FRBR and Tillett's Taxonomy of Bibliographic Relationships†

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ABSTRACT: Bibliographic relationships are one of the most active research areas in knowledge organization, especially in cataloguing. This study attempts to examine and map the *FRBR (Functional Requirements for Bibliographic Records)* bibliographic relationships with Tillett's taxonomy of bibliographic relationships, and to assess the congruence between them. The *FRBR* conceptual model provides a taxonomy of bibliographic relationships in chapter 5, illustrating them in 11 tables. This study shows that there is considerable congruence between these two taxonomies.

1.0 Introduction

A bibliographic relationship is defined as the association, relation, connection, and interaction between different bibliographic entities, or components of entities (Arsenault and Noruzi 2012). In other words, bibliographic relationships provide a means for relating/connecting two or more bibliographic entities. It has to be with respect to another bibliographic entity, one work (e.g., a novel) to another work (e.g., a film). So, there are two sides to bibliographic relationships: the referential work and autonomous work. However, it is not always easy to identify two sides of a bibliographic relationship. In other words, "a relationship is not operative unless the entities on each side of the relationship are explicitly identified" (IFLA 2007, 65). According to Smiraglia (2002, 3) "explicit linkage

of relationships among entities is critical for document-based information retrieval."

One of the traditional functions of the library catalog is to clarify bibliographic relationships for the ultimate purpose of enabling searchers to identify and locate related works. Thus, linkages should be made between related works to explicate those relationships in the catalog (Vellucci 1995). The construction, utilization, and management of bibliographic relationships mainly depends on an organizing intelligence to discover and set up relationships, and this is costly since it requires assigning persistent identifiers to the entities to be related (Svenonius 2001). Therefore, identifiers are needed to construct bibliographic relationships to retrieve and display related entities and to specify navigational pathways between them. The point is that identifiers should be viewed in a generic

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sense that includes not only URIs (Uniform Resource Identifiers), but also text strings that are the authorized access points that name an entity.

Bibliographic relationships/associations (e.g., associations among families of works that are derived from a common source) can be identified by analyzing "sets of documents; existing information systems; standards, rule sets and registration formats; empirical studies of user's identification – and assessment of importance – of associations among groups of entities" (Jepsen 2005).

In 1997, the IFLA Cataloguing Section approved a new model called the *Functional Requirements for Bibliographic Records* (*FRBR*) and published its final report in 1998. The 1998 report by the IFLA Study Group on the *FRBR*, representing the products of intellectual or artistic endeavor, suggested the entity-relationship structures of work, expression, manifestation, and item. *FRBR* is a means by which bibliographic relationships are made explicit in a model linking entities (works, whether book, audio, video, etc., authors, and so on) with attributes that describe them (Hadro 2008).

Bibliographic relationships have been, and continue to be, investigated in the field of knowledge organization, especially in the area of cataloguing (e.g., in the *FRBR* model and in the *RDA: Resource Description and Access* cataloging standards). Well-known researchers in the area (such as Barbara Tillett and Richard Smiraglia) have studied in depth the types of relationships that can exist between bibliographic items.

FRBR, in fact, is a means of modeling the bibliographic relationships that exist in bibliographic records. The *FRBR* model defines three interrelated groups of entities in the bibliographic universe:

Group 1: the products of intellectual or artistic endeavor: work, expression, manifestation, and item;

Group 2: those responsible for intellectual or artistic content of entities in group 1: person, family, and corporate body;

Group 3: entities that can be subjects of intellectual or artistic endeavor: concept, object, event, and place.

The *FRBR* model includes four levels or points of view for bibliographic entities (work, expression, manifestation, and item) associated with three kinds of relationships (primary, responsibility, and subject relationship) (Chen and Chen 2004) to facilitate the

identification, categorization, and retrieval of related entities (Tillett 2005) and to assist a user to navigate through the bibliographic universe.

The *FRBR* Group 1 entities of work, expression, manifestation, and item are defined and characterized in the following manner (IFLA 2007, 12):

The entities defined as work (a distinct intellectual or artistic creation) and expression (the intellectual or artistic realization of a work) reflect intellectual or artistic content. The entities defined as manifestation (the physical embodiment of an expression of a work) and item (a single exemplar of a manifestation), on the other hand, reflect physical form.

The *FRBR* conceptual model is mainly built upon bibliographic relationships between and among entities in the bibliographic universe in order to support specific user tasks: find, identify, select, and obtain. The concept of bibliographic relationships is a key component to library catalogs and bibliographic databases in the new age of *FRBR*ization and categorization of query results.

"A related work is a work related to the resource being described (e.g., an adaptation, commentary, supplement, sequel, part of a larger work)" (*RDA* 25.1.1.1). Bibliographic relationships are frequently made explicit through the use of a note or similar device that indicates not only that a relationship exists between the entity described in the record and another entity, but also clearly represents the nature of the relationship (Arsenault and Noruzi 2012) (e.g., "Translated from the French '*La Nausée*' by Lloyd Alexander," "A dramatization of Helen Jackson's immortal romance"). It should be noted that the network of bibliographic relationships is inherently complex and may be difficult to manage and thus is not always easy to recognize and identify (Arsenault and Noruzi 2012). It is possible that a work be a "supplement to" another work, while at the same time "has supplement," "review in" or "commentary in" another work.

Tillett (1987), through a careful analysis of the *Anglo-American Cataloguing Rules* (AACR), proposed a taxonomy of seven bibliographic relationships (i.e., equivalence, derivative, descriptive, whole-part, accompanying, sequential, and shared characteristic). Based upon that analytical study, she further examined the occurrence of bibliographic relationships in bibliographic records of different subjects, languages, publication dates, and formats. The Tillett study was a

cornerstone piece of research that has inspired many studies to examine the relationship between bibliographic entities.

2.0 Purpose and Objectives

The main purpose of this study is to map the *FRBR* bibliographic relationships with Tillett's taxonomy of bibliographic relationships and to assess the congruence between them. In particular, we ask the following question: to what extent is there congruence between *FRBR* bibliographic relationships and Tillett's taxonomy? Previously, Riva (2004) wrote a research paper, "Mapping MARC 21 Linking Entry Fields to *FRBR* and Tillett's Taxonomy of Bibliographic Relationships." As evidenced by the title of her research, it emphasized MARC 21 and is different from the current study.

3.0 Literature review of Taxonomy of Bibliographic Relationships

Information on bibliographic relationships can be used by users to navigate between bibliographically related works, or by information systems designers to organize large results sets in a better way that is more understandable and useful to users. Two user tasks identified via bibliographic relationships are:

> *finding* a work that bibliographically relates to another one (e.g., find a guide, supplement, complement, addenda, …); and

> *identifying* relationships between bibliographic entities (e.g., to confirm that the work is the one a user is looking for).

While bibliographic relationships have long received considerable attention from catalogers (Panizzi 1841; Cutter 1876), serious study of the bibliographic relationships did not begin until IFLA attempted in the 1970s to create a universal MARC format (later called UNIMARC) to store, display, and communicate bibliographic data (Zhang 2003). It seems that bibliographic relationships have become an important topic for research following the library automation systems since the 1970s, and especially since the 1980s.

The UNIMARC format (1980), for the first time, suggested a framework for bibliographic relationships by categorizing and defining relationships into the following three types (Tillett 1987, 8):

> Vertical—the hierarchical relationship of the whole to its parts, and the parts to a whole, e.g., downward link: a serial to its subseries or to individual volumes of the series; upward link: the individual volume to its subseries and/or series …

> Horizontal—the relationship between versions of an item in different languages, formats, media, etc....

> Chronological—the relationship in time between issues of an item, e.g., the relation of a serial to its predecessors and successors.

Green (2008, 158) argues that relationships are at the heart of knowledge organization attempting to locate information that relates to a user's need, but "despite the centrality of relationships, their expression in knowledge organization schemes seldom rises to full and systematic expression."

In the four previous decades since the 1980s, numerous studies have emphasized the importance of bibliographic relationships, which laid the foundation for understanding the type of relationships in the bibliographic universe. Among the most prominent researchers in the field of bibliographic relationships are Tillett, Smiraglia, and Vellucci.

Tillett (1987)—as a pioneering researcher in the field investigating bibliographic relationships and their treatment in the cataloging rules—attempted to identify, categorize, and classify the entire range of bibliographic relationships in the bibliographic universe using bibliographic records in the Library of Congress database cataloged between 1968 and 1986. Her research divided into two parts. In the first part, she created a taxonomy of bibliographic relationships based on cataloging codes and as reflected in MARC records entered in the Library of Congress. The seven types of bibliographic relationships defined by Tillett are as follows (1987, 24-25):

> Equivalence relationships, "which 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";

> Derivative relationships, "which hold between a bibliographic item and a modification based on that item";

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Descriptive relationships, "which hold between a bibliographic item or work and a description, criticism, evaluation, or review of that work";

Whole-part (or part-whole) relationships, "which hold between a component part of a bibliographic item or work and its whole";

Accompanying relationships, "which hold between a bibliographic item and the bibliographic item it accompanies, such that the two items augment each other equally or one item augments the other principal or predominant item";

Sequential relationships, "which hold between bibliographic items that continue or precede one another"; and

Shared characteristic relationships, "which hold between a bibliographic item and other bibliographic items that [are] not otherwise related but coincidentally has a common author, title, subject, or other characteristic used as an access point in a catalog."

The second part of her research was an empirical study designed to examine the extent of bibliographic relationships as reflected in their frequencies of occurrence in the Library of Congress database. She found that nearly 75 percent of the records in the database contained some type of bibliographic relationship. It should be noted that some of the above categories are very broad and also very frequent in bibliographic records (e.g., derivations), while others occur infrequently (Riva 2004). Tillett's systematic study of bibliographic relationships was the first detailed analysis of bibliographic relationship types.

Smiraglia (1992, 1994), a second pioneering researcher, investigated Tillett's derivative bibliographic relationships, refining the definition to include several different categories of derivation and subsequently subdividing them into seven types as follows (1992, 28):

Simultaneous derivations, "works that are published in two editions simultaneously or nearly simultaneously";

Successive derivations, "works that are revised one or more times ...works that are issued successively with new authors, as well as works that are issued successively without statements identifying the derivation";

Translations, "including those that also include the original text";

Amplifications, "including illustrated texts, musical settings, and criticisms, concordances and commentaries that include the original text";

Extractions, "including abridgements, condensations and excerpts";

Adaptations, "including simplifications, screenplays, librettos, arrangements of musical works, and other modifications"; and

Performances, "including sound or visual (i.e., film or video) recordings."

Smiraglia (1992) stated that a major problem in the structure and use of bibliographic retrieval system is an absence of explicit linkages. He found that 49.9 percent of all works were derivative, but between 40 percent and 63 percent of the derivative relationships are not apparent from bibliographic records.

Vellucci (1995), as the third most influential researcher in the field, applied the bibliographic relationships defined by Tillett and Smiraglia to music, by examining their occurrence among musical bibliographic entities contained in the catalog of the Sibley Music Library, validating 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), and found that nearly 94 percent of musical materials bear at least one of the relationships defined by Tillett. She also postulated two new derivation categories applicable only to musical works: musical presentation and notational transcription. It is concluded that a high proportion of music score bibliographic entities exhibit bibliographic relationships. The study pointed out weaknesses in the syndetic structure of online public library catalogs (OPACs). She argued that "although library catalogs are rapidly evolving into bibliographic tools that reside in an electronic environment, most online catalogs today still use the same basic linkage structure that was developed for the collocating devices of the nineteenth century" (Vellucci 1995, 301).

In a catalog, the syndetic structure comprises the system of cross-references (e.g., "see," "see also," "relationship designators") to other related entities. Therefore, a syndetic device should be used to connect related entities by means of cross-references. A bibliographic record is navigable if it is hyperlinked to re-

lated entities via establishing machine-understandable bibliographic relationships between related entities. In other words, bibliographic records may be made navigable by the establishment of hyperlinked bibliographic relationships. In fact, navigability depends on machine-understandability. More cross-referential hyperlinks between related entities mean higher navigability.

The fourth most important work published on bibliographic relationships is the 1998 final report of the *Functional Requirements for Bibliographic Records* (*FRBR*). In *FRBR* chapter 5, "Relationships," the section 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 (IFLA 2007). It should be noted that Barbara Tillett was a consultant to the IFLA Study Group on *FRBR*.

FRBR and *RDA* bibliographic relationships were inspired and influenced by the conceptual structure of the bibliographic relationships defined and categorized by Tillett and Smiraglia. Chapter 5 of the *FRBR* final report and several sections of RDA (5-10) focused on the relationships between bibliographic entities, and their context within the *FRBR* model.

As described in the *FRBR* final report, the primary role of bibliographic relationships is to "serve as the vehicle for depicting the link between one entity and another, and thus as the means of assisting the user to navigate the universe that is represented in a bibliography, catalogue, or bibliographic database" (IFLA 2007, 64). The *FRBR* Group 1 entities of work, expression, manifestation, and item can be related to each other in a variety of ways: work to work, expression to expression, work to expression, expression to manifestation and so on (see Table 1).

The ability to identify, build, and maintain various types of bibliographic relationships is a key functionality of a *FRBR*ized system. Bibliographic relationships provide a means to connect and navigate between related entities through the syndetic structure of the catalog. Andersen (2002, 57) argued that "Bibliographic relationships are textual means to provide structure in the bibliographic textual space." But they can be textual or non-textual (e.g., URI) and could be accomplished with many different devices, including URI connections, DOI (Digital Object Identifier), ISBN (International Standard Book Number), ISWN (International Standard Work Number), etc. *FRBR* and *RDA* offer the possibility to realize the "finding" and "collocating" functions of the library catalog, us-

ing various bibliographic relationships, authority control, and uniform titles (*Preferred Title for the Work* in RDA 6.2.2).

Zagorskaya (2000) argued that the need for bibliographic relationships to be represented in the catalog is determined by the following factors:

> functions of a library catalog,
> functions of a bibliographic record,
> work as a subject of bibliographic description,
> concepts of main and additional records and of the reference system,
> structure of bibliographic and authority records, and
> objectives and principles of catalog organization.

*FRBR*ized systems should organize and categorize records in such a way that searching for a specific work in the catalog will lead to all available editions of this work, as well as to related entities. Both information types (on work and on related entities) should be available in the catalog because the user generally starts with searching for a work and eventually proceeds to the selection of a specific edition (Zagorskaya 2000).

4.0 Data analysis

The *FRBR* final report provides a taxonomy of bibliographic relationships in chapter 5, illustrating bibliographic relationships in 11 tables. The *FRBR* taxonomy of bibliographic relationships is shown in comparison with Tillett's taxonomy of bibliographic relationships in the following Table 1. A check mark (√) means that there is an exact match.

Some types of bibliographic relationships shown in Table 1 are very broad and also very frequent in bibliographic records as indicated in the previous research conducted by Tillett and Smiraglia (e.g., derivative), while others occur infrequently (e.g., sequential and shared characteristic).

It is interesting to note that the word "descriptive" and the phrase "shared characteristic" are not used in chapter 5 of the *FRBR* report. Tillett's "descriptive relationships" are not discussed in chapter 5 of *FRBR*, because they are considered part of the "subject" relationships (*FRBR*, Figure 3.3). Tillett (2011) indicated that "*FRBR* does not explicitly mention the types of descriptive relationships, but does include them indirectly in the diagram (Figure 3.3) showing the Group 3 entities and 'is subject of/has subject' relationships

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FRBR	Tillett's taxonomy FRBR	Deriva-tive	Sequen-tial	Whole-part / Part-whole	Descriptive	Accompany-ing	Shared characteri-stic	Equiva-lence
Work-to-work relationships	Successor		√					
	Supplement					√		
	Complement					√		
	Summarization	√						
	Adaptation	√						
	Transformation	√						
	Imitation	√						
Whole/Part Work-to-Work Relationships	Whole/Part			√				
Expression-to-Expression Relationships	Abridgement	√						
	Revision	√						
	Translation	√						
	Arrangement (music)	√						
	Successor		√					
	Supplement					√		
	Complement					√		
	Summarization	√						
	Adaptation	√						
	Transformation	√						
	Imitation	√						
Whole/Part Expression-to-Expression Relationships	Whole/Part			√				
Expression-to-Work Relationships	Successor		√					
	Supplement					√		
	Complement					√		
	Summarization	√						
	Adaptation	√						
	Transformation	√						
	Imitation	√						
Manifestation-to-Manifestation Relationships	Reproduction							√
	Alternate							√
Whole/Part Mani-festation-to-Manifestation Relationships	Whole/Part			√				
Manifestation-to-Item Relationships	Reproduction							√
Item-to-Item Relationships	Reconfiguration					√		√
	Reproduction							√
Whole/Part Item-to-Item Relationships	Whole/Part			√				

Table 1.FRBR Relationships and Tillett's Taxonomy of Bibliographic Relationships

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to work. Descriptive relationships involve one work 'talking about' or describing some other work, which could be seen as a 'has subject' relationship." It should be noted that the Appendix J for *RDA* has defined descriptive relationships for the bibliographic entities: work, expression, manifestation, and item. *RDA* is a practical application of *FRBR*, so the *RDA* committee took considerable effort to be clear about differences for machine differentiating of the types of relationships.

Table 1 has shown that Tillett's "shared characteristic" has no equivalent in *FRBR*, because it is considered unnecessary for the *FRBR* model. A "shared characteristic" is common information (e.g., title, language, subject, publication date, common origin, common author) that is shared among bibliographic entities and potentially can be used as an access point or a device to collocate otherwise unrelated entities using a common characteristic. "Shared characteristic" holds between an entity and otherwise unrelated entities sharing some properties or characteristics (Tillett 1991). It seems that *FRBR* and *RDA* removed "shared characteristic" in the taxonomy of relationships to simplify Tillett's taxonomy of bibliographic relationships.

After reading chapter 5 of the *FRBR* final report and a discussion with Barbara Tillett (2011), a question was raised about whether the "alternate relationship" in *FRBR* is derivative or equivalence. Tillett (2011) stated that

> the example of 'alternate relationship' in 5.3.4 in *FRBR* is intended to be limited to equivalence relationships, where the manifestations are issued simultaneously in more than one format or in two different places, but have the same content. There are also derivative relationship situations where the simultaneous publication in different places also has adjusted the content for local needs, so those are derivative relationships with one of the versions declared to be 'first.' The key factor is its equivalent if the content is not changed, and derivative if the content did change. However, in some applications, it may be useful to consider them all as one or the other, depending on the need.

Another important point is the "reconfiguration" relationship from *FRBR* that can be considered as "whole/part" or "accompanying," depending on what is being related.

Comparing Tillett's taxonomy of bibliographic relationships with *FRBR*'s taxonomy indicates that the majority of relationships are "derivative" (see column 3 of Table 1). In other words, the overall distribution of relationships shows that most bibliographic relationships fall in the "derivative" category. The broad-ranging nature of derivative works previously led Smiraglia (1992, 1994) to focus only on the derivative relationships and to propose a subdivision into seven subclasses as an extension to the taxonomy.

5.0 Conclusion

This study provides, as an alternative, a map for those who would like to see *FRBR*'s taxonomy of bibliographic relationships from the viewpoint of Tillett's taxonomy of bibliographic relationships. Those who conduct research on *FRBR* bibliographic relationships and need to map these relationships based on Tillett's taxonomy in order to review previous studies and to draw comparisons with them, can use the map provided in the current research.

Comparing these two taxonomies reveals that there is significant congruence between them, partly due to the fact that the *FRBR* bibliographic relationships were inspired and influenced by the conceptual and theoretical structure of the bibliographic relationships defined and categorized by Barbara Tillett. It should be noted that there is not complete congruence between them, because Tillett's shared characteristic has no equivalent in *FRBR*, and descriptive relationships are not explicitly identified in *FRBR*. However, descriptive relationships are considered part of the "subject" relationships. Column 3 of Table 1 demonstrates that derivative bibliographic relationships have a wide range of relationships in the bibliographic universe. This is also supported by previous studies conducted by Tillett and Smiraglia. This is the reason why it deserves particular attention.

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