

# Potential impact of ISBD for Manifestation on the future of UNIMARC

## Potencialni vpliv ISBD for Manifestation na razvoj UNIMARC-a

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**ABSTRACT:** The paper discusses challenges in the development of UNIMARC as an encoding standard for metadata content that conforms to the stipulations of ISBD for Manifestation, an implementation of the IFLA Library Reference Model. UNIMARC already encodes metadata controlled by ISBD: International Standard Bibliographic Description, the precursor of ISBD for Manifestation. Issues discussed include the interaction between metadata standards in the ecosystem maintained by IFLA, the impact of a focus on a single entity from an entity-relationship conceptual model for a multiple-entity metadata ecosystem, and the application of the Semantic Web technologies for which the model is optimized.

**KEYWORDS:** ISBD, IFLA LRM, UNIMARC, IFLA standards ecosystem

**IZVLEČEK:** Prispevek obravnava izzive pri razvoju formata UNIMARC kot standarda za kodiranje metapodatkovne vsebine, ki so skladne z določili ISBD za pojavno obliko, ki je implementacija modela IFLA Library Reference Model (IFLA LRM). UNIMARC že kodira metapodatke, ki jih ureja ISBD: Mednarodni standard za bibliografski opis, predhodnik ISBD za pojavno obliko (angl. manifestation). Prispevek obravnava vprašanja, povezana z interakcijo med metapodatkovnimi standardi v ekosistemu, ki ga vzdržuje IFLA, vpliv pristopa na en entitetni nivo iz entitetno-relacijskega konceptualnega modela na metapodatkovni ekosistem z več entitetami in uporabo tehnologij semantičnega spleta, za katere je model optimiziran.

**KLJUČNE BESEDE:** ISBD, IFLA LRM, UNIMARC, ekosistem standardov IFLA

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## 1 Introduction

This paper discusses issues for the encoding of metadata structure and content that result from the development of a content standard that implements the entity-relationship conceptual model for library and cultural heritage resources that is published and maintained by the International Federation of Library Associations and Institutions (IFLA).

Discussions of the packaging of encoded metadata as a “bibliographic record” are out of scope for this paper. They involve issues of application profiles and data provenance that require international agreement on policies for constraining metadata content to meet the requirements of data interchange and functionality. Modern bibliographic standards attempt to utilize Semantic Web technologies that are based on an open metadata paradigm. This is at odds with the older closed metadata paradigm of universal bibliographic control as a top-down process based on prescriptive standards.

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## 2 ISBD for Manifestation

ISBD for Manifestation (Dunsire and Willer, 2025) is the main deliverable of the first phase of a project to develop International Standard Bibliographic Description (ISBD, 2011, 2022) as an implementation of the IFLA Library Reference Model (LRM), which was first published in 2017 (Riva et al., 2024). The LRM and the ISBD, along with UNIMARC, are the principal components of a new IFLA bibliographic standards ecosystem: the LRM is an entity-relationship model of metadata elements; the ISBD implements the model by refining the elements and stipulating their values; UNIMARC encodes the metadata elements and values for storage and exchange. The ISBD Review Group had recognized, from the “Functional requirements” family of models that preceded the LRM and by monitoring its development as a consolidated conceptual model for bibliographic metadata, that the LRM would have a significant impact on the ISBD as IFLA’s principle bibliographic metadata content standard. In particular, the Consolidated edition of the ISBD published in 2011 acknowledged the issues in aligning the ISBD with the Work, Expression, Manifestation, and Item (WEMI) entities of Functional Requirements for Bibliographic Records (FRBR: IFLA, 2009; ISBD, 2022, pp. xii-xiii), which were eventually absorbed by the LRM.

Two fundamental issues were recognized to have an impact on the development and structure of ISBD as an implementation of the LRM that defined the direction of a single-entity standard – ISBD for Manifestation (ISBDM). The first issue is the relationship between ISBD and the WEMI entities. The ISBD accommodates bibliographic metadata as the values of descriptive attributes of a single instance of the single entity Resource. “Resource is not equivalent to any individual WEMI class because the definition contains parts of the semantics of each of the WEMI definitions, which are mutually exclusive. This suggests that Resource is disjoint with each WEMI class.” WEMI entities are recognized as ‘is-aspect-of’, not ‘is part-of’ ISBD Resource (Dunsire, 2013). Therefore, while the alignment between ISBD and WEMI can be expressed as equivalent, broader, or narrower between one or more elements of the two schemas (ISBD Review Group, 2014, 2016a), a semantic mapping cannot. The mapping, which is an expression in RDF (W3C, 2014) of a **single** alignment between two elements, must be semantically consistent, that is, the matched properties must have the same domain and range, which is not the case for ISBD and WEMI (ISBD Review Group, 2016b). The ISBD entity Resource is the domain of all of its properties, so no ISBD property can be mapped directly to any WEMI property.

The second issue is the fact that the ISBD does not cover entity relationships that are integral to the LRM and necessary for entity-relationship metadata, for example, Manifestation to Agent relationships. In RDF the range of all ISBD properties, which are essentially attribute elements, is a literal (string) while the range of an LRM relationship element can be either a literal (string) or any of the LRM entities.

Both these facts have a major impact on the alignment, and subsequent mapping of properties of the ISBD with LRM. As those would require major structural changes of the ISBD, the project was split into two parts. Phase 1 focused on the LRM **Manifestation** entity, and phase 2 will cover the other LRM entities (ISBD Review Group. ISBD for Manifestation Task Force, 2019-2025). At the moment of writing this article, ISBDM has been approved by the IFLA Committee on Standards and recommended for endorsement by the IFLA Professional Committee.

## 2.1 ISBD for single-entity cataloguing

ISBDM was developed as a **stand-alone** content standard as a result of the first phase of the project focused on a single entity, LRM Manifestation (Dunsire, 2025). This has two main advantages:

1. The second phase of the project might not be completed for a variety of reasons, so the output of the first phase will remain useful.
2. Lessons learned in the first phase can be systematically applied to the entities covered in the second phase.

The main disadvantage is the confinement of descriptions of related LRM entities to local annotations and access points of the manifestation that is being described. The use of local annotations is similar to ISBD, but access points are not accommodated in ISBD. The resolution of these issues in ISBDM is applicable to all other LRM entities and there is no further gain in developing a special approach for related WEMI entities that are aspects of the ISBD Resource entity, which is incompatible with the LRM.

ISBDM provides elements for a manifestation's **attributes** (characteristics), elements for **relationships** between a manifestation and other entities, and elements for **annotations** that refer to the manifestation and other LRM entities.

ISBDM includes only stipulations for the description of a manifestation, but these take into account the context of the other LRM entities. Metadata for other LRM entities that needs to be incorporated in the metadata for Manifestation is accommodated by several devices, such as inclusion of the so-called short-cut elements, broad relationships ("has entity associated with manifestation") and broad note elements.

Non-Manifestation attributes can be included by using short-cut elements that access controlled values for other entities to allow entities' categories to be attached to the description of the manifestation. The most notable case in ISBDM is the inclusion of an Expression content type in the short-cut element "has category of content". The short-cut does not distinguish which expression is referenced, but re-uses the value vocabulary for Expression for content type that is likely to be developed in the second phase because it is based on the RDA/ONIX Framework for Resource Categorization (RDA Steering Committee, 2006), which is already used in ISBD as the basis of its Area 0.

A short-cut element does not depend on the values of the longer chain of elements or LRM "path" that it replaces for its utility and functionality in single-entity cataloguing, but the complete chain provides context and interoperability in multiple-entity cataloguing.

ISBDM provides broad relationship elements from Manifestation to the other LRM entities that have similar functionality to authorities, for example "has person associated with manifestation". There are also broad note elements for uncontrolled descriptions of other entities associated with the manifestation being described, for example "has note on entity associated with manifestation", and one of its sub-types "has note on person associated with manifestation".

## 2.2 ISBDM elements and element hierarchy

ISBDM identifies four categories of elements. These are:

- Manifestation statements (annotations)
- Notes (annotations)
- Attributes
- Relationships

The manifestation statement category applies only to Manifestation and it is based on **LRM-E4-A4 Manifestation statement**. The note, attribute, and relationship categories are applicable to all of the other LRM entities.

All ISBDM elements belong to an element hierarchy based on semantics. This is a full implementation of the LRM, which is declared as an enhanced entity-relationship model that introduces a structure of semantic hierarchy of its elements: entities, attributes and relationships. The “is a” (conventionally labelled “isA”) hierarchy is expressed by defining, for example subclasses and superclasses of entities: the entity Person is a subclass of the entity Agent (Person isA Agent) while the entity Agent is a subclass of the entity Res (Agent isA Res) (Riva et al., 2024, pp. 18–19).

In ISBDM, elements with a broader meaning (super-types) are placed above elements with a narrower meaning (sub-types) in each hierarchy. The structure of this semantic hierarchy is explained in the section on Granularity of the ISBDM (ISBDM, [Granularity](#)). There are 6 elements that have the broadest level of granularity, that is, they have no element super-type. These are

- annotations:
  - “has manifestation statement” that corresponds to the LRM Manifestation attribute **LRM-E4-A4 Manifestation statement**
  - “has note on manifestation” that is derived from **LRM-R1 Res** note attribute **LRM-R1-A2 Note**
- attributes:
  - category – “has category of manifestation” that is derived from **LRM-R1 Res** category attribute **LRM-R1-A1 Category**, i.e. **LRM-E4-A1 Category of carrier**, **LRM-E4-A5 Access conditions**, **LRM-E4-A3 Intended audience**
  - physical characteristics – “has physical characteristics” groups attributes that correspond to **LRM-E4-A2 Extent**
  - access and usage – “has use rights” that corresponds to **LRM-E4-A6 Use rights**
- relationships:
  - a set of 8 elements that express the relationship of LRM entities to Manifestation have super-type “has entity associated with manifestation”; these 8 sub-type elements are “has agent /expression /item /manifestation

... /nomen associated with manifestation”; they are derived from the LRM top level relationship **LRM-R1 RES is associated with RES** and function as intermediary relationship elements between LRM-R1 and the LRM’s second level relationships, e.g., **LRM-R2 WORK is realized through EXPRESSION**, **LRM-R3 EXPRESSION is embodied in MANIFESTATION**

For example, the “has material” attribute element is narrower in meaning than the “has physical characteristic” element and is broader in meaning than the “has base material” element.

- has physical characteristic
  - has material
    - has base material

Such a structure enables further element refinements and data granularity ensuring that metadata at different levels of granularity within an ISBDM element hierarchy is interoperable at the level of granularity of the broadest of the elements in question. A metadata value that is recorded for an element with a finer level of granularity is valid for all other elements at a broader granularity in the hierarchy by definition. For example, a value of “canvas” for the base material of a manifestation is also a value for the material and physical characteristic of the same manifestation. This does not apply in the other direction, so a value is not necessarily valid for elements at a finer granularity.

The depth of the hierarchies, which is an indication of granularity, is not as great as the consolidated ISBD because the stipulations have been broadened to support the expanded focus from Manifestation in the consolidated ISBD to all of the LRM entities.

The broader semantic hierarchical structure additionally ensures interoperability of ISBDM metadata with the metadata element set of schemes with different structures. Semantic interoperability maintains data quality by mapping a target entity or element as a super-type of a source entity or element. This can always be done if the target metadata scheme includes a broad entity and element such as **LRM-R1 RES is associated with RES**. While this is essential for the completeness of a conceptual model that encourages entity and element hierarchies, it is not necessarily desirable in an implementation of the model. For example, RDA uses its own entity super-type, RDA Entity, to define the overall scope and boundary of RDA bibliographic metadata. Nonetheless, RDA accommodates metadata from sources beyond this boundary by providing a set of broad relationships from RDA entities to an unspecified external entity. For the time being, ISBDM supports only the unspecified entity approach with the element “has entity associated with manifestation”. This is a super-type of all other Manifestation relationship elements for related LRM entities.

### 2.3 ISBDM name space and kinds of value

The ISBDM element categories are defined by the values that can be recorded for the element, and how the values are processed for functionality in an information storage and retrieval application. For example, a manifestation statement element may be processed for uncontrolled keyword indexing only, while an attribute element may be processed for

keyword indexing in general, and for browsing terms or their translations from a controlled value vocabulary.

Table 1 gives the number of elements in each category for ISBDM at the end of Phase 1.

*Table 1. ISBDM number of elements in each category and their hierarchical structure*

Element category	Number of elements	Element hierarchies (Level 0)	Element sub-type levels					
			1	2	3	4	5	
Statements	8	1	7					
Notes	20	1	4	15				
Attributes	36	3	19	6	8			
Relationships	65	1	8	23	16	16	1	
<b>Total</b>	<b>129</b>	<b>6</b>	<b>38</b>	<b>44</b>	<b>24</b>	<b>16</b>	<b>1</b>	

These are minimum numbers. The number of relationships is likely to increase in the second phase of the project. For example, a relationship element from another entity to Manifestation may be developed in the context of the other entity. This will generate an inverse element from Manifestation to the other entity. ISBDM in the first phase has relationship elements to other entities only at the broadest level. For example, the relationship element “has person associated with manifestation” can be used to record the general type of person relationship, but also a person who is associated with an expression or work that is embodied in the manifestation. This relationship element has, however, two sub-type elements to enable recording a person who is a creator of the manifestation and who is a distributor, that is, to record a person's specific relationship to the manifestation.

The table excludes the name space for value vocabularies. Several of the ISBDM value vocabularies are open-ended and additional controlled terms are expected to be suggested by applications of ISBDM.

Each ISBDM element accommodates one or more kinds of metadata value. These value categories are distinguished by the source of the value and how the value is processed for use in an information retrieval system.

For example, the source of an uncontrolled value may be the manifestation itself or a cataloguing agency, and the value can only be indexed by uncontrolled keywords for high recall, low precision retrieval. On the other hand, the source of a controlled term, heading, access point, notation, identifier, or IRI is a value vocabulary or authority file that is maintained separately from the element, and the value can be indexed for controlled keyword searching, listed for browsing, or linking (ISBDM, [Metadata utility and processing](#)).

The ISBDM element categories are aligned with different sets of value categories, as follows. ISBDM gives the rationale and context for these alignments in the “Element value” sections of the general stipulations for each element category.

Attributes accommodate all four categories of value:

- Uncontrolled value
- Controlled term
- Notation for controlled term
- IRI for controlled term

Relationships accommodate three categories of value:

- Controlled heading (access point) for related entity
- Controlled identifier for related entity
- IRI for related entity

Statements and notes accommodate a single category of value, the uncontrolled value. Although the value may be controlled at a local level, for example a structured note, it is considered to be unstructured at the global level of the standard.

Note that the RDF (linked data) namespace for ISBDM represents elements as properties and can, at best, only distinguish a category of value as a literal or entity determined by a property range, as specified by RDF. The namespace is constructed according to current IFLA practice, which does not use this distinction. ISBDM considers this to be too restrictive for the bibliographic metadata that it accommodates, which requires the four categories of value. This may be alleviated by extending the namespace with Web Ontology Language (OWL) datatype and object properties, but the distinction between string categories, for example, controlled headings and identifiers for a related entity, can only be made using the RDA implementation of **LRM-R13 RES has appellation NOMEN**. For example, the ISBDM elements “has access point of manifestation” and “has identifier of manifestation” have the same domain Manifestation and both can have a value of an IRI or string that is the related Nomen or nomen string respectively. The distinction between access point and identifier is only made with distinct elements with appropriate labels and definitions.

Therefore, the encoding name space for instance values needs to include the distinction between datatype strings and object IRIs to be consistent with the potential extension to the ISBDM namespace. Furthermore, the encoding name space must be able to distinguish the “name/title”, “access point”, and “identifier” nomen strings, as appropriate, for datatype string values of a relationship element outside of the context of the appellation elements for the related entity. That is, the same instance of a related entity can be referenced by any of the specified categories of value.

### **3 Preliminary activity for ISBD phase 2**

As noted, the ISBD Review Group recommends adopting the single-entity cataloguing view for each of the other LRM entities. This allows the ISBDM templates for layout of guidance and stipulations, with associated boilerplate content, to be re-used in the second phase.

ISBDM is developed as an online product, so bringing together the single-entity ISBDs requires just the addition of a higher-level menu. This approach will allow entity-based ISBDs to be picked and mixed to better support local implementations and applications. This will be attractive to applications that do not need to use all of the LRM entities.

As a scoping study for the second phase, the ISBDM element set has been expanded to cover the other LRM entities by incorporating LRM attributes and relationships and inverses of the Manifestation relationship elements. This provides an indication of the minimum accommodation requirements for the UNIMARC encoding of ISBD for LRM.

Each “stand-alone” component of ISBD for LRM can be applied independently to attract a wider range of communities.

The second phase of the project will develop additional elements for finer granularity to accommodate the provisions of the current UNIMARC and to interoperate with RDA.

### **3.1 Expanded name space for ISBD/LRM**

The Permanent UNIMARC Committee (PUC) set up the ISBDM-UNIMARC Harmonization Working Group at its August meeting in 2023 with representatives of PUC and ISBDM Task Force as members. This was a result of the PUC’s tasks, ongoing discussion about the future development of UNIMARC formats that is part of the “Future of UNIMARC” project, and monitoring of the development of the ISBD for Manifestation.

The purpose of the Working Group was to:

- prepare a mapping table of the ISBD for Manifestation to UNIMARC
- check with the ISBD liaisons if there have been any updates since we received the last version (or if there might be further updates)
- highlight the elements that are not supported by UNIMARC
- present the results to the PUC

Based on the above, the following areas for discussion and research were identified:

1. mapping
2. vocabularies
3. future of UNIMARC
4. UNIMARC for LRM entities
5. encoding templates for UNIMARC LRM

As part of the scoping study for the second phase of the ISBD project and ongoing work within the ISBDM-UNIMARC Harmonization Working Group, an expanded name space of ISBD for LRM beyond Manifestation was designed (Table 2).

Table 2. Expanded name space for ISBD/LRM

Entity	Element categories				Total
	s	n	a	r	
Manifestation	8	20	36	65	<b>129</b>
Work		13	2	44	<b>59</b>
Expression		13	9	30	<b>52</b>
Item		13	2	29	<b>41</b>
Agent		13	4	31	<b>48</b>
Collective Agent		13	4	37	<b>54</b>
Person		13	5	30	<b>48</b>
Place		13	2	27	<b>42</b>
Time-span		13	1	30	<b>44</b>
Nomen		13	8	99	<b>120</b>

*Legend: s – statement elements; n – note elements; a – attribute elements; r – relationship elements*

Manifestation has the largest number of elements as a result of the granularity developed in the first phase of the project. Nomen has the largest number of elements beyond ISBDM because of inverses for appellations such as access point and identifier for each of the entities.

### 3.2 Further expansion

As previously noted, the name space numbers are minimums that will increase during the second phase of the project. These expanded element sets are based on ISBDM and LRM, and part of RDA. Additional elements will be determined during the second phase, and by matching to UNIMARC Bibliographic and Authorities formats.

The impact of interoperability with RDA will be explored more fully during the second phase. It is unlikely that every RDA element will have a corresponding ISBD for LRM element because ISBD will be more prescriptive than RDA and will not accommodate RDA elements based on the approach of the consolidated ISBD. For example, RDA accommodates both the new manifestation statement elements from LRM and the older ISBD structures of areas that mix annotations and “authority” values. The latter is not supported by ISBDM because the focus of the metadata has shifted radically from “Resource” to the WEMI entities and has expanded to include other related LRM entities.

#### 4 Impact on “new” UNIMARC/LRM

The UNIMARC encoding of ISBD for Manifestation and the other LRM entities must take into account two distinct requirements. The first one is to accommodate the distinct elements in the name spaces and the different **kinds of values** that can be recorded. The minimum number of distinct UNIMARC encodings required is calculated by multiplying the number of elements in each category by the number of kinds of values that can be recorded for each category:

1 annotation (statement/note) x 1 kind of value
1 attribute x 4 kinds of value
1 relationship x 3 kinds of value

A cataloguing agency may wish to record and encode more than one kind of value for a single ISBDM element, for example a controlled access point and an IRI for the same instance of a related entity, as the result of local policy or the merger of two ISBDM metadata description sets from different sources. This suggests that kinds of value are encoded within the encoding of the element; if the element is encoded as a UNIMARC field, the kinds of value should be encoded as indicators or subfields.

The second requirement concerns the hierarchical semantics of elements. UNIMARC must encode all of the elements in an ISBDM **element hierarchy** rather than the element with the finest granularity. ISBDM elements are structured from one to four sub-type levels of one or more top-level element super-types. Although the metadata for broader elements can be inferred and automatically generated in a UNIMARC application, there is other utility in encoding the broader elements. ISBDM does not prescribe the use of the element with the finest level of granularity because it may not be suitable for every ISBDM application. For example, a collection of paintings may be described by a cataloguing agency who decides that the element “has material” is sufficient for its users’ needs and the distinction between the base and applied materials is not required. The mandatory use of “has base material” and “has applied material” would increase data entry and display costs and discourage the use of ISBDM itself.

Another cataloguing agency may have different requirements, or the same agency may have a different policy for other kinds of Manifestation. If ISBDM metadata encoded in UNIMARC is to be exchanged and merged between agencies and collections, UNIMARC must provide the encoding to do so.

In addition, UNIMARC must also encode the terms, notations, and IRIs in each of the ISBD for LRM value vocabularies. ISBDM currently has 12 controlled vocabularies.

A similar calculation can be made for the UNIMARC encoding of RDA. Each element in RDA is assigned one or more of four recording methods (unstructured description, structured description, identifier, and IRI). The calculation can be based on currently available data from the RDA Registry:

Name space x Value space for each element

There are approximately 45 controlled vocabularies in RDA. There will be some overlap between ISBD for LRM, UNIMARC and RDA value vocabularies. It is a moot point if these should be cloned for each standard, or shared between the standards.

#### 4.1 Single-entity UNIMARCs

Following the ISBD Review Group's recommendation that each ISBD for LRM is developed as a standalone, single-entity cataloguing standard there are advantages for this approach to be adopted for the future development of UNIMARC.

If a UNIMARC is intended to accommodate more than one LRM entity, it will be necessary to indicate to which entity an encoding refers, either by using distinct encodings for each entity or by a broad indicator of which entity is being encoded. This will have an impact on publishing UNIMARC namespaces.

Using distinct encodings for each entity within a single (multiple-entity) UNIMARC will lose the advantage of mnemonic encoding of the same field or subfield encodings being used for elements that have similarities between the entities. This may be alleviated by using the indicators for each field with fixed values for each entity, but this will require additional processing to extract the metadata in local applications. For example, an application that uses Manifestation data that is encoded in a specific (single-entity) UNIMARC for Manifestation only has to identify the entity and select the appropriate UNIMARC. Otherwise, the application must process the multiple-entity UNIMARC to identify the Manifestation elements before processing them.

As noted, a single-entity UNIMARC gains the advantages of encoding mnemonics. For example, the "has category" elements for each LRM entity (such as "has category of manifestation") can be encoded with the same field and subfield codes across each single-entity UNIMARC. Also, it gains the functionality of hierarchically structured data for a cataloguing agency or agencies with different requirements for recording and processing data.

Still another consideration in deciding between multiple-entity UNIMARC or single-entity UNIMARCs should take into account the mapping between UNIMARC and ISBD/LRMs and RDA. Following the RDF standard, the two latter standards are semantically consistent in defining domains and ranges for their properties (elements) using the LRM entities, while multiple-entity UNIMARC defines entity Resource as a domain for all its properties with no range. The issue here is the same as for the mapping of the ISBD consolidated and the LRM WEMI entities. To have a correct mapping that is an expression in RDF of a single alignment between two elements, the matched properties must have the **same** domain and range.

The approach of a single-entity UNIMARC would be consistent with the ISBD Review Group's recommendation for single-entity ISBDs and the advantages it brings. In particular, communities and applications that do not require the use of every LRM entity will be able to pick and mix the IFLA content and encoding standards for the entities they choose.

## 5 Conclusion

UNIMARC Bibliographic format was originally designed as an encoding standard for bibliographic data primarily defined by the ISBD standard, which elements are implemented in data fields of functional blocks from 0- to 4-. As such it focused on a publication/item, later

renamed the resource, to be described at the finest level of granularity following a defined linear order of interdependent data elements. This basic function of the format was expanded by encoding of “entities” needed to record name (blocks 5– and 7–) and subject (block 6–) authorities, coding information (block 1–) and international use (block 8–). As such, UNIMARC Bibliographic format met the requirement of a full bibliographic description of a resource (description and access points) from the aspect of the entities that were recognized later by FR/LRM models. It also implemented the mechanism to link authority data to specific, later developed complementary authorities formats enabling their implementation in entity-relational database applications.

The UNIMARC Bibliographic with its complementary UNIMARC Authorities formats (name and classification) and Holdings Format have to look into their history – what factors influenced their configuration, to competently answer the question of their future development and function within the ecosystem of IFLA bibliographic standards.

Table 3 summarizes analyzed functionalities of the ISBD and UNIMARC standards development within the IFLA bibliographic ecosystem.

*Table 3. Functional analysis of the ISBD and UNIMARC standards development*

<b>Functionality</b>	<b>ISBD/LRM Single-entity ISBDs</b>	<b>Multiple-entity UNIMARC formats</b>	<b>UNIMARC/LRM Single-entity UNIMARCs</b>
<b>IFLA standards ecosystem</b>	LRM metadata content standard	ISBD/GARR/ GSARE encoding format	LRM encoding format
<b>Development requirements</b>	ISBD phase 2	updating existing formats	new formats
<b>Entity described</b>	10 LRM entities	B: Resource A: 13 entities C1: 1+ entities (Nomen) H: Item	10 LRM entities
<b>Hierarchical structure</b>	super-type + 1–5 levels / sub-types	1 level: lowest level of granularity	super-type + 1–5 levels / sub-types
<b>Granularity</b>	low granularity: statement high granularity: notes, attributes, relationships	high granularity: subfield data elements	low granularity: statement high granularity: notes, attributes, relationships
<b>Encoding elements</b>	distinct elements in distinct entity's name spaces	UNI/traditional: 1 name space UNI/E-R: indicate to which entity an element's encoding refers	distinct elements in distinct entity's name spaces
<b>Kinds of element value</b>	1–4: statement/notes: 1 (literal string)	UNI/B & A 3: data subfield (literal string)	1–4: statement/notes: 1 (literal string)

<b>Functionality</b>	<b>ISBD/LRM Single-entity ISBDs</b>	<b>Multiple-entity UNIMARC formats</b>	<b>UNIMARC/LRM Single-entity UNIMARCs</b>
	attributes: 4 relationships: 3	4-, 5-, 6-: \$3 Authority /Classification Record Identifier 0-, 2-, 3-, 4-, 856: \$u URI (URL/URN)	attributes: 4 relationships: 3
<b>Mapping</b>	mapping at entity level: RDF semantic consistent	mapping to LRM entities not RDF semantically consistent	mapping at entity level: RDF semantic consistent
<b>Number of standards</b>	8 (Agent, Collective agent and Person to collapse into one)	1 bibliographic 1 name authorities 1 classification 1 holdings	8 (Agent, Collective agent and Person to collapse into one)
<b>Harmonization feasibility of ISBD/LRM &amp; UNIMARC</b>	feasible	different concept and semantic consistency require major structural changes	feasible
<b>Application</b>	single-entity cataloguing; pick and mix standards	UNIMARC/B&A vs. UNIMARC-ER	single-entity cataloguing; pick and mix standards

ISBDM accommodates the Semantic Web's Open World Assumption and Anyone can say Anything about Any thing principle, with special emphasis on "any Agent can say Anything about Any thing". At the same time, prescription is retained in the focus of stipulations on single entity metadata implementations based on relational database and linked data technologies, a set of defined structures for combining WEMI entities that describe a single instance of a bibliographic resource (supported by the mandatory status of a few key elements), and the values of specific attribute elements.

Normalized relational and linked metadata structures are isomorphic and can be used as a bridge between the closed and open metadata paradigms. ISBDM attempts to balance this bridge by prescribing structural integrity but allowing flexibility in the granularity and breadth of description. The impact of ISBDM on UNIMARC is dependent on how UNIMARC responds to this shift in the environment of the IFLA bibliographic standards ecosystem.

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