing the foundations of library catalogues, while for many years the future of MARC formats has been a matter of much debate yet with no structural changes.

The FRBR (Functional Requirements for Bibliographic Records)[1] model has brought an understanding of the bibliographic universe based on a detailed analysis of bibliographic data functions from the user's perspective. There is international recognition of the validity of the model and experience of "FRBRized" displays based on existent MARC records.[2] Both have underlined that full FRBRization of bibliographic data will require different levels of data about *work, expression, manifestation* and their attributes and the capability of parsing data into separate elements that allow enough flexibility and discretion for their manipulation and recombination.

However, the framework of MARC formats consists of non-relational implementations – in fact, MARC bibliographic formats are specific ISBD implementations, i.e., essentially oriented to record display rather than to enable a network of relationships based upon the richness of its data elements.[3] The principles governing the structure and evolution of MARC formats have not been aligned with technology concepts and the practice of data modelling, despite some past suggestions, e.g., for the application of principles underlying conceptual database schemas to MARC [4] for object–oriented thinking in structuring cataloguing data[5] or for the use of formal ontologies to design and support relationships of bibliographic entities.[6]

With FRBR providing a conceptual model of the bibliographic universe built upon the entity-relationship method of analysis a whole new perspective is open pointing to a redesign of standards for data records that is already emerging in undertakings such as *the Bibliographic Framework Transition Initiative*,[7] under which new bibliographic data modeling activities will be carried out. These will be oriented not only by the needs raised in FRBR but also by the demands of the semantic web technology, e.g., linked open data.

Therefore, it seems clear that nowadays we may be on the verge of a major shift in the conception and management of library data. In this context it may be useful to make the exercise of looking back at the evolution of MARC formats and develop a critical analysis of its management and limitations. This is the context of the present paper the objective of which is to provide an overview study of the evolution of UNIMARC since it started to be used, with special emphasis on the period covered by the activity of the PUC, from its establishment in 1991 to the present (March 2012, the date of the last PUC meeting).

2.   A brief history of UNIMARC

First issued in 1977, as a recommendation of the IFLA Working Group on Content Designators, UNIMARC (standing for **UNI**versal **MA**chine-**R**eadable **C**ataloguing) was primarily aimed at facilitating the exchange of bibliographic records originally produced in any other MARC formats. It was therefore designed to act as a common format capable of accommodating / translating data from /to other formats. At the time, a variety of bibliographic data standards[8] were in place in different countries and the cost of producing and maintaining different conversion tools was to be avoided. In its development phase, several publications followed that defined the format in detail and provided the necessary documentation for actual use.[9]

Facilitating the international exchange of records was still the main goal of UNIMARC in the early 90s, when the Commission of the European Community (CEC) recognized its potential as a common standard for data exchange among European national libraries, bibliographic utilities and the book trade. Following a workshop held in Luxembourg in 1990, a study on this matter was commissioned to the Deutsche Bibliothek whose results,[10] presented at a seminar in Florence, in 1991, underlined the importance of UNIMARC for that purpose, confirmed it as the common standard for all European cooperation projects and stressed the need for data conversion programs to and from UNIMARC.

Another important outcome of the 1991 Seminar was the establishment of a maintenance body for UNIMARC: the existence and terms of reference of the PUC – Permanent UNIMARC Committee were decided,[11] superseding the review functions of the International MARC Network Committee (IMNC), established in 1975. The PUC, composed of specialists from several countries, has since then governed the maintenance of UNIMARC, first within the IFLA

UBCIM Core Activity,[12] later, since 2003, under the responsibility of the IFLA UNIMARC Core Activity,[13] coordinated by the National Library of Portugal.

Since the late 80s, and especially since the establishment of the PUC, UNIMARC evolved from a theoretically defined format for record exchange to a format used also for the generation and management of original records. Many countries adopted it as their national standard, providing for the emergent need in library automation or replacing other existing national MARC flavors.[14] As a consequence, UNIMARC maintenance has been driven by both the need to align with the evolution of other MARC formats, for purposes of exchange, and the practical needs of actual users in the creation of original records. This has reinforced, since the beginning of the 90s, the need for more detailed and regularly updated UNIMARC documentation and for the completion of the set of standards that correspond to the different library data records: bibliographic,[15] authorities,[16] classification [17]and holdings.[18]

Over the years, the number of different national MARC formats has decreased, with MARC 21 becoming more prominent at the international level, especially since it emerged from the harmonization of USMARC with CANMARC,[19] in 1999, and its adoption to replace UKMARC, in 2004.[20]

Despite some moves of former UNIMARC users to MARC21, the evolution of the UNIMARC community shows a continuing growth. In 1993, UNIMARC was used as the internal format at 6 national bibliographic agencies plus as exchange format in another 3; and in 3 countries new MARC formats were based on UNIMARC.[21] By 1998, 18 institutions used UNIMARC as their local standard and 9 for purposes of exchange only, while 4 had UNIMARC-based formats.[22] In 2008, 23 national institutions were using UNIMARC as their internal format, 10 for exchange only, and there were 5 UNIMARC-based national formats.[23] These figures reveal that a community is stable, relying on the continuity of the standard.

3. The evolution of UNIMARC: general figures

Over its 35 years of existence, UNIMARC evolved to adapt to emergent needs related not only to the coverage of different types of resources to describe but also to align with changes in ISBDs, with concepts and terminology arisen from the new International Cataloguing Principles (ICP)[24] and, more recently, to reflect changes derived from the implementation of FRBR and FRAD (*Functional Requirements for Authority Records*) in bibliographic standards.

In general terms, we can see the UNIMARC evolution in terms of growing content designation of the bibliographic format: since 1983 we have **68%** growth in the number of fields and of **431%** in the number of subfields. While new field definition is quite regular, the subfield growth is particularly high 1998 and 2005.

Table 1 – Number of fields and subfields by edition/year

	Hanbook	1st. ed.	2nd. ed.	2nd. ed., 1st. up.	2nd. ed., 2nd. up.	2nd. ed., 3rd. up.	2nd. ed., 4th. up.	2nd. ed., 5th. up.	3rd. ed.
	1983	1987	1994	1996	1998	2000	2002	2005	2008
Fields	115	144	153	164	167	171	178	185	193
Subfields	337	464	489	530	**1109**	**1181**	**1239**	**1653**	**1791**

Table 2 – Number of fields by block and edition/year

Blocks	Hanbook	1st. ed.	2nd. ed.	2nd. ed., 1st. up.	2nd. ed., 2nd. up.	2nd. ed., 3rd. up.	2nd. ed., 4th. up.	2nd. ed., 5th. up.	3rd. ed.
	1983	1987	1994	1996	1998	2000	2002	2005	2008
0--	7	9	10	11	13	15	18	19	20
1--	10	21	22	24	24	24	24	25	25
2--	8	10	11	11	11	11	11	11	11
3--	22	29	30	33	33	33	34	34	34
4--	30	31	34	36	36	36	36	40	40
5--	16	16	17	18	18	18	18	18	20
6--	12	17	18	19	19	19	20	20	22
7--	9	9	9	9	9	10	11	11	14
8--	1	2	2	3	4	5	6	7	7
Total	115	144	153	164	167	171	178	185	193

Table 3 – Number of subfields by block and edition/year

Blocks	Hanbook	1st. ed.	2nd. ed.	2nd. ed., 1st. up.	2nd. ed., 2nd. up.	2nd. ed., 3rd. up.	2nd. ed., 4th. up.	2nd. ed., 5th. up.	3rd. ed.
	1983	1987	1994	1996	1998	2000	2002	2005	2008
0--	19	22	26	29	37	43	61	78	78
1--	29	64	65	64	68	68	70	79	84
2--	41	43	44	45	45	45	45	50	50
3--	23	35	36	56	56	56	76	83	90
4--	30	31	34	36	576	612	612	960	1000
5--	65	114	117	124	124	128	128	134	149
6--	70	84	90	97	97	116	129	135	175
7--	57	66	72	74	74	77	81	81	111
8--	3	5	5	5	32	36	37	53	54
Total	337	464	489	530	1109	1181	1239	1653	1791

In general, the rate of enlargement and further specification observed in the evolution of UNIMARC parallels that of USMARC, now MARC21: in 1972 there were 118 fields and 471 subfields[25] while the corresponding figures rose up to 207 fields and 2042 subfields in 2012.

4. UNIMARC maintenance activities

4.1 Methodology

The study encompassed all the proposals received by the PUC since its establishment, consisting of a total of 384. Throughout time there were changes in the terminology used to reflect the status of a proposal. For this analysis, all proposals recorded as "approved", "accepted", "approved or accepted as amended, or with amendments, or with changes", and "done" are approved proposals. Not approved are those recorded as "rejected", "cancelled", "superseded by... or replaced by... or added to..." another previous or later proposal, as well as those marked "postponed" and "withdrawn".

This section will present data about UNIMARC maintenance and evolution in three perspectives: i) general data about maintenance activities: number of approved and not approved proposals: proposals approved according to specific UNIMARC formats, years of production and source; ii) type of resources dealt with the approved proposals; iii) characterization of changes by format block.

With regard to the *type of resources dealt with the approved proposals*, the objective was to analyze the subject and temporal focus of the proposals and its connection with the concerns of providing UNIMARC with features to cope with resources other than books and serials as well as to align with the FRBR and FRAD models.

In the *characterization of changes by format block*, the objective was to analyze the evolution of the format vis-à-vis the changes in ISBD and the type of changes according to the UNIMARC structure.

4.2 General data about maintenance activities

a) Number of proposals

From 1991 to March 2012 a total of 384 proposals were submitted to the PUC, whose status is as follows:

- approved - 277;
- not approved - 106;
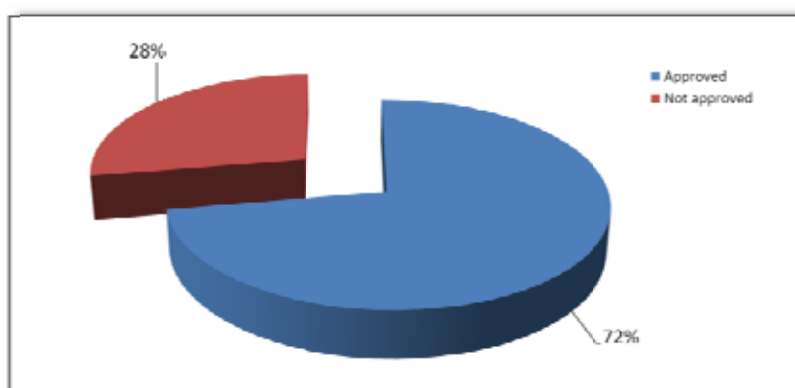- under discussion - 1.

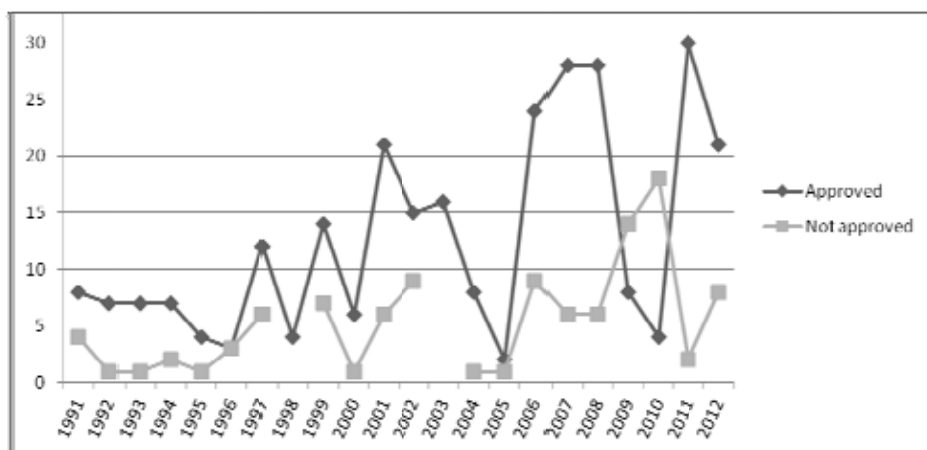Figure 1 – Total of approved and not approved proposals 1991-2012

Figure 2 – Approved and not approved proposals by year

According to the source, the distribution of proposals is as follows

- France, from CfU mostly: 143 proposals, of which 71% approved
- Italy, from ICCU mostly: 48 proposals, of which 56% approved
- UK: 33 proposals, of which 85% approved
- Russia: 25 proposals, of which 68% approved
- Croatia and Portugal: 20 proposals each, 90% approved;
- From the PUC itself: 21 proposals, of which 57% approved.
- From other countries: the remaining 73 proposals, of which 77% approved.

b) Proposals by format

The majority of proposals respects to UNIMARC/Bibliographic (316), followed by Authorities (64) and Holdings (9). The years with the highest number of approved proposals were 2011 (30), 2007 and 2008 (28), 2006 (24), 2012 and 2001 (21).

Figure 3 – Proposals by format/year of approval

The 2011 and 2012 approved proposals were essentially focused on providing UNIMARC with a data structure better prepared to describe the entities of the FRBR model, following the frame of reference described as scenario 1 in *RDA Implementations Scenarios.*[26]

Besides some the consolidation of descriptive fields and enhancement of appendices, the proposals from 2006 to 2008 were mostly about the creation of fields for identification numbers and new subject and title access points.

The 2001 changes were at the level of coded data mostly, followed by descriptive fields, respecting primarily to music, followed by continuing and electronic resources.

The years with the highest numbers of not approved proposals were 2009 and 2010. These proposals concerned the format adaptation to ISBD area 0 and requirements of FRBR group 1

entities. They were not approved due to the need of further study of these topics and were submitted later, in 2011 and 2012.

4.3 Type of resources dealt with the approved proposals

Throughout the years many proposals consisted of changes that we can consider of a general nature, i.e. applicable to any type of resource: new fields and subfields or the description of existing ones, definition of repeatability and required occurrence, notes and examples, etc. These types of changes (with a total of 109) occurred between 2006 and 2008 mostly.

Figure 4 – Changes applicable to all types of resources

The number of UNIMARC changes applicable to specific types of resources was less expressive and scattered throughout the years. Those relating to printed textual resources (including fields specific to antiquarian) are from 17 proposals only, occurred in 2001 and 2007 mostly.
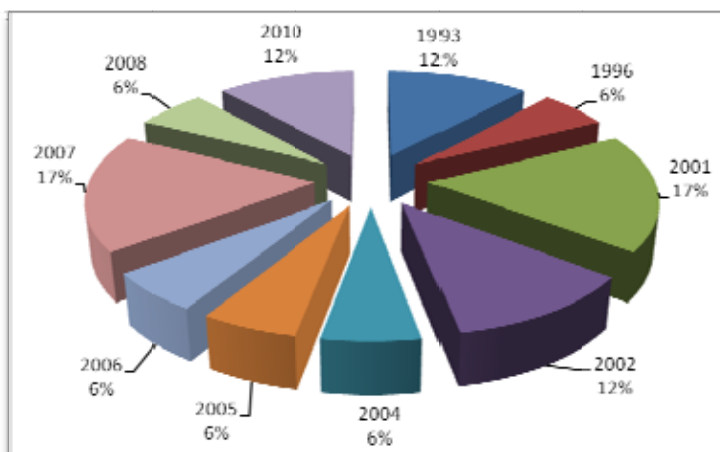

Figure 5 – Changes applicable to textual resources

Changes related to electronic resources (a total of 16) occurred in 1999 and 2001 mostly, reflecting specific needs arisen from the 1997 publication of ISBD(ER).
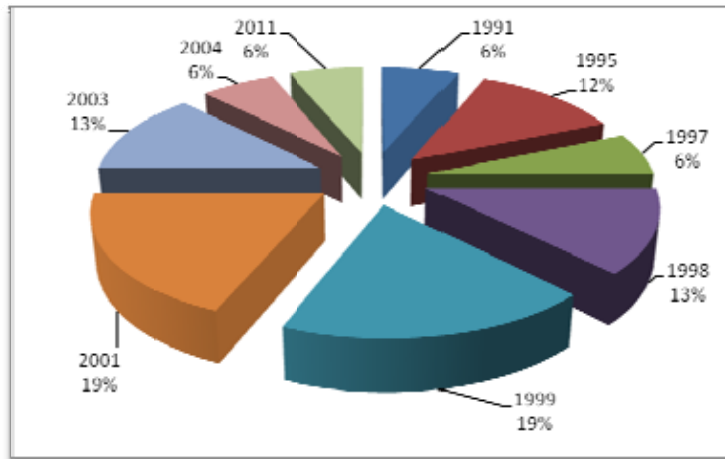
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Figure 6 – Changes applicable to electronic resources

Changes regarding continuing resources (12 in total) occurred mainly in 2002 (the publication year of ISBD(CR)) and 2007, although the first proposals date from 2001 regarding a specific code for this type of resource in the leader and the change to make 210 repeatable to carry information about several sequential publishers.
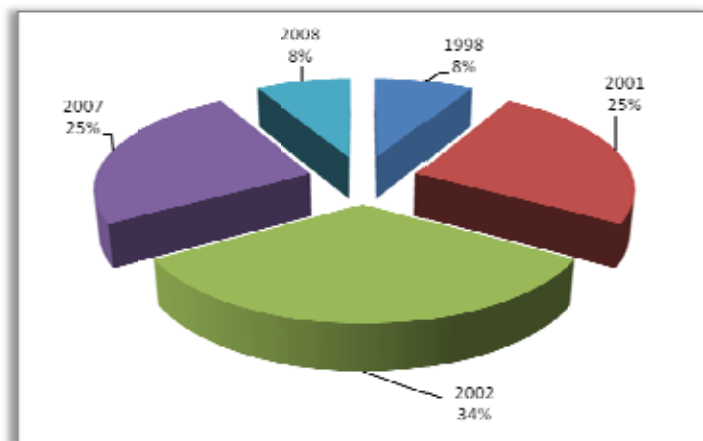

Figure 7 – Changes applicable to continuing resources

In what concerns music (notated music, printed or manuscript) there were 21 proposals approved, most of them in 2001, when the need was felt for codes to specifically identify the form of musical work and key or mode, as well as the medium of performance. In 2012, other changes were approved having in mind the adaptation of music data elements to FRBR.
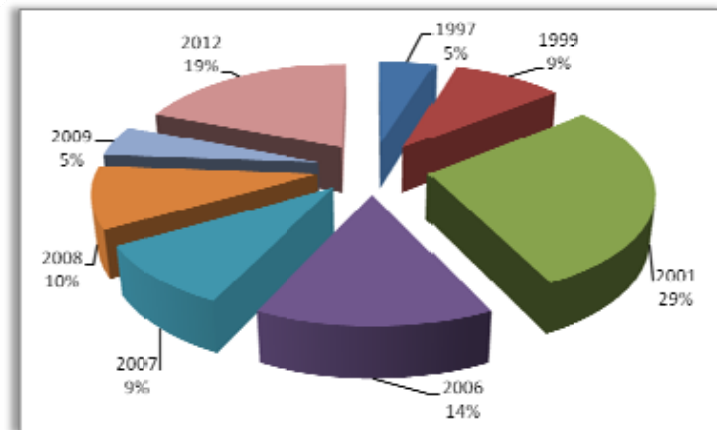
Figure 8 – Changes applicable to music resources

Manuscripts and archival materials were also the object of several approved proposals, 10 in total, focused on improving the description of this type of documents. This demand started in 2001 for manuscripts and had a second increment in 2012 with a set of proposals specifically concerning archival documents.
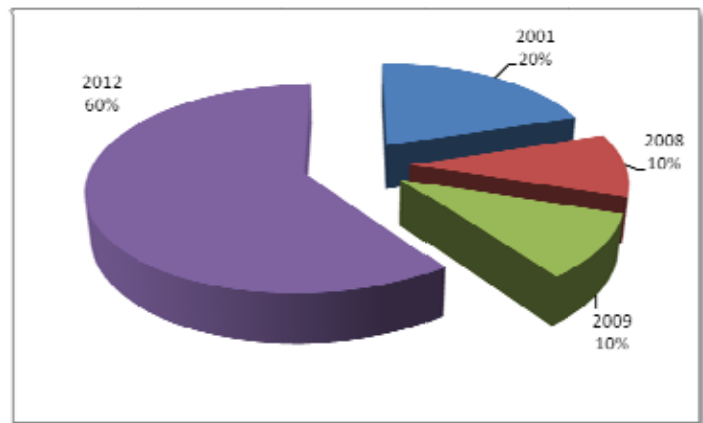

Figure 9 – Changes applicable to manuscripts

Types of resources other than the above mentioned had little expression in the proposals submitted to/approved by the PUC:

- **cartographic material** was the object of 4 proposals only (1993, 2001, 2003 e 2012), the latter concerning adaptation to FRBR. This little demand for changes is perhaps the refection of UNIMARC having, since the beginning, data elements specific to cartography;
- **sound and video recordings** had 7 proposals (1999, 2003, 2006 e 2012) with the last one also concerning FRBR;
- **graphic material** and *realia* received a total of 8 proposals (1992, 1993, 1999, 2001 e 2008);
- for **data elements concerning reproductions**, there were 4 proposals (1992, 2003 e 2012).

4.4 Changes to accommodate FRBR

The need for practical application of the FRBR model, especially since its implementation in RDA (*Resource Description and Access*) motivated the adaptation of UNIMARC to the

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description of entities work and expression. The movement towards such changes started in 2008 and intensified in 2011. Between 2008 and 2012, 38 proposals were approved with that objective, some in UNIMARC bibliographic, others in Authorities.
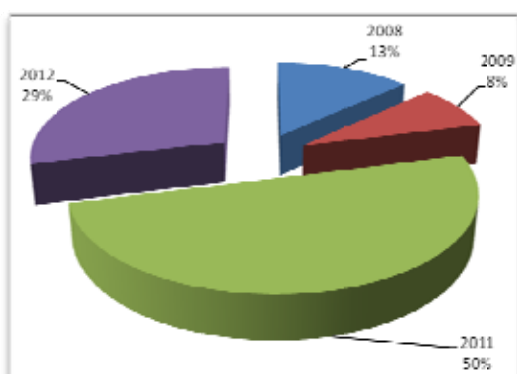

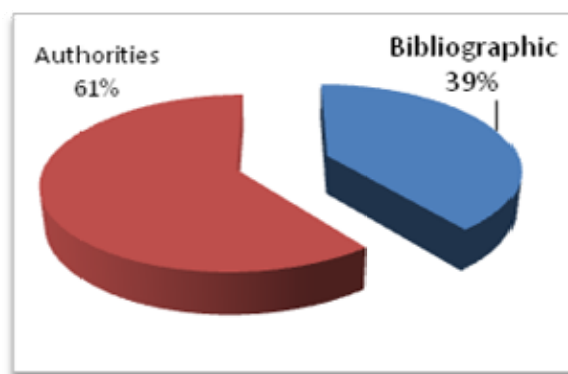Figure 10 – Changes to accommodate FRBR entities

Figure 11 – FRBR changes by format

5. UNIMARC Bibliographic format - characterization of changes

General overview

Table 4 provides an overview of the changes in the bibliographic format, by block. Numbers refer to the year the approved proposals were submitted. Blocks 1--, 3--, 5-- and 6 -- are the most affected.

Table 4 – Distribution of changes in the bibliographic format by block/year

	0--	1--	2--	3--	4--	5--	6--	7--	8--	Total
1991	-	-	1	-	1	-	-	-	-	2
1992	1	4	-	1	-	1	1	1	-	9
1993	1	1	1	1	-	-	1	1	-	6
1994	-	-	-	-	-	2	1	-	-	3
1995	-	1	-	-	-	-	-	-	1	2
1996	1	1	-	-	-	-	-	-	1	3
1997	3	2	-	-	-	-	1	-	2	8
1998	-	1	2	1	-	-	1	-	-	5
1999	-	7	1	-	-	-	1	1	-	10
2000	1	1	1	-	-	-	1	-	-	4
2001	1	9	3	3	-	-	-	1	2	19
2002	-	-	1	1	4	1	1	1	-	9
2003	1	5	-	4	1	2	-	-	-	13
2004	-	2	-	-	-	1	-	-	2	5
2005	1	-	-	-	-	-	-	1	-	2
2006	1	-	-	2	1	4	5	2	1	16
2007	3	3	-	2	3	2	2	-	2	17
2008	-	3	3	1	-	1	4	2	-	14
2009	1	-	-	-	2	1	-	1	-	5
2010	1	2	-	-	-	-	-	-	-	3
2011	-	-	-	-	-	4	-	1	1	6
2012	-	9	3	3	-	-	-	1	-	16
Total	16	51	16	19	12	19	19	13	12	177

Blocks 2-- and 3--

Changes proposed to blocks 2-- and 3-- of UNIMARC bibliographic are the ones that best match the changes in ISBD, as they correspond to areas 1 to 7 of the bibliographic description standard. Most of the changes in these blocks occurred in 2001 and 2012 (each with 17% of the proposals concerning these blocks), followed by 2003 and 2008 (12% each year).
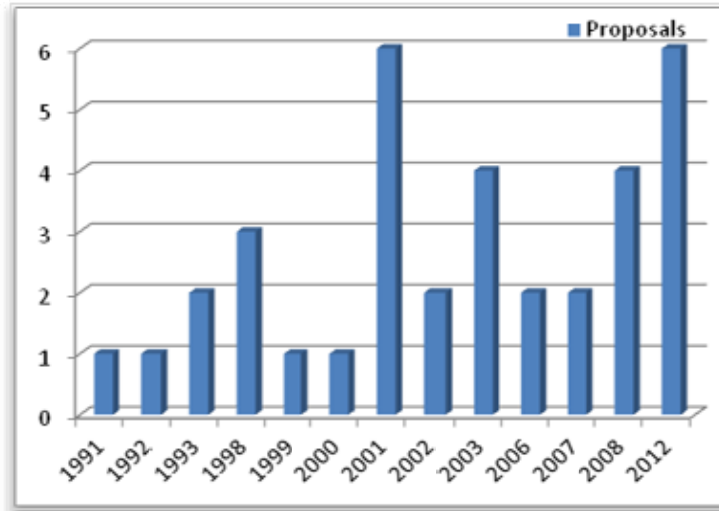

Figure 12 – Changes to UNIMARC Bibliographic blocks 2-- and 3--

Taking into account the data regarding changes by type of resource, we can see that changes in these blocks, mostly in 2001, correspond to the need to consolidate descriptive information elements while more recent changes, mostly in 2012, reflect other needs – those of adapting the format to FRBR.

Block 0--

This block contains two types of identification numbers: those that identify the bibliographic record (with 13% of the changes) and those that identify the resource being described (accounting for 87% of the changes). Only the last one is related to ISBD, therefore more subject to change.
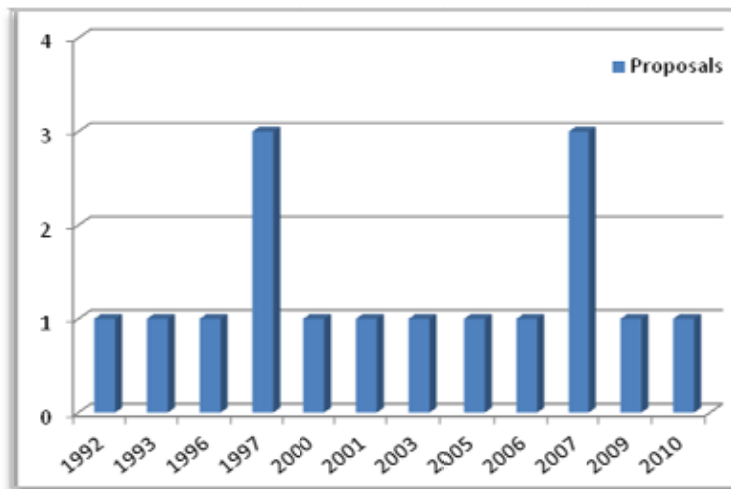

Figure 13 – Changes to UNIMARC Bibliographic block 0--

In the three blocks analyzed above, the most frequent changes have been the so called content changes i.e., text changes to any part of the content designation description (e.g., definitions, content notes, examples, etc.) which represent 33% of the changes in block 2--, 50% of the changes in block 3-- and 42% of the changes in block 0--.
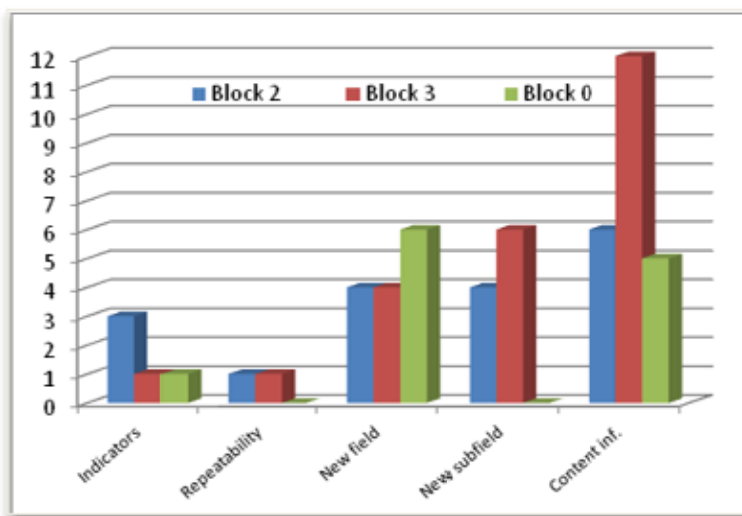

Figure 14 – Type of changes to UNIMARC Bibliographic blocks 0--, 2-- and 3--

Blocks 5--, 6-- and 7--

In UNIMARC bibliographic, blocks 5--, 6-- and 7-- are used for access points of title, subject and responsibility, respectively. These blocks account for 29% of the changes occurred.
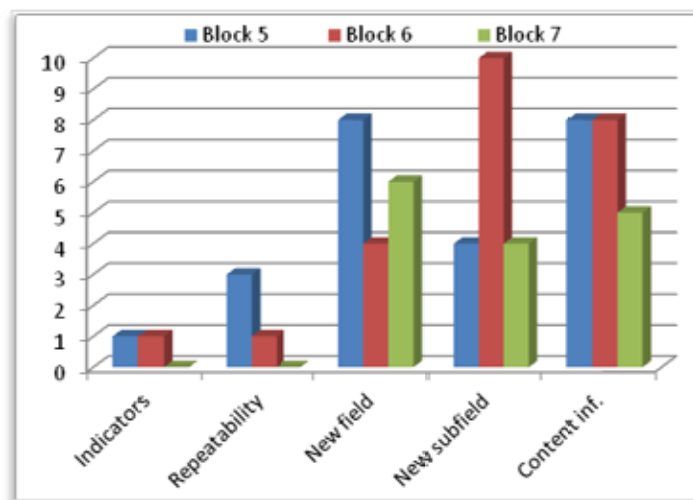

Figure 15 – Type of changes to UNIMARC Bibliographic blocks 5--, 6-- and 7--

In block 5-- most important changes were at the level of new fields and content information (each with 33% of the total changes in this block). In what concerns new fields, two of them respect to the identification of the entity *work* and another two relate to the entity *expression*.

As for block 6--, most important changes were at the level of subfields (42% of the total in this block). In block 7--, 35% of changes were new fields created, while 29% respect to changes in content and 24% to new subfields. The remaining 12% were changes regarding the application of relator codes.

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Block 1--

Data from Block 1-- - Coded information block, serve mainly restriction functions in the retrieval and selection processes. Most changes were new codes and data elements (44%), followed by changes in content. From the new elements created, two relate to the identification of the entities *work* and *expression*.
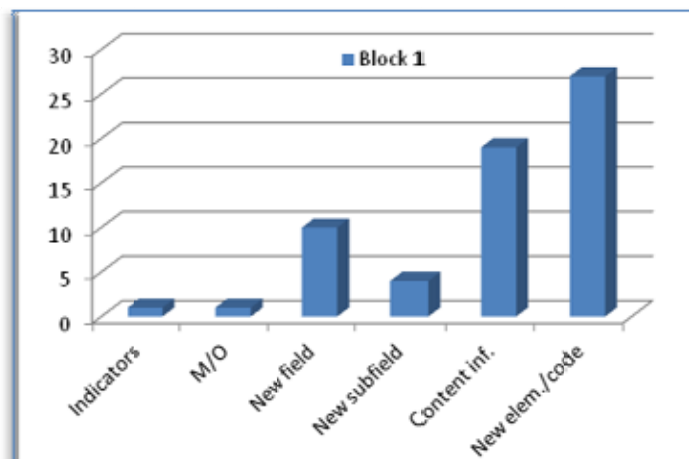

Figure 16 – Type of changes to UNIMARC Bibliographic block 1--

Block 8--

This block contains data elements for maintenance and exchange of records. Most changes in this block were new fields created (33%) followed by changes in content (25%).
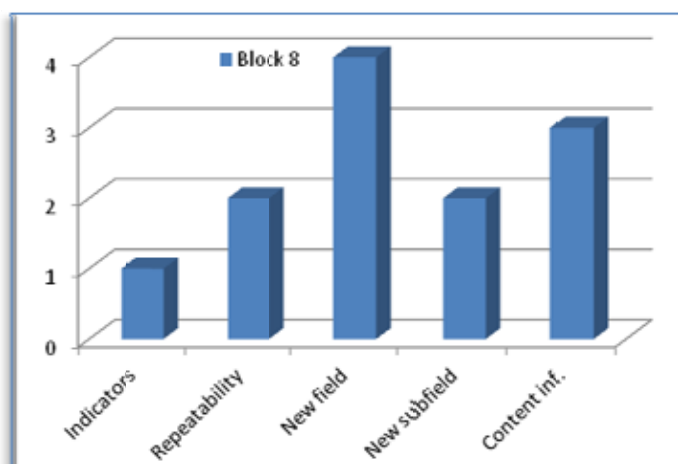

Figure 17 – Type of changes to UNIMARC Bibliographic block 8--

6. UNIMARC Authorities format - characterization of changes

The conceptual evolution regarding bibliographic control that developed internationally, especially in what concerns authority control – from the concept of uniform heading[27] to that of authorized heading[28] and, later, to that of controlled access point,[29] have influenced the maintenance and development of UNIMARC Authorities format.

Changes in Authorities have also derived from the need to align with changes in the bibliographic format and the need to implement FRBR and FRAD concepts. In 2008, an important set of changes started to be defined concerning the relationships between entities, both primary entities and specific instances of such entities.

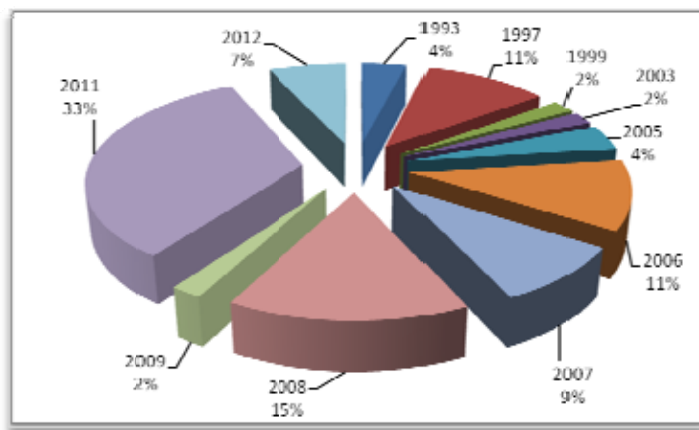From the total (64) of the proposals submitted, 72% (46) were approved.

Figure 18 – Changes to UNIMARC Authorities – distribution by year

The majority of changes occurred in 2011 (33%) resulting from approval of new fields to adapt the format to FRBR (fields for data regarding the work and expression), following earlier proposals of 2008 (15%) for the creation of fields for international identification numbers or codes such as ISTC, ISWC, ISAN, ISRC. Changes approved in 2006 and 1997 (11% each year) were essentially alignments with the bibliographic format and changes in content to improve text consistency.

Access points are recorded in blocks 2--, 4--, 5-- and 7--, respectively for authorized, variant, related access points and access points in another language and/or script. As changes operated in a block 2-- field should have parity in the corresponding fields of the other blocks, these changes were taken care simultaneously. Figure 17 shows the creation of new fields to record the controlled information regarding work and expression title.
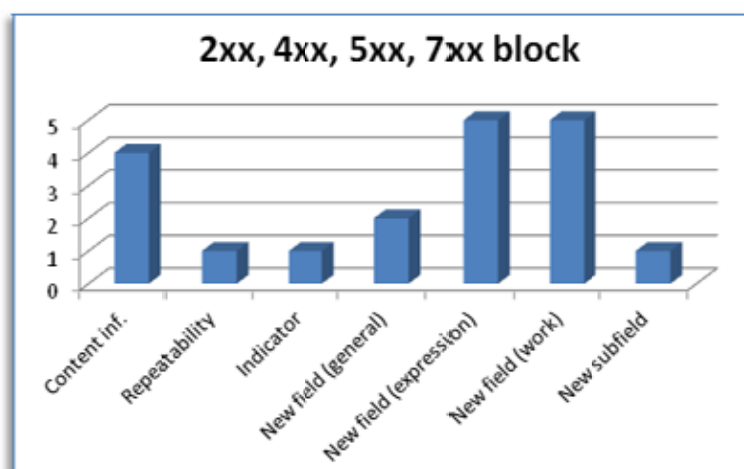

Figure 19 – Type of changes to UNIMARC Authorities

7.   Concluding notes

The objective of the analysis carried out for this paper was twofold: first, to provide an overview of the evolution of UNIMARC aimed at contributing to lead us to improve our actions regarding the future of the format management. Second, to interpret the evolution to get new ideas about the future of the format itself.

The analysis reveled that the format evolved to a large standard whose specification became fairly complex. Throughout time the frequency and type of changes has been driven by i) new needs arising from different materials to describe and ii) changes occurred in other existing or emerging standards; and iii) occasional demands from users, foreign to any strategic directions.

In all these cases and for most situations, the factors influencing the evolution of the format have been exogenous to it and, therefore, of a different nature. That is to say, changes in the format have been mostly to accommodate new data elements or attributes by adding new content designators or values, rather than to improve the structure and quality of the format as such.

As a consequence, the practical result of the UNIMARC evolution has been essentially one of extension, rather than one of revision, in a structural sense. And this is why we have lived comfortably with so many and constant changes to the format: usually they are not disruptive and in many cases new content designations or values are optional. But can we simply proceed with extending the format?

The experiences with FRBRization and other mapping and conversion operations show that one of the reasons why they are difficult is because of the length and complexity of the standard. Not to mention that extending the specification has not circumvented the diversity of local options (and localizations), thus not helping to improve a standard application.

Besides, it is known that a significant proportion of existing content designators have a fairly low usage,[30] which makes us to question the return on investment of studying, approving, documenting, publishing, changing processing tools, teaching, etc., a very extended element set, also difficult to understand and reuse,[31] especially by outsiders and where deficiencies such as redundancy, for example, are not solved.

The truth is that the "expansionist" strategy of the format maintenance has served extended content better than functionality, flexibility and facility of use and integration in the wider and diversified space of the online environment. Especially, the evolution of the format has not been dictated by technological changes: this can be claimed for a small number of changes only, and not structural.

All this is known, has been long discussed and is not specific to UNIMARC. Other MARC formats have been pointed out the same problems and they come from the same historical (or legacy) reasons deeply rooted, first of all, in the model of the old card catalogue and driven by "display" requirements. Even the recent efforts to implement FRBR in UNIMARC, which are deemed of structural value to catalogues, have been made by expanding the format, not otherwise: so far, the need to comply with a different model and simultaneously to provide for continuity does not leave us with other options.

This being said, what is different now? The real urgency in finding practicable ways to realize the restructuring of catalogues and at the same time to achieve easy and smooth integration with the technology and content of the wider information environment,[32] by lowering the barriers to understanding and reuse of bibliographic data. This may require radical approaches to transformation starting with data disaggregation, decomposition and remodeling, as it was done, at the conceptual level, in FRBR.

The overview of UNIMARC maintenance activities and the evolution portrayed in this paper is offered for further exploration. It does not provide answers to how a radical approach is to be done or what methodology and effort it entails. But we believe that looking back to what, why and how was done in the past may enact a better understanding, or simply some clues, for what we may not want in the future.

NOTES & REFERENCES

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