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, using 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