Mapping MARC 21 Linking Entry Fields to FRBR and Tillett's Taxonomy of Bibliographic Relationships

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Bibliographic relationships have taken on even greater importance in the context of ongoing efforts to integrate concepts from the Functional Requirements for Bibliographic Records (FRBR) into cataloging codes and database structures. In MARC 21, the linking entry fields are a major mechanism for expressing relationships between bibliographic records. Taxonomies of bibliographic relationships have been proposed by Tillett, with an extension by Smiraglia, and in FRBR itself. The present exercise is to provide a detailed bidirectional mapping of the MARC 21 linking fields to these two schemes. The correspondence of the Tillett taxonomic divisions to the MARC categorization of the linking fields as chronological, horizontal, or vertical is examined as well. Application of the findings to MARC format development and system functionality is discussed.

The investigation of bibliographic relationships, how they can be categorized, and how they are encoded in the MARC bibliographic record has taken on even greater importance in the context of ongoing efforts to integrate concepts from the *Functional Requirements for Bibliographic Records* (FRBR) into our cataloging codes and database structures. Precise coding of data elements is needed for precision in machine manipulation of records. Efforts to reparse existing MARC data for either storage or display depend on an understanding of current and previous coding standards. The MARC data mining study by Hegna and Murtomaa investigated the extent to which FRBR entities and relationships can be drawn out of bibliographic records found in the Finnish and Norwegian national bibliographies and presented potential user displays for an author's works and their expressions and manifestations.[1] The Network Development and MARC Standards Office of the Library of Congress prepared examples to illustrate possible hierarchical displays in which manifestations of a work and of related works are grouped using expression-level "guide cards," which could be generated from existing MARC 21 coding.[2] The VIRTUA system from VTLS is an FRBR-aware library management system implementation with a tree-style display. OCLC is developing algorithms for analyzing WorldCat records according to FRBR, particularly for identifying records for manifestations of the same work.[3] Carlyle and Summerlin have investigated data elements that could be used to cre-

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The author thanks Jennifer Bowen and Christine Oliver for their encouragement and comments on earlier versions of this paper.

ate relationship-based clusters of the records associated with large fiction works.[4] These projects use data found in existing MARC 21 records.

In MARC 21, bibliographic fields 760–787, referred to as the linking entry fields, are intended to draw out relationships between different bibliographic records. (For a list of the linking entry fields with their respective scope statements, see appendix A.) Links are usually made reciprocally on each record involved in the relationship by means of complementary pairs of fields (except that fields 775, 776, 777 and 787 are their own complements). Ideally, both a display note and a machine link would be generated from the fields.[5] Maintaining the accuracy of linking information, already challenging within a single catalog, is complicated in a shared cataloging environment where records are communicated between systems. As the MARC formats are primarily intended to be communications formats, the tensions inherent in devising methods to communicate relationship information, clearly described by Attig, continue to be relevant.[6] In spite of the difficulties, potential system functionality that could be implemented using linking entry fields has frequently been discussed, particularly for serial successive entries. Bernhardt first presented a description of desirable system functionality, which would display serial title changes intelligibly for the user.[7] Alan's empirical study of CONSER records as found in the OCLC database demonstrated the presence of appropriate data for carrying out the linking in a substantial majority (71 percent) of cases.[8] However, actual implementation is still infrequent, as Guay's recent call to action makes clear.[9]

Dunham examined the potential of various fields "for linking together all the records of a multiformat serial in which one of the manifestations is an electronic version."[10] Use of field 776 (Additional Physical Form Entry) alone resulted in an impressive match rate of 96.4 percent in a sample of record sets for currently published serials from the author's catalog. The sets mainly consisted of the original print and one electronic version.

Originally, these fields were defined for the serials format with a subset in the books format, but when field 773 (Host Item Entry) was approved in 1982, it was defined for all formats. Although all have been valid in all formats since format integration in 1995, most (apart from field 773) are still primarily applied in serials records. Current CONSER (Cooperative Online Serials) policy provides for reciprocal links among all types of continuing resources and between continuing resources and monographs, but Program for Cooperative Cataloging policy is that most linking fields are not used between monographs.[11] As of 1999, links are to be made between a serial and a monograph that precedes or succeeds the serial, such as conference proceedings that change from serial to monographic treatment; and, since 2002, between a serial and an integrating resource that continues the serial, such as a directory that changes from an annually updated print publication to a frequently updated Web database; and between updating looseleafs.[12]

Subfields in the linking entry fields have been defined to support both textual linking and linking via control numbers and standard numbers. Subfield w (Record Number) accommodates system control numbers such as the LCCN (Library of Congress Control Number) or the OCLC control number, while standard numbers are recorded in subfields x (ISSN), y (CODEN), or z (ISBN), as appropriate. Textual linking is accomplished by information recorded in one or more of subfields a (Main Entry Heading), s (Uniform Title) and t (Title), as applicable. The content of these subfields is, in structure, a uniform title heading (whether name/title or uniform title alone), constructed following chapter 25 of the *Anglo-American Cataloguing Rules 2d Revised* (AACR2R) (and appropriate Library of Congress Rule Interpretations). This is what makes it possible to carry out textual linking (that is, collocation) when including these fields in appropriately defined indexes. The uniform title is itself a linking device, whether used as a main entry heading (coded in fields 130 or 1xx/240), or used as a secondary entry (coded in fields 730 or 700/710/711 Author/Title), or as a series entry (coded in fields 440 or 8xx).[13]

Categories of Linking Entry Fields According to MARC 21

The MARC 21 bibliographic format, in its introduction to the 76x–78x linking entry fields, gives the following three-way breakdown of the types of relationships that the linking fields encode:

> Chronological relationship—the relationship in time between bibliographic items (for example, the relation of a serial to its predecessors and successors) (fields 777, 780, 785)
>
> Horizontal relationship—the relationship between versions of a bibliographic item in different languages, format, media, etc. (fields 765, 767, 775, 776)
>
> Vertical relationship—the hierarchical relationship of the whole to its parts and the parts to the whole (such as a journal article to the journal, subseries to main-entry series) (fields 760, 762, 770, 772, 773, 774)[14]

This division has a long history in MARC, first appearing in *UNIMARC* in 1977.[15] It has served as a concise introduction to bibliographic relationships, especially for serials, for many catalogers and system designers.

The only other early systematic discussion of relationship types in MARC records is the investigation by Goossens and Mazur-Rzesos of subtypes of the vertical relationship, which they named the hierarchical relationship.[16] Working from the perspective of multilevel description and the need of a national bibliography to provide a physical description of every volume, they described both simple and complex cases of hierarchical relationships and showed that several types of relationships can operate between different parts of a single work.

Taxonomies of Bibliographic Relationships

Tillett, in her comprehensive investigation of bibliographic relationships and their treatment in the cataloging rules, proposed a taxonomy of bibliographic relationships with seven major classes: equivalence, derivative, descriptive, whole-part, accompanying, sequential, and shared characteristic.[17] (See appendix B for Tillett's definitions of the classes.) Some of these classes are very broad and also very frequent in bibliographic records, while others occur infrequently.[18]

Tillett's empirical study used records in the Library of Congress database cataloged between 1968 and 1986 to look for instances of six of the relationship classes (*shared characteristic* was omitted) and easily found many instances of five of the types. However, the descriptive relationship was very rarely encountered in bibliographic records, turning up in only two records (0.109 percent) in a sample of 1,841 records in which 500 (General Note) fields were examined.[19] The empirical study uncovered no new relationship classes; thus, while the examination of a sample cannot conclusively validate a taxonomy, Tillet's study suggests that the seven classes proposed are in fact exhaustive.[20] Four of the classes (equivalence, derivative, whole-part, and sequential), are identified as using uniform titles as one mechanism to accomplish the linking.[21] The uniform title, when coded as a linking field, is an expression of this mechanism.

Of the seven classes, *derivative* is particularly broad ranging. This led Smiraglia to propose a subdivision into seven subclasses as an extension to the taxonomy: simultaneous derivations, successive derivations, translations, amplifications, extractions, adaptations, performances.[22] (See appendix C for Smiraglia's definitions of the classes.) This is itself a taxonomy of the derivative relationship. These categories were developed through an examination of the Anglo-American Cataloguing Rules for types of derivatives given specific mention.[23] Again, the classes differ greatly in their frequency of occurrence in bibliographic records, and no additional classes were discovered in quantitative studies.[24]

In a sample of records relating to 477 progenitor works drawn from OCLC WorldCat in 1993, Smiraglia and Leazar found 366 occurrences of derivative relationships. The subtype *successive derivation* accounted for 55.5 percent, while the types *adaptation*, *amplification*, *extraction,* and *performance* each accounted for less than 3 percent of the relationships found.[25] As the progenitor work for each bibliographic family was not necessarily represented by a bibliographic record, the counting procedure required the use of an eighth category, *predecessor,* defined as "a work from which a progenitor is clearly derived, e.g., a short story from which a novel is derived."[26] However, this category is not a true taxonomic class; it merely served to facilitate the statistical analysis.

The combination results in a taxonomy with seven major classes as proposed by Tillett, one of which is subdivided into seven subclasses as proposed by Smiraglia.

Vellucci's presentation to the 1997 Conference on the Principles and Future Development of AACR in Toronto gave a comprehensive overview of research studies on bibliographic relationships in the catalog.[27] The focus of Vellucci's contribution to research in this area was the study of relationships among bibliographic records for music. She was able to validate the applicability of six of Tillett's seven classes to music materials (the *shared characteristic* class is applicable to all materials by default and so was not investigated further), although the subgroups within the categories varied somewhat.[28] The quantitative aspect of Vellucci's work demonstrated the particular importance of relationships for music, as "97 percent of the scores in the sample exhibited at least one relationship, a considerably higher figure than that discovered by Tillett," who was considering bibliographic records for all types of materials.[29]

In FRBR, the section in chapter 5, "Relationships," on "other relationships between Group 1 entities" categorizes bibliographic relationships first by the level of the entities involved (work, expression, manifestation, item) then by type of relationship, each of which is named.[30] The relationships are subdivided into referential or autonomous (for the whole/part relationship, dependent or independent part is used instead). These three parameters used together provide a taxonomy of bibliographic relationships. In addition, the FRBR tables include specific examples of many of the relationships, which indicate the intended category for these conventional terms. These examples, although not meant to be exhaustive, provide informative lists of subtypes for some relationships. These can be useful in further analysis, as long as it is understood that new examples can be added whenever new forms of publication come into existence.

While organized according to different principles, the Tillett/Smiraglia and FRBR schemes are particularly of interest as they are intended to be *taxonomies* of bibliographic relationships, meaning that all possible relation-

ships are categorized in each scheme. The classes in any taxonomy should be designed to be mutually exclusive and jointly exhaustive, and divided in a logical and principled manner.

Neither of these taxonomies makes reference to specific MARC fields. In 2002, Delsey completed a study for the Network Development and MARC Standards Office of the Library of Congress with the first objective being "to clarify the relationships between the data structures embodied in the MARC formats and the FRBR and AACR models."[31] The scope of the study was the MARC 21 Bibliographic and Holdings formats. Appendix A of the study presents a mapping of MARC data elements to FRBR and AACR, while appendix B presents the reverse mapping of FRBR to MARC data elements. MARC fields, subfields, and indicator positions (but not indicator values) were considered. This was a large scale project; of the 2,300 MARC elements considered,

> approximately 1,200 MARC data elements can be mapped to the entities, attributes and relationships defined in the FRBR model. . . . However, the correspondences are not in all cases exact. Approximately ten percent of the correspondences to both FRBR and AACR have to be qualified in some form or other, usually because the MARC data element comprises a mix of values pertaining to different entities or to different attributes of the same entity.[32]

The unmatched elements and inexact correspondences point to areas where a more detailed investigation of the actual use and meaning of the MARC elements may clarify the situation.

The exercise presented in this paper is intended to provide a detailed bidirectional mapping of the MARC 21 linking entry fields to the FRBR and Tillett/Smiraglia theoretical breakdowns of bibliographic relationships. In the process, this author will explore whether the MARC 21 linking entry fields also provide a taxonomic division of relationship types and likewise examine the correspondence of the MARC three-way categorization of the linking fields to the taxonomic divisions.

Mapping MARC 21 Linking Entry Fields to FRBR and Tillett's Taxonomy

In table 1, each linking field, subdivided when applicable by second indicator values or subtypes, is mapped to an entry or entries in the FRBR relationship tables. The level of FRBR entities to which the relationships captured in that table apply, the general relationship type, and the specific subtype that applies to the data expressed by that linking field is noted. In some cases, these characterizations cover only part of the actual extent of application of the field. The final column gives the Tillett taxonomic class (and Smiraglia subclass), which most effectively captures the data coded in the field.

Tillett compared her taxonomic classes with the three MARC categories of relationship as they appeared in *UNIMARC* (2nd ed.).[33] The correspondences highlighted are:

- MARC *chronological* with Tillett's *sequential*[34]
- MARC *vertical* with Tillett's *whole-part* [35]
- MARC *horizontal* with Tillett's *derivative*[36]

From the respective definitions, MARC *horizontal* should also correspond with Tillett's *equivalence*.

Delsey summarized the results of the mapping exercise for linking entry fields as follows:

> "Certain linking entry fields (770 and 772) are defined specifically to convey *work-to-work* relationships. . . . *Expression-to-expression* relationships may appear . . . in certain linking entry fields (765, 767, and 775). *Manifestation-to-manifestation* relationships appear . . . in a number of linking entry fields (760, 762, 773, 774, and 776)."[37]

The exceptions to these expectations are instructive. In the FRBR tables, the part-in-a-series specific relationship subtype, which maps exactly to fields 760/762 (Main Series Entry/Subseries Entry), appears only in tables 5.2 and 5.5, the whole/part work-to-work and expression-to-expression tables. Yet Delsey (above) described these fields as encoding manifestation-to-manifestation level relationships, since the linking information recorded in the fields will refer to a specific manifestation. This correctly captures the fact that later editions of a monograph originally issued in a series may well be issued in other series or issued without a series, thus the relation of the series statement is to a specific manifestation of the work, not to the work as a whole or even to a specific expression of the work.

The scope statement for field 770 (Supplement/Special Issue Entry) describes two subtypes (*has supplement* and *special issue*), which are not differentiated by indicator values although the reciprocal subtypes in field 772 (Supplement Parent Entry) (*supplement to* and *parent*), are so differentiated; the two subtypes map to different relationship classes both in FRBR and Tillett, although both are at the expected work-to-work level. In the FRBR whole/part tables, the correlate of the *special issue* subtype is characterized as "dependent part," however, these fields also are applied to independent special issues. Both fields are categorized in MARC as embodying *vertical* relationships,

Table 1. Mapping MARC 21 linking entry fields to FRBR relationship categories and Tillett's taxonomy

MARC 21 Linking field (category)	FRBR table	FRBR relationship type	Referential/autonomous or dependent/independent or specific subtype	Tillett taxonomic class/*Smiraglia subclass*
760 - Main series entry (vertical)	5.2 (work-to-work) 5.5 (expression-to-expression)	Whole/part	Independent part - series	Whole-part
762 - Subseries entry (vertical)	5.2 (work-to-work) 5.5 (expression-to-expression)	Whole/part	Independent part - series	Whole-part
765 - Original language entry (horizontal)	5.3 (expression-to-expression, same work)	Translation		Derivative/*translation*
767 - Translation entry (horizontal)	5.3 (expression-to-expression, same work)	Translation		Derivative/*translation*
770 - Supplement/Special issue entry (vertical)				
Has supplement	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Supplement	Either referential or autonomous	Accompanying
Special issue	5.2 (work-to-work) 5.5 (expression-to-expression)	Whole/part	Dependent part - volume/issue of serial	Whole-part
772 - Supplement parent entry (vertical)				
Blank - supplement to	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Supplement	Either referential or autonomous	Accompanying
0 - Parent	5.2 (work-to-work) 5.5 (expression-to-expression)	Whole/part	Dependent part - volume/issue of serial	Whole-part
773 - Host item entry (vertical)	5.2 (work-to-work) 5.5 (expression-to-expression) 5.8 (manifestation-to-manifestation)	Whole/part	Dependent part - all other cases Independent part - other cases	Whole-part
	5.10 (item-to-item)	Reconfiguration	Split into, Extracted from	Whole-part
774 - Constituent unit entry (vertical)	5.2 (work-to-work) 5.5 (expression-to-expression) 5.8 (manifestation-to-manifestation)	Whole/part	Dependent part - all other cases Independent part - other cases	Whole-part
	5.10 (item-to-item)	Reconfiguration	Split into, Extracted from	Whole-part
775 - Other edition entry (horizontal)	5.3 (expression-to-expression, same work)	Revision		Derivative
Language editions	5.3 (expression-to-expression, same work)	Translation		Derivative/*translation*
Regular-print reprints	5.7 (manifestation-to-manifestation) 5.9 (manifestation-to-item)	Reproduction	Reprint, macroreproduction, photo-offset reprint	Equivalence
Other editions	5.3 (expression-to-expression, same work)	Revision	Revised edition, Enlarged edition	Derivative/*successive derivation*
	5.7 (manifestation-to-manifestation)	Alternate	Simultaneously released edition	Derivative/*simultaneous derivation*

Table 1. Mapping MARC 21 linking entry fields to FRBR relationship categories and Tillett's taxonomy (continued)

MARC 21 Linking field (category)	FRBR table	FRBR relationship type	Referential/autonomous or dependent/independent or specific subtype	Tillett taxonomic class/*Smiraglia subclass*
776 - Additional physical form entry (horizontal)	5.7 (manifestation-to-manifestation) 5.9 (manifestation-to-item)	Reproduction	Reproduction (general), microreproduction	Equivalence
	5.10 (item-to-item)	Alternate	Alternate format	Equivalence
777 - Issued with entry (chronological)	(manifestation-to-manifestation, different work)	Whole/part (siblings)	Independent part - parts of an unnamed containing manifestation	Accompanying
780 - Preceding entry (chronological)	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Successor	Autonomous - succeeding work	Sequential
0 - Continues 1 - Continues in part 2 - Supersedes 3 - Supersedes in part	4 - Formed by the union of . . . and . . . 5 - Absorbed 6 - Absorbed in part 7 - Separated from			
785 - Succeeding entry (chronological)	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Successor	Autonomous - succeeding work	Sequential
0 - Continued by 1 - Continued in part by 2 - Superseded by 3 - Superseded in part by 4 - Absorbed by	5 - Absorbed in part by 6 - Split into . . . and . . . 7 - Merged with . . . to form . . . 8 - Changed back to			
786 - Data source entry	None of them			Descriptive
787 - Nonspecific relationship entry	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Complement	Autonomous	Accompanying
	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Summarization	Autonomous	Derivative/*extraction?*
	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Adaptation	Autonomous	Derivative/*adaptation*
	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Transformation	Autonomous	Derivative/*adaptation*
	5.1 (work-to-work) 5.4 (expression-to-expression, different work) 5.6 (expression-to-different work)	Imitation	Autonomous	Derivative
	5.3 (expression-to-expression, same work)	Abridgement	Autonomous	Derivative/*extraction*

which would be expected to be *whole-part* according to Tillett's correspondences, yet the *supplement* subtype actually maps to Tillett's *accompanying* relationship (see table 1 for details). Thus the distinction made in field 772 by the indicator values is bibliographically significant; the lack of distinction in field 770 reduces the precision of the reciprocity between the fields.

However, the *whole-part* relationship always maps to fields characterized as *vertical* in MARC. It corresponds to the general 773/774 fields and also to the specific 760/762 (series) and 770/772 (*special issue* subtype only) fields. This indicates that the whole-part class can be broken down into subtypes that are sufficiently significant bibliographically to merit special coding. Relationships encoded by fields 773/774 actually hold at all four FRBR levels, although the focus for recording the linking information will be on the manifestation level.

Delsey's summary characterizes field 775 (Other Edition Entry) as essentially encoding expression-level relationships; however, its correspondence to FRBR also is noted as problematic.[38] The scope statement for field 775 describes three subtypes not differentiated by indicator values: language editions, regular-print reprints, and other editions.[39] The lack of specific coding reduces precision considerably; not only do the subtypes map to different relationship types both in FRBR and Tillett, two of the subtypes apply to multiple FRBR levels. The *regular-print reprint* is the simplest subtype. It includes facsimile and other reprint editions, and operates at the FRBR manifestation-to-manifestation level, always demonstrating an *equivalence* relationship. The *other edition* subtype is used, among other cases, for geographic editions, editions differing in scope (such as teacher/student editions), and editions differing in format (such as large print or Braille editions). When the content of the editions is essentially the same, the relationship is indeed at the expression level; however, geographic editions that share little content are better understood as having a *work-to-work* relationship.[40]

The MARC distinction between language editions (when all language versions are published simultaneously) encoded in field 775 and translated editions (when there is a clear relation between a source-language version and the translated versions) linked to the original edition using fields 765/767 (Original Language Entry/Translation Entry) is a distinction not made by either FRBR or Tillett. With language editions, there is the additional consideration that they represent either different expressions (for example, government reports issued simultaneously in each official language of the country) or different works when the content is not shared between the publications. Those language editions that are different works do not appear explicitly in any of the relationship types in the FRBR work-level tables. They could perhaps be considered specific instances of either adaptation or transformation.

The *sequential* relationship is associated only with fields 780/785 (Preceding Entry/Succeeding Entry), which are characterized as *chronological* in MARC. The second indicator values in fields 780 and 785 do not lead to any specific correspondences in either taxonomy as they do not subdivide the fields into relationship classes; rather they refine the fields at a finer level of detail than provided in either taxonomy. Leazar posits that the indicator values "demonstrate the existence of subtypes of the sequential relationship, and appear to be an exhaustive breakdown of this relationship."[41] Thus they could be seen as a taxonomy of the sequential relationship itself.

Field 777 (Issued With Entry) expresses a relationship between manifestations of different works that does not appear in any of the FRBR tables. The "issued with" relationship is an accompanying relationship that applies at the manifestation level, but between manifestations of different works. The issued-together manifestations are siblings in a whole/part relationship to a (generally unnamed) manifestation of the composite work that contains them all. The distinction between "issued with" and "bound with" is neatly captured by the respective levels of these two relationships. The first is at the manifestation level, while the latter is at the item level (and appears in FRBR table 5.10 as a case of the *reconfiguration* relationship). The MARC 21 documentation currently groups field 777 with fields 780/785 in the *chronological* class, but this is a somewhat tenuous grouping. In fact, previous iterations of this documentation listed 777 as *vertical*.[42]

Field 786 (Data Source Entry) is unlike the other linking fields. It expresses a very specific relationship—it is a work-to-work relationship but not a formal one between group 1 entities. It is most similar to a subject relationship in that the content of the two works is related by the first being based on data from the second. It could be considered either as a special type of derivative relationship, or as falling into the descriptive relationship. As a relatively new field, it does not have a place in the three traditional MARC categories of linking fields.[43]

The definition of field 787 (Nonspecific Relationship Entry) allows it to serve as a catchall, to record any important relationship that does not belong in a more specific field. A note explaining the nature of the relationship should appear in field 580 (Linking Entry Complexity Note), or subfield i (Display text). As a result, the field is not associated with any of the three categories of MARC link types. While certain relationships can be identified that would, if expressed, have to use field 787, actual use patterns may be much more varied. Cases frequent enough to be identified in the *CONSER Cataloging Manual* include companions, complements, cumulations, summaries, abstracts, and indexes to a serial when cataloged on a separate record.[44] These are primarily work-to-work relation-

ships. One also can use field 787 if two or more different relationships between the same serials are involved. For example, if a print serial and its online counterpart start as versions in alternate formats (field 776) but become successive titles (780/785) when the print edition is discontinued, field 787 is used instead of the specific fields.

Mapping FRBR Relationships to MARC 21 Linking Entry Fields and Tillett's Taxonomy

The observation that certain FRBR relationship categories appear repeatedly in table 1 while others appear to be missing leads to the reverse exercise. Tables 2–7 list, in the first column, the broad FRBR relationship types and subtypes from FRBR tables 5.1 to 5.7, 5.9, and 5.10. The second column provides a mapping to the appropriate MARC 21 linking entry field (or linking field and second indicator value or subtype). The third column maps the FRBR relationship type or subtype to a class from Tillett's taxonomy of bibliographic relationships and, in the case of mappings to the derivative relationship, to a subclass from Smiraglia's extension. Speculative or tenuous mappings are indicated by a question mark.

FRBR chapter 5 includes two more relationship tables. Table 5.8 covers whole/part manifestation-to-manifestation relationships.[45] Table 5.11 covers whole/part item-to-item relationships.[46] These are not specifically discussed here as they are subsets of the whole/part relationships covered in tables 5.2 and 5.5 (see table 3) at the work or expression level.

A number of relationship types and subtypes do not map to any linking entry field or could only tenuously be mapped to field 787 (Nonspecific Relationship Entry). (See in particular tables 2 and 4.) This could mean that in reality these relationships are rarely encountered, at least in serials that have been the main impetus behind the development of this block of fields. As the MARC formats are normally expanded only when need is demonstrated for additional coding, fields would not be created just for theoretical possibilities. Alternately, it may be that these relationships are currently being expressed by means other than linking fields when being recorded in bibliographic records. This is particularly true of item-level relationships. Linking fields are still used primarily for serials cataloging, thus any perceived need to encode types of relationships occurring mainly among non-serials would call for a mechanism other than linking fields.

The mapping from FRBR to Tillett's taxonomy finds correspondences for five of the seven classes of relationship. The *descriptive* and *shared characteristic* relationships do not map to the FRBR relationships between group 1 entities because they generally involve subject or responsibility relationships or other coincidental similarities. In the FRBR model, the relationships between entities from different groups are briefly summarized in sections 5.2.2 and 5.2.3.[47]

Some of Tillett's classes (*sequential*, *whole-part*) correspond very precisely to FRBR in that they appear in a single correspondence. The *sequential* relationship is seen only in the successor relationship in table 2; the *whole-part* relationship corresponds to table 3 (and in a minor way in table 7 to two subtypes of the reconfiguration relationship). Others having a much broader scope appear in many places (particularly *derivative*, which appears in tables 2, 4, and 5). Thus Grimaldi's observation that the Tillett taxonomy groups relationships broadly without considering the level

Table 2. Mapping FRBR relationships between different works to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.1, work-to-work relationships
FRBR table 5.4, expression-to-expression relationships between expressions of different works
FRBR table 5.6, expression-to-work relationships

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy/ *Smiraglia subclass*
Successor	780/785	Sequential
Sequel		
Succeeding work	780/785	
Supplement	770 (has supplement)/ 772 (ind.1=blank)	Accompanying
Complement	787	Accompanying
Summarization	787	Derivative/*extraction?*
Adaptation	787?	Derivative/*adaptation*
Transformation	787?	Derivative/*adaptation*
Imitation	787?	Derivative/*adaptation?*

Table 3. Mapping FRBR whole/part relationships to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.2, whole/part work-to-work relationships
FRBR table 5.5, whole/part expression-to-expression relationships

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy
Whole/part (general)	773/774 (or depends on subtype)	Whole-part
Dependent part		
Chapter, section, part, etc.	773	
Volume/issue of serial	770 (special issue)/ 772 (ind.1=1)	
Intellectual part of a multipart work	773/774	
Illustration for a text		
Sound aspect of a film		
Independent part		
Monograph in a series	760/762	
Journal article	773	
Intellectual part of a multipart work	773/774	

of entity involved is largely borne out by this mapping exercise.[48]

The derivative relationship is the only one that appears at the work-to-work, expression-to-expression, and manifestation-to-manifestation levels (tables 2, 4, and 5). Subdividing according to Smiraglia's subclasses improves the precision of the correspondences; however, the *adaptation* subclass turns out itself to be rather broad, corresponding to three distinct work-to-work relationship types as well as one expression-to-expression type (tables 2 and 4). Only five of Smiraglia's seven subclasses appear in the tables. The *performance* subclass would be expected to appear in FRBR table 5.3 (expression-to-expression relationships) (see table 4) where one would expect a relationship type for performances, but there is no such entry in the table. However, performances are explicitly considered to create new expressions of works in FRBR.[49] The *amplification* subclass does not appear explicitly either; Smiraglia defines it to include "only illustrated texts, musical settings, and criticisms, concordances and commentaries that include the original text."[50] In FRBR, the actual amplifications are treated either as supplements or complements to the base work; the composite or aggregate that includes both the base and the amplification is treated as a new work with a whole/part relationship to the base work alone.

FRBR table 5.7 (see table 5) summarizes the relationships that hold between members of an expression set (that is, all manifestations of the same expression of a work). In terms of Tillett's relationship classes, they fall almost exclusively into the *equivalence* relationship, which otherwise only appears in the item-level FRBR tables 5.9 and 5.10 (see tables 6 and 7). These item-level tables are subsets of table 5.7, in that a reproduction may well be based on a unique item or a specific item from a manifestation, and the reproduction process is the same whether a single or multiple copies are made. MARC 21 linking fields 775 (Other Edition Entry) and 776 (Additional Physical Form Entry) are the only two linking fields that are used to encode relationships found in FRBR table 5.7. Field 776 is applied when different physical formats are involved, while one use of 775 is for regular-print reprints, which are more likely to exist for older serials. It would be tempting to conclude that expression sets can be identified by using these two fields; however, comparison with the reverse mapping in table 1 shows that the correspondence does not go both ways. In addition to its manifestation-level use for regular-print reprints, field 775 has been used to encode expression-to-expression relationships from FRBR table 5.3 (see table 4), revision and translation, and also a work-to-work relationship in the case of some language editions. In practice there is no coding distinction of any sort between these cases, as subfield e (Language code), which could at least distinguish translations and language editions from revisions and reprints, is usually not applied. And while the language of the translation will appear in the text of the uniform title, the language element is not separately subfielded when the uniform title is cited in the linking entry field. As the mapping between these linking fields and relationships at the FRBR manifestation-level is not fully bidirectional, any attempt to use these two linking fields to identify expression sets in existing databases will, in the most general case, be too broad.

Table 4. Mapping FRBR relationships between expressions of the same work to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.3, expression-to-expression relationships between expressions of the same work

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy/ *Smiraglia subclass*
Abridgement	787?	Derivative/*extraction*
Revision	775	Derivative/*successive derivation*
Revised edition	775	
Enlarged edition	775 (other edition)	
State (graphic)		
Translation	765/767 or 775 (language edition)	Derivative/*translation*
Arrangement (music)		Derivative/*adaptation*

The status of simultaneously released editions is interesting since, according to Tillett's breakdown, that relationship is to be classed with *derivative* rather than *equivalence* relationships. This point is reinforced in Smiraglia's division of the derivative relationship into seven sub-categories, of which *simultaneous derivations* is at the "least-differences" end of the spectrum. Again, a clean correspondence is not present between two systems, this time between Tillett and FRBR. Graham, in her keynote address to the Airlie House Multiple Versions Forum, proposed that the discussion of multiple versions be limited to Tillett's *equivalence* class.[51] However, the scope of the present work of the Joint Steering Committee's Format Variation Working Group, which is in an FRBR framework, is the entire expression set. The ambiguous status of simultaneous editions could lead to confusion for catalogers and may point to an area that needs very precise guidelines in AACR.

Concluding Remarks

This mapping exercise highlights the differences in scope and level of detail represented in three distinct categorizations of bibliographic relationships. Understanding how precisely MARC 21 coding maps to theoretical taxonomies of bibliographic relationships can be a consideration in future format development. For instance, the ambiguous mapping of field 775 to more than one relationship type,

Table 5. Mapping FRBR relationships between manifestations of the same expression to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.7, manifestation-to-manifestation relationships

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy/ *Smiraglia subclass*
Reproduction	(Depends on subtype)	Equivalence
Reproduction	776	
Microreproduction	776	
Macroreproduction	775 (regular print reprint)	
Reprint	775 (regular print reprint)	
Photo-offset reprint	775 (regular print reprint)	
Facsimile	776	
Mirror site		
Alternate	(Depends on subtype)	(Depends on subtype)
Alternate format	776	Equivalence
Simultaneously released edition	775 (other editions)	Derivative/ *simultaneous derivation*

Table 6. Mapping FRBR manifestation-to-item relationships to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.9, manifestation-to-item relationships

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy/ *Smiraglia subclass*
Reproduction	(Depends on subtype)	Equivalence
Reproduction	776	
Microreproduction	776	
Macroreproduction	775 (regular print reprint)	
Reprint	775 (regular print reprint)	
Photo-offset reprint	775 (regular print reprint)	
Facsimile	776	

Table 7. Mapping FRBR relationships between items to MARC 21 linking entry fields and Tillett's taxonomy

FRBR table 5.10, item-to-item relationships

FRBR relationship type/subtype	Expressed by linking field(s)	Tillett's taxonomy/ *Smiraglia subclass*
Reconfiguration	(Depends on subtype)	
Bound with		Accompanying
Split into	773/774	Whole-part
Extracted from	773/774	Whole-part
Reproduction	(Depends on subtype)	Equivalence
Reproduction	776	
Microreproduction	776	
Macroreproduction	775 (regular print reprint)	
Facsimile	776	

and more particularly to relationships at different FRBR levels, is undesirable; it should not be repeated in other fields and it may even be desirable to correct it. Also, the consequence of the lack of second indicator values in field 770 to correspond with the indicator values in the reciprocal field 772 is seen to affect our ability to distinguish a whole/part situation from an accompanying situation.

There is another application that can benefit from this level of detail: that of mining existing data from MARC databases to implement FRBR concepts in database structures and displays.

An understanding of the level of FRBR entity referenced (either always or almost always) by a particular linking entry field can be applied in system design. One strategy that could be interesting in implementing FRBR-aware systems is to provide a detailed "show like" feature, which would bring up bibliographic records for other manifestations of the same expression as the record being viewed. Once the user has identified one record of interest (via whatever access path, such as an added entry, subject, or classification), this function would provide horizontal access to those records most like it, namely, other manifestations of that expression. Explicit links coded in MARC 21 linking fields 776 (which always operates between manifestations of one expression) and 775 (which does in one case) could be one mechanism behind such functionality.

This would be an extension to functionality already present in some current systems that allows direct links between closely related works, such as serial succeeding works, using fields 780 and 785. The PCC (Program for Cooperative Cataloging) Standing Committee on Automation has created the Task Group on Linking Entries with the charge of investigating how library systems make use of linking entry fields and suggesting possible improvements, with a report expected in 2004. This demonstrates that there is active interest in the application of linking entries to OPAC navigation. The mapping of MARC 21 fields to FRBR entities does, however, demonstrate that all linking entry fields are not alike, and that users may not be well served by functionality that retrieves a complete set of linked records in an entirely undifferentiated fashion.

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Appendix A
Definitions of Linking Entry Fields in MARC 21

Linking Entries: Definition and Scope

Fields 760–78X contain information that identifies other related bibliographic items. Each of the linking entry fields specifies a different relationship between the target item described in the record and a related item. These relationships fall into three categories: (1) related items that assist the user in continuing to search but are not physically required to obtain the target item (such as former entries for serials, translations of the target item); (2) related items that have to be obtained physically in order to use the target item (such as the host item for a component part—a journal issue containing a specific article); (3) related items that are constituent units of a larger whole (such as the individual photographs contained in a visual material collection). The linking entry fields are intended to generate a note in the display of the record in which they appear; provide machine linkage between the bibliographic record for the target item and the bibliographic record for the related item, if the related item is covered by a separate record; and/or facilitate indexing.

760 – Main Series Entry

Information concerning the related main series when the target item is a subseries (vertical relationship). This field is recorded *in addition to* any other series information in the record. When a note is generated from this field, the introductory phrase *Main series:* or *Subseries of:* may be generated based on the field tag for display.

762 – Subseries Entry

Information concerning a related subseries when the target item is a main series or a parent subseries (vertical relationship). This field is recorded *in addition to* any other series information in the record. When a note is generated from this field, the introductory phrase *Has subseries:* may be generated based on the field tag for display.

765 – Original Language Entry

Information concerning the publication in its original language when the target item is a translation (horizontal relationship). When a note is generated from this field, the introductory phrase *Translation of:* may be generated based on the field tag for display.

767 – Translation Entry

Information concerning the publication in some other language other than the original when the target item is in the original language or is another translation (horizontal relationship). When a note is generated from this field, the introductory phrase *Translated as:* may be generated based on the field tag for display.

770 – Supplement/Special Issue Entry

Information concerning the supplement or special issue associated with the target item but cataloged and/or input as a separate record (vertical relationship). When a note is generated from this field, the introductory phrase *Has supplement:* may be generated based on the field tag for display.

772 – Supplement Parent Entry

Information concerning the related parent record when the target item is a single issue, supplement or special issue (vertical relationship) of the parent item. When a note is

generated from this field, the introductory phrase *Supplement to:* may be generated based on the field tag for display.

773 – Host Item Entry

Information concerning the host item for the constituent unit described in the record (vertical relationship). This field is provided to enable the user to locate the physical piece that contains the component part or subunit being described. Thus, only those data elements required to assist in the identification of the host item need to be included in the field, such as links to the bibliographic record describing the item and/or descriptive data that identifies the host item. When a note is generated from this field, the introductory term *In:* may be generated based on the field tag for display.

774 – Constituent Unit Entry

Information concerning a constituent unit associated with a larger bibliographic unit (vertical relationship). The constituent unit may be part of a single bibliographic item, a multipart item, or a collection. The constituent item may or may not be described in a separate bibliographic record. When a note is generated from this field, the introductory term *Constituent unit:* may be generated based on the field tag for display.

775 – Other Edition Entry

The entry for another available edition of the target item (horizontal relationship). The following types of editions are recorded in this field:

– *Language editions.* When a serial is issued simultaneously in more than one language (usually by the same publisher, as opposed to a translation that is usually issued by another publisher).

– *Regular-print reprints.* When the serial being cataloged is a regular-print reprint, field 775 is used for the original entry.

– *Other editions.* Other editions of the target item. These will generally bear the same title as the target item but have edition information that distinguishes them.

When a note is generated from this field, the introductory phrase *Other editions available:* may be generated based on the field tag for display.

776 – Additional Physical Form Entry

Information concerning another available physical form of the target item (horizontal relationship). It is used to link multiple physical format records for the same title. When a note is generated from this field, the introductory phrase *Available in other form:* may be generated based on the field tag for display.

777 – Issued With Entry

Information concerning publications that are separately cataloged but that are issued with or included in the target item (horizontal relationship). This field is not used for *bound with* notes that refer to local binding practices or for component parts (analytical relationships). When a note is generated from this field, the introductory phrase *Issued with:* may be generated based on the field tag for display.

780 – Preceding Entry

Information concerning the immediate predecessor of the target item (chronological relationship). When a note is generated from this field, the introductory term or phrase may be generated based on the value in the second indicator position for display.

785 – Succeeding Entry

Information concerning the immediate successor to the target item (chronological relationship). When a note is generated from this field, the introductory phrase may be generated based on the value in the second indicator position for display.

786 – Data Source Entry

Information pertaining to a data source to which the described item is related. It may contain information about other files, printed sources, or collection procedures.

787 – Nonspecific Relationship Entry

Information concerning the work related to the target item when the relationship does not fit any of those defined in fields 760–786. In most cases, a note is recorded in field 580 that defines the specific relationship.

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Appendix B
Definitions of Classes in Tillett's Taxonomy of Bibliographic Relationships

1. *Equivalence* relationships hold between exact copies of the same manifestation of a work or between an original item and its reproductions, as long as the intellectual and artistic content and authorship are preserved. Included here are copies, issues, facsimiles and reprints, photocopies, microforms, and other similar reproductions.
2. *Derivative* relationships, called horizontal relationships in UNIMARC, hold between a bibliographic item and a modification based on that same item. These include (a) variations or versions of another work, such as editions, revisions, translations, summaries, abstracts, and digests; (b) adaptations or modifications that become new works but are based on earlier works; (c) changes of genre, as with dramatizations and novelizations; and (d) new works based on the style or thematic content of other works, as with free translations, paraphrases, imitations, and parodies.
3. *Descriptive* relationships hold between a bibliographic item or work and a description, criticism, evaluation, or review of that work, such as that between an item and a book review describing it; also included are annotated editions, casebooks, commentaries, critiques, etc.
4. *Whole-part* (or part-whole) relationships, called vertical relationships in UNIMARC or hierarchical relationships by Goossens and Mazur-Rzesos, hold between a component part of a bibliographic item or work and its whole, as with an individual selection from the whole anthology, collection, or series.
5. *Accompanying* relationships hold between a bibliographic item and the bibliographic item it accompanies such that the two items complement each other equally or one item augments the other principal or predominant item. Examples are relationships between items and their accompanying materials where one item is predominant and the other subordinate, as is the case with concordances, indexes, and catalogs of libraries, or where the items are of equal status but have no specific chronological arrangement, as is the case with the parts of a kit.
6. *Sequential* relationships, called chronological relationships in UNIMARC, hold between bibliographic items that continue or precede one another, as between the successive titles of a serial, sequels of a monograph, or among the various parts of a numbered series.
7. *Shared characteristic* relationships hold between a bibliographic item and other bibliographic items that are not otherwise related but coincidentally have a common author, title, subject, or other characteristic used as an access point in a catalog, such as a shared language, date of publication, or country of publication.

Source

Barbara B. Tillet, "A Taxonomy of Bibliographic Relationships." *Library Resources & Technical Services* 35, no. 2 (1991): 156.

Appendix C
Definitions of Classes in Smiraglia's Taxonomy of the Derivative Relationship

1. *Simultaneous derivations*. Works that are published in two editions simultaneously, or nearly simultaneously, such as a British and a North American edition of the same work. Often such simultaneous derivations will exhibit slightly different inherent bibliographic characteristics.
2. *Successive derivations*. Works that are revised one or more times and issued with statements such as "second, [third, etc.] edition," "new, revised edition"; works that are issued successively with new authors; and works that are issued successively without statements identifying the derivation.
3. *Translations.* Include those works that also include the original text.
4. *Amplifications*. Include only illustrated texts; musical settings; and criticisms, concordances and commentaries that include the original text.
5. *Extractions*. Include abridgements, condensations, and excerpts.
6. *Adaptations*. Include simplifications, screenplays, librettos, arrangements of musical works, and other modifications.
7. *Performances.* Including sound or visual (that is, film or video) recordings.

Source

Richard P. Smiraglia, "Derivative Bibliographic Relationships: Linkages in the Bibliographic Universe," in *Navigating the Networks: Proceedings of the ASIS Mid-year meeting, Portland, Oregon, May 21–25, 1994.* Eds. Deborah Lines Andersen, Thomas J. Galvin, and Mark D. Giguere. Medford, N.J.: ASIS, 1994, 177.