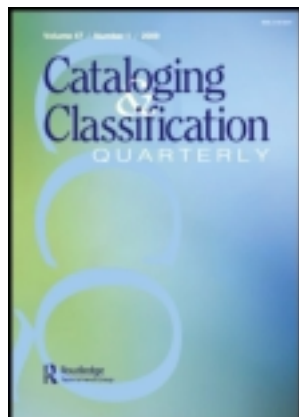


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FRBR—The MAB2 Perspective

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FRBRizing legacy data has been a subject to research since the Functional Requirements for Bibliographic Records (FRBR) model was published in 1998. Studies were mainly conducted for MARC 21, but in Austria, Maschinelles Austauschformat für Bibliotheken (MAB2), a data format based on the rules for descriptive cataloging in academic libraries, mainly in Germany and Austria, is still in use. The implementation of Primo, an Ex Libris software, made research in FRBRizing MAB2 records necessary as Primo offers the possibility of building FRBR-groups by clustering different manifestations of a work. The first steps of FRBRizing bibliographic records in MAB2 at the Vienna University Library and the challenges in this context are highlighted in this article.

KEYWORDS FRBR, FRBRization, MAB2, Primo (Ex Libris), Austria

INTRODUCTION

The Functional Requirements for Bibliographic Records (FRBR) are not substantially new anymore; they were originally published in 1998.¹ Since then a lot of research has been undertaken in the sense of FRBRization in order to find out how to apply FRBR to existing catalogs. These studies were mostly conducted for MARC 21, an internationally renowned and widespread data format for bibliographic records. Although there are some disillusioning lessons to be learned, for example, that bibliographic records contain incorrect and inconsistent data, which are not reliable enough to build FRBR-trees and that existing MARC 21 records are based on current cataloging rules and traditions and were not cataloged according to an Entity Relationship (ER)-model like FRBR, which means the information needed to present data in terms of FRBR is sometimes missing or lacking consistency to be

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extracted automatically,² the implementation of FRBR nevertheless was subject to research with some interesting results. Three categories can be built upon these implementation endeavors: full-scale systems, prototypes, and software/algorithms.³

One example of trying to FRBRize bibliographic records using algorithms is Primo, an Ex Libris software, which offers the possibility of building FRBR keys so as to group different manifestations of a work into a FRBR-group. It raised the hopes of improving current online public access catalog (OPAC) displays, which are nothing more than a long alphabetical list of records and of presenting bibliographic records in reasonable clusters. This article mainly focuses on the special situation in Austria concerning data format and FRBRization possibilities in Primo respectively its application at the Vienna University Library.

CURRENT SITUATION IN AUSTRIA

In Austria more than 80 academic and administrative libraries take part in the Austrian Library Network (ALN),⁴ which is characterized by co-operative cataloging. The Austrian Cooperative Catalogue (ACC) is a union catalog composed of 8 million bibliographic records. The data format used for cataloging and exchanging data is still MAB2 (Maschinelles Austauschformat für Bibliotheken; machine readable library exchange format), in combination with RAK-WB (Regeln für die alphabetische Katalogisierung in wissenschaftlichen Bibliotheken; rules for descriptive cataloging in academic libraries).

MAB was developed in 1973⁵ and revised in 1995. The Austrian libraries started online cataloging not prior to 1988, which is also the year RAK-WB was implemented as the mandatory set of rules for descriptive cataloging, whereas they were initially designed for card catalogs. MAB2 for bibliographic data (MAB-TITEL) uses a three-digit numeric code in order to identify each field in the record, comparable to MARC 21. The first digit indicates the segment:

- 0xx Section control fields, general encoded information, volume description
- 1xx Section personal names
- 2xx Section corporate names
- 3xx Section title
- 4xx Section publication note, extent, accompanying material, series statements
- 5xx Section Notes, standard numbers and source of works not separately published
- 6xx Section blanket references and see also references, edition statement for secondary form, computer files, edition statement literary remains and autographs, additional search criteria

- 7xx Section subject indexing
- 8xx Section non-standardized added entry
- 9xx Section RSWK-subject heading chains⁶

MAB2 is not up to date anymore: In 2004 the Committee for Library Standards decided to move to the common data exchange format MARC 21 in order to improve international record sharing between libraries.⁷ MAB2 is therefore not enhanced anymore, but nevertheless in use in Austria for exchanging data and cataloging in the Austrian Library Network. As Primo was implemented in Austria and offered a FRBR section, it was indispensable to undertake research concerning MAB2 and FRBR. First steps to implement FRBR in Primo on the basis of MAB2 records were taken in Austria.

MAB2 and RAK-WB versus MARC 21 and AACR2

Although MAB2 does not seem to be too different from MARC 21, there are nevertheless some peculiarities of the German data format that make research findings referring to bibliographic records in MARC 21 only partially applicable: In general, bibliographic data is created according to a set of cataloging rules and is made machine-readable through data formats. Cataloging rules are usually written regardless of data format, whereas the formats have to use terms and concepts aligned with the rules. As a consequence, formats are not really independent and the rules have to be considered. MARC 21 is basically rule-independent; *Anglo-American Cataloguing Rules*, Second Edition (AACR2) is the de facto standard whereas MAB2 is the format explicitly used in combination with the German rules RAK-WB.⁸ Both AACR2 and RAK-WB are based on the same premises, namely International Standard for Bibliographic Description (ISBD) and the Paris Principles, but differ in crucial points. AACR2 is applicable to all resources a library deals with, while there are special rules for non-book materials and musical scores in Germany and Austria. On top of that, an analysis of both rules illustrated that in AACR2 the aspiration of bringing together works is much more considered than in RAK-WB.⁹ Thus, the differences in rules have an impact on the data formats. While both formats are characterized by segments and sections, the arrangement of the fields in the records depends on different aspects: in MAB2 they are ordered semantically, in MARC 21 according to the bibliographic structure. The fields and their designations, the application of indicators and the repeatability of particular fields are distinct.¹⁰

The most significant difference is obvious in terms of cataloging multipart items. According to Croissant, AACR2 defines five possibilities of cataloging this special kind of resource: analytical added entries, analysis of monographic series and multipart monographs (the so-called full analysis), note area, “in” analytics, and multilevel description, whereas the Library of

Congress mainly practices the first three.¹¹ In MAB2 and RAK-WB multipart items are treated uniformly. The standard procedure corresponds to the full analysis in AACR2. Hierarchical structures are built in order to describe multipart items: a record for the collective title (main record), and a record for each volume (subordinate records). The latter is linked to the collective title by identifier (the Austrian Cooperative Catalogue identifier of the main record is recorded into a designated field in the subordinate record). Attributes relevant for all volumes are recorded in the main record (e.g., publication notes, author, collective title, language), while characteristics of the single volumes are recorded in their subordinate records (pagination, year of publication, etc.). Different types of multipart items have to be distinguished: There are multipart monographs that consist of multiple volumes because of physical reasons—too many pages for just one volume. These cases are characterized by having a main title for all volumes, while all of the volumes are continuously numbered (volume 1, volume 2, etc.). In MAB2 a main record is created, as well as a subordinate record for each volume. Another type we have to deal with in descriptive cataloging are multipart items that are additionally part of a serial—they can have different numberings: one for the multipart item as well as one for the serial (volume 1 of a multipart monograph is likewise volume 13 of a serial). Every volume gets its own subordinate record containing both numberings, and is linked to the main record of the multipart item and to the main record of the serial; linking works with the help of ACC-identifiers. All in all at least three records will have to be created to describe the resource at hand, if it is simultaneously part of a multipart item and of a serial. There are also multipart items consisting of volumes which carry their own titles. It is the same procedure in descriptive cataloging as in the aforementioned cases: a main record for the collective title and a subordinate record for every volume whereas they all contain their own titles in the title field 331. If multipart items additionally show sections within them, it will get substantially difficult in terms of bibliographic description: When MAB2 was implemented the catalogers were enabled to create a record for each section, which was linked between the main and the subordinate record. This procedure was abandoned, but as we still want to depict sections in our descriptions, we use the field 089, which is normally used for recording volume numberings only. All information concerning the section has to be squeezed in, in a more or less structured way.

MAB2 and FRBR

In 2004 the German National Library conducted research concerning MAB2 and FRBR. They compiled a FRBR-MAB2 Mapping in 2004¹² to analyze the data format regarding FRBR attributes and pointed out that most attributes are recorded in MAB2, but often they cannot be differentiated clearly;

unambiguous assignments are not possible.¹³ As the Vienna University Library implemented Primo and wanted to make use of its FRBRization possibilities, it was necessary to carry on research. As the analysis of bibliographic records describing “The Expedition of Humphry Clinker,” that was conducted by OCLC¹⁴ gave insight into the availability of FRBR attributes in MARC 21 records, a similar study was carried out to highlight FRBR in MAB2.¹⁵ ACC-records describing Franz Kafka’s “The trial” provided the basis for analyzing current cataloging practice with regard to data display based on FRBR in Primo. “The trial” was chosen for the following reasons: It is a rather popular belletristic work written by Franz Kafka and has been published in innumerable editions and translations. Nearly every library in Austria holds one or more copies. Furthermore, a lot of different realizations and embodiments are available: monographs, multipart monographs, audio books, eBooks, and so on. Moreover, it is a work of midlevel complexity—comparable to “The Expedition of Humphry Clinker.”

Considering the research results of OCLC with special regard to the work-set algorithm developed by Hickey et al.,¹⁶ an author-title-key for grouping MAB2 records, which are mainly manifestation records including attributes of other FRBR entities, into work sets seemed to be reasonable and one of the best options to display current bibliographic data in terms of FRBR (possible configurations in Primo). For individual works an algorithm consisting of author and title seemed to hold a lot of promise, but some aspects related to MAB2 and RAK-WB pose significant problems: In MAB2 the author is recorded in field 100_; the main title in field 331. If the resource to be cataloged is a translated edition, the uniform title will be entered into field 304. In the case of individual works, according to RAK-WB the uniform title will be recorded if it is mentioned in the bibliographic item to be cataloged or if it can be identified without much effort. Depending on how the publishers indicated the original title, if they indicated it, it will be registered as the uniform title in field 304, or will not be recorded at all. As the example “The trial” has shown, publishers vary the original title as the work has been published originally in German as “Der Prozess” or as “Der Process”—this is reflected in bibliographic records; an aggravating circumstance when it comes to work-set algorithms.

As already mentioned, non-book materials have their own cataloging rules (Regeln für die alphabetische Katalogisierung von Nichtbuchmaterialien—RAK-NBM; rules for descriptive cataloging of non-book material). These are of course based on the rules for printed resources, but they define different main and added entries: Audiobooks or CD-ROMs are recorded as title works. The work has to be entered under the title proper. So there is no field 100_ containing the author in records describing non-book materials—again an aggravation in terms of FRBRization issues as records without an author field do not have the chance to join the print resources in a work-set.

Generally, a prerequisite of functioning FRBRization is that data has been cataloged consistently and without errors. This applies notably to the problem of content versus carrier where it is necessary for information concerning content and carrier to be cataloged exactly, or better yet, coded for automatic extraction. Since most coded fields were not relevant for OPAC display, there was not such great importance attached on cataloging these fields (e.g., in the Austrian Library Network there is an agreement on cataloging of so-called “inhouse-digitizations,” that only one record for print and electronic version of a title will be cataloged and coded). Due to the fact that the data format MAB2 is connected to the cataloging rule set RAK-WB, which was developed for describing card catalogs, there is a totally different view on the bibliographic universe compared to the ER-model with its entities and relations; as O'Neill puts it: “The ‘FRBRization’ challenge is to find an algorithm that is effective with less than perfect data.”¹⁷

PRIMO IN AUSTRIA

Primo in the Austrian Library Network and u:search at Vienna University Library

In 2009, the Austrian Library Network decided to acquire Primo from Ex Libris, and as part of the consortia, Vienna University Library was one of the first libraries in Austria to implement it.¹⁸ Primo follows the principles of “next generation library catalogs,” which means searching in a search engine index rather than real-time searching in a database (i.e., in the OPAC). Search results can be interpreted easier because of the use of icons for media types, and filtered using facets like subject, author, creation date, and so on. Data to be searched in Primo has to be exported from the source system (e.g., the library system) and harvested into Primo. During this process, a normalization template is used to map source fields (e.g., MAB- or MARC-fields) to PNX-fields in Primo. PNX (Primo Normalized XML) is the data format in Primo, it consists of 12 sections dealing with display, searching, linking, delivery, sorting, ranking, and so on, of data. One of the sections is called FRBR-section, here so-called FRBR-keys are configured that determine to which FRBR-group the record will belong. After importing data into Primo, records can be enriched with abstracts, tables of contents, cover images, and so on. The last two steps in bringing data into Primo are deduplication, where identical records from different sources are merged, and FRBRization, where different versions of works are clustered. All records with similar FRBR-keys are hidden in the results list behind one “preferred” record, and the user has to click on the link “View X editions” to get a list of all editions available (Figure 1).



FIGURE 1 Display of FRBR Group in Primo Results List (color figure available online).

How Does Normalization Work?

A rule in the normalization template consists of three parts: input, conditions, and output. First, the source (MAB-field, MARC-field, etc.) is defined and from that data is taken. Then, conditions are defined which the contents of the defined source field must meet (this is optional). Lastly, the content of the PNX-field to be created can be adjusted (take only parts of the content, perform transformations like upper/lowercase, use mapping tables for formatting of data, etc.)

In Figure 2, MAB-field 050 (type of record) is taken as source field. If there is the value “g” at the eighth position and if there also exists MAB-field 051 (type of publication) in the record, the constant “ebook” should be filled into the PNX-field “display/type.” This leads to the display of the ebook-icon in the brief results view for this title (Figure 3).

How Does FRBR Work in Primo?

The FRBR-section in the PNX-record contains keys, which are created from fields in the source record. There are three different key types available: author part and title part (which are joined together, using all possible

FIGURE 2 Normalization Rule (color figure available online).

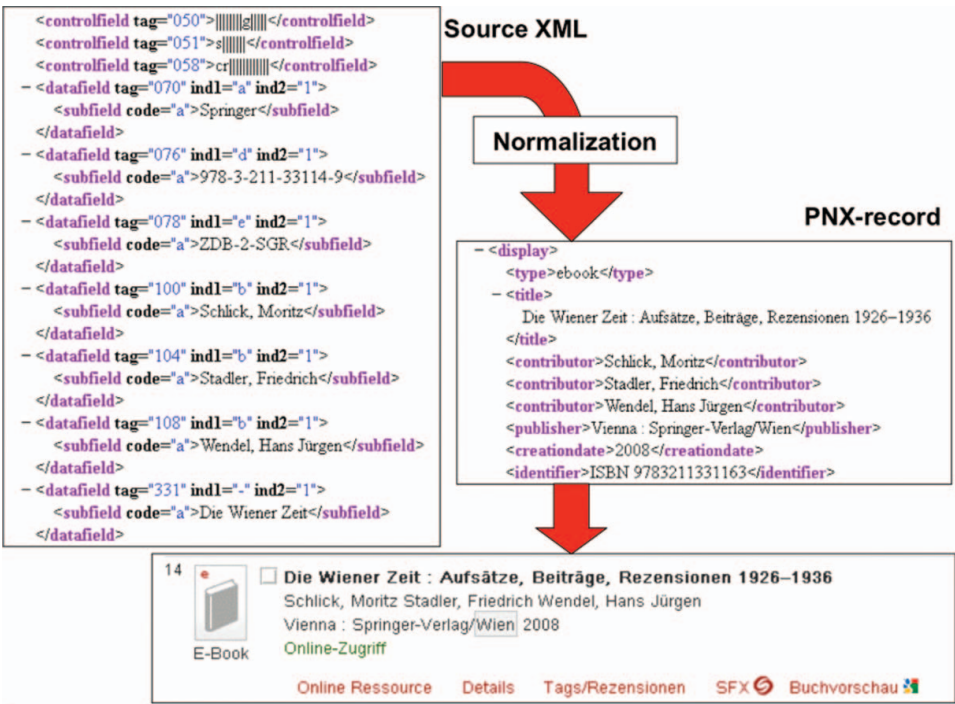


FIGURE 3 From Source XML to Display on the Frontend (color figure available online).

combinations) and title only. In the normalization phase of the harvesting process, the keys are generated, after some transformations like removing non-filing characters, deleting brackets, commas, and so on. In the FRBRization phase, the keys are compared to records existing in the Primo database and if a record has the same key as another record already in Primo, it is added to this FRBR-group. FRBR in Primo means that various manifestation-level records are grouped together under a preferred record, which is treated like it was a work-level record. But this work-level record is not the same as it is meant in the FRBR model, it is just one of the manifestation-level records. This can confuse users, for example, when the electronic version of a title is shown as preferred record and multiple print editions are hidden behind—or when an older version is shown as preferred record. Ideally there would be a (configurable) metadata-record, which is shown in the result list, and only when the user clicks on the “View X editions”-link, he/she would get a list with all editions.

In Primo, a record can only belong to one FRBR-group, which means that when creating the normalization rules for the FRBR-section, the library has to decide, if all editions of a work are put together into one FRBR-group (print and electronic versions, versions in different languages, etc.) or if there should be more FRBR-groups (e.g., different groups for print and multimedia versions). The libraries implementing Primo in the Austrian Library Network decided to configure facets for resource types and publication types, which can be used to navigate through different editions within a FRBR-group. This can be helpful, if expressions and manifestations of a work are mixed into a single FRBR-group. Obviously, Primo tries to represent the expression level via facets (language, resource type).

FRBR-Rules of the Vienna University Library (VUL)

Key 1 (k1)—author: MAB-field 100_ author OR MAB-field 540 ISBN OR MAB-field 100b first contributor

For key 1 (k1), the main author is taken in most cases. If there is no MAB-field 100_, the first sections of the International Standard Book Number (ISBN) are taken. The FRBR-rule looks like this: Drop prefix (978-); if ISBN-13; then take all digits up to the next hyphen, which represent the group identifier (language sharing country group); then take all digits up to the next hyphen, which represent the publisher code. The author key for a title with the ISBN 3-7065-4050-9 would look like this: <k1>\$\$Kuwiuwiwi37065\$\$\$AA</k1> (the prefix “uwiuwiwi” is necessary in our consortial Primo installation so that only titles belonging to our institution are FRBRized). By default, title works would be FRBRized in Primo using title-only keys. Because there are many works that have the same title but do not share anything in terms of

their content, that is, they do not embody an expression of the same work, we wanted to find a way to build author keys for title works. We did this, because there are many textbooks available in our library, which are often published in many new editions over the years. These textbooks often do not have an author, but editors, who can change—so we decided to use the ISBN instead of author/editor names. Our idea was that a publisher will not publish many books with exactly the same title, but by different editors/contributors. FRBRizing these editions is a benefit for our users, because they do not have to browse through long result lists any longer. Now we can at least group titles issued by the same publisher. This also works well for travel guides, but we have already stumbled over some titles that are FRBRized, although they do not belong together. So we will evaluate the use of ISBN for FRBRization eventually in the future. If there is no ISBN, then the contributors listed in MAB-field 100b are used.

Key 3 (k3)—title: MAB-field 304 uniform title OR MAB-field 331 main title

The main source for key 3 (k3) is the uniform title in MAB-field 304, which guarantees that translations are taken into account for the FRBR-group. If there is no MAB-field 304, then the main title in MAB-field 331 is used. Via normalization rules, non-sorting characters and language codes in brackets after the uniform title are dropped, otherwise the keys would not match (e.g., “«The» process of education <dt.>” is transformed to “process of education”).

Examples

In what follows there are some examples to illustrate FRBRization according to the FRBR keys, which were developed at the Vienna University Library: What works well and what does not? Clustering variations of single works of personal authorship is rather successful in Primo (e.g., “Dynasties of the world : a chronological and genealogical handbook” by John E. Morby).

As seen in Figure 4, the keys for the FRBR section have the same content; that is why they match and make up a FRBR-group at the frontend of Primo (see Figure 1). K1 consists in cases of personal authorship of the author (in MAB2 recorded in the field 100_). According to our priority of bringing together as many manifestations of a work as possible in one FRBR-group, not only new (print and electronic) editions but also translations should be included. Therefore, the VUL also decided to include uniform titles in its FRBR rules. If the field 304 (uniform title) exists in a bibliographic record, its content will be filled into k3. If there is no 304, the content of field 331 (main title) will be utilized.

Random samples show that there are rather good FRBRization results regarding works that have few editions (if the data is recorded correctly), but

Title:	Dynastien der Welt : ein chronologisches und genealogisches Handbuch
Uniform title:	Dynasties of the world <dt.>
Author:	Morby, John E.
Publisher:	Zürich [u.a.] : Artemis & Winkler
Creation Date:	1991
Format:	367 S.
Identifier:	ISBN 3-7608-1065-9
Description:	Literaturangaben
Language:	German

Title:	Dynastie świata : przewodnik chronologiczny i genealogiczny
Uniform title:	Dynasties of the world <poln.>
Author:	Morby, John E.
Edition:	Wyd. 2
Publisher:	Kraków : Wydawn. Znak
Creation Date:	1998
Format:	428 S.
Identifier:	ISBN 83-7006-781-6
Description:	Literaturangaben
Language:	Polish

FIGURE 4 Identical FRBR Keys (color figure available online).

that there are severe problems when it comes to complex and large works. The conclusion of O'Neill has to be confirmed for records in MAB2: "The irony is that the FRBR model provides minimal benefits to the small works that can be reliably FRBRized, but fails on the large and complex works where it is most needed."¹⁹ As mentioned earlier, one example for problems with the automatic generation of FRBR-groups in Primo is Franz Kafka's "Der Process" ("The trial"): Bibliographic records describing this novel contain different titles. Depending on the editors the titles for manifestations of this work were either spelled "Der Process" or "Der Prozess." So there is no chance of grouping all manifestations into a single FRBR-group, although it is just one single letter that is different. Two FRBR-groups are formed (Figure 5).

Furthermore, multipart items are cataloged differently in MAB2/RAK-WB and AACR2/MARC 21. In MAB2, there is always a main record in connection with subordinate records. Various types of multipart items were identified, for example, cases in which volumes have a main title and additionally a different one for each volume. An example for this case is "A history of Greek philosophy" by William Guthrie.

As can be seen in Figure 6, every volume has its own title in MAB-field 331 in the respective subordinate record, so Primo is able to build FRBR keys: The author is extracted from the main record for k1, the title from the subordinate record for k3. This type of multipart item achieves good results

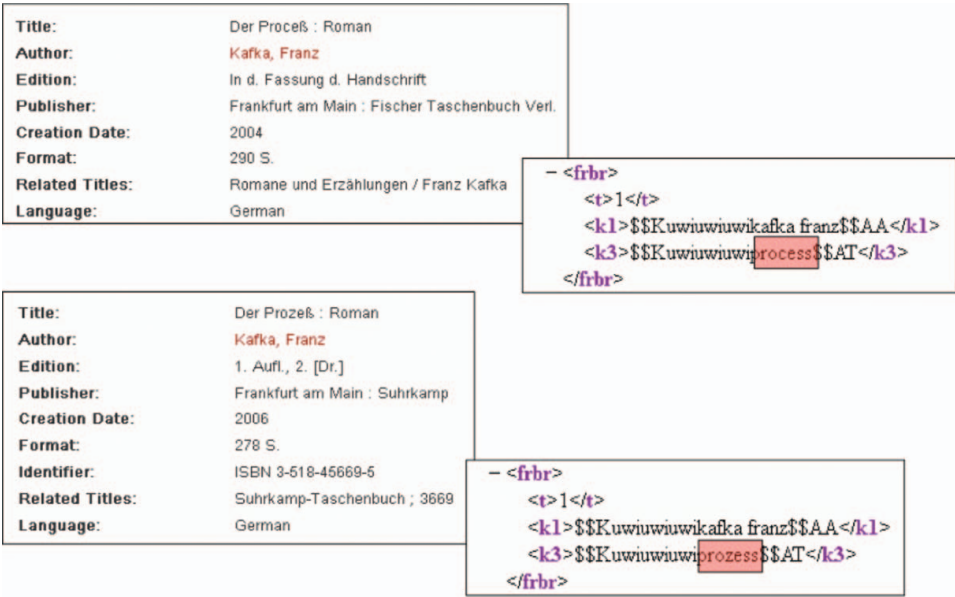


FIGURE 5 Different FRBR Keys for Identical Titles but Spelled Differently (color figure available online).

in forming FRBR-groups. Unfortunately, this doesnot apply to multipart items which consist of volumes only containing volume numbering, without any further title: One example is “The social and economic history of the Hellenistic world” by Michael Ivanovitch Rostovtzeff. The volumes do not

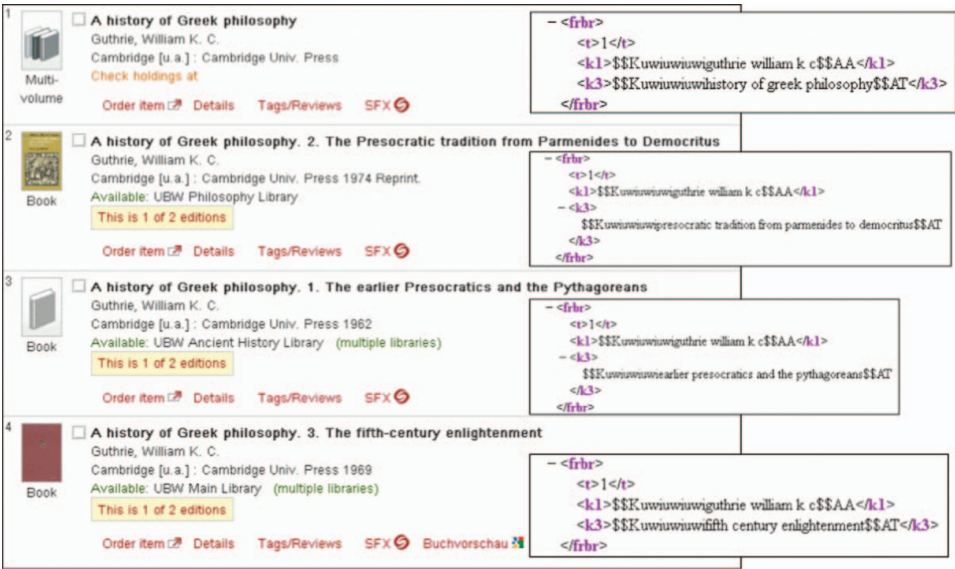


FIGURE 6 Different FRBR Keys for Multipart Items (color figure available online).

Title:	The social and economic history of the Hellenistic world. 1 (1941)
Author:	Rostovtzeff, Michael Ivanovitch
Publisher:	Oxford : Clarendon Press
Creation Date:	1941
Format:	XXIV, 602 S. : Ill.
Language:	English

- <frbr> <t>1</t> <kl>\$\$\$Kuwjuwuiwirostovtzeff michael ivanovitch\$\$\$AA</kl> </frbr>
--

Title:	The social and economic history of the Hellenistic world. 1 (1951)
Author:	Rostovtzeff, Michael Ivanovitch
Publisher:	Oxford : Clarendon Press
Creation Date:	1951
Format:	[getr. Zählung]
Language:	English

- <frbr> <t>1</t> <kl>\$\$\$Kuwjuwuiwirostovtzeff michael ivanovitch\$\$\$AA</kl> </frbr>
--

FIGURE 7 No Title Key for Subordinate Records (color figure available online).

bear their own titles additionally to the main title, so the subordinate records do not include the MAB-field 331.K3 cannot be built for the subordinate records—they all will not be grouped into a work set and are listed similar to traditional OPAC-displays (Figure 7).

All in all it has to be said that especially multipart items pose significant problems when applying FRBR to bibliographic records in MAB2, as the model itself is quite ambiguous in terms of the so-called aggregates: “(a) collections, selections, anthologies . . . (b) augmentations, (c) series, (d) journals, (e) integrating resources, (f) multipart monographs, all of which are gathered under the generic term ‘aggregates.’”²⁰ For a rather long time we did not know how to express aggregates in an ideal FRBR tree—there were concurrent proposals for sorting this problem out: Are aggregates new works, consisting of other works, or can works just be combined in a manifestation? Are the single volumes of a multipart monograph so called manifestation components? To clarify these issues, a Working Group on Aggregates²¹ was established in 2005. This group presented its final report²² in 2011, which clearly states that “it can be assumed that works and expression are unchanged when they are embodied in a manifestation.”²³ Three distinct types of aggregates are discussed in the final report: aggregate collections of expressions, aggregates resulting from augmentation and aggregates of parallel expressions.²⁴ Multipart monographs are not explicitly covered and so they remain a confusing component of the bibliographic universe, especially for the German cataloging tradition, as we have to create a record for each physical item, no matter if it embodies an expression of a work or if it simply is

divided in more than one volume because of physical reasons. Subsequently, it is difficult to decide where the entity work is hidden in these cases, not to mention the difficulties in automatic extraction. And so there are rather serious difficulties in clustering manifestations, which are part of a multipart item in Primo. Further research is definitely needed to see if there are ways to deal with this kind of resource in Primo and its current methods of building FRBR keys.

SUMMARY

In this article we have shown our first attempts to implement the presentation of data coming from our Integrated Library System (ILS) in Primo, following basic FRBR-rules. The data format, which is used in our ILS, is MAB2. There are some basic differences between MARC 21 and MAB2. The foundations of the data representation in MAB2 are the cataloging rules, outlined in RAK-WB. Our cataloging rules and the data format used are closely related to each other, the data format is not rule-independent. This means that FRBRizing datasets from the ILS has to consider the rules they are based on. Significant differences between the two worlds of cataloging (MARC 21 and MAB2) can be found in how they deal with multipart items. In MAB2 hierarchical structures are used to describe these items. Following these rules and the underlying data format, a different perspective has to be taken when it comes to FRBR.

Still, it was tempting to use the possibilities of Primo and its FRBR-section in the PNX records for clustering—either in grouping works or clustering. Referring to OCLC's work-set algorithm we tried to use the two possible FRBR keys in Primo for work clustering. We could show that combinations of author and title (main and/or uniform) work well, if the underlying dataset is small. In case of larger datasets, it fails. One of the reasons is that different spelling of titles cannot be normalized and results in different FRBR keys in the PNX record. Unfortunately, this means that it fails, where it would be most useful.

Problems occur with the FRBRization of multipart items—as could be expected after explaining how they are handled in MAB2. Clustering works, if a volume has its own title (331), is no problem for automatic extraction. If this is not the case (volumes only have numbering), no title key will be built in the FRBR section of Primo. As a result no clustering is achieved at all. Furthermore, in Primo there is no way of handling expressions. Instead, facets are used to compensate, which can be rather successful (e.g., language, publication type). Further research has to be undertaken: An analysis of multipart items and their hierarchical data structure is urgently required. Moreover, Primo does not provide enough facilities to really FRBRize MAB2

records, it is rather a kind of clustering or work-set building. So the future of MAB2, FRBR, and Primo remains exciting.

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