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Conceptualizations of the Cataloging Object:
A Critique on Current Perceptions of FRBR Group 1 Entities

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SUMMARY. Libraries face a double challenge in the digital age: both the describing framework and the describing object are under change. FRBR attempts to generate a coherent theory and yield a new Paradigm of cataloging. This study deploys current conceptualizations of the FRBR Group 1 entities within the FRBR models family with a view to semantic interoperability. FRBR cannot be considered as simple metadata describing a specific resource but more like some kind of knowledge related to the resource. This study reveals that there are different perspectives of what is introduced by FRBR as the cataloging object in the context of various interpretations of the model, namely RDA, FRBRization projects and $FRBR_{OO}$.

KEYWORDS. Resource Description, FRBR Group 1 Entities, FRBRization, RDA, FRBRoo, Cataloging Object, Semantic Interoperability

BACKGROUND

The theory and practice of cataloging has been oriented to describing the physical objects which libraries actually possessed in their collections. Nowadays the main issue is to ensure access to and interoperability of the available content regardless its location. In addition to this change of services' orientation, the object of cataloging itself has changed. From the stable form of a printed book we passed on to objects of multiple electronic formats where a computer file's migration from one format to another is easy and in many cases fundamental for the preservation of the resource itself. Hence, libraries face a double challenge in the digital age. Not only the describing framework changes, take for instance the focus on ranking instead of sorting, but also the describing object changes as well, having to deal with the new structures of the digital objects.

Having to deal with the new status while making the best out of existing data, increasing its formal expression and reducing the cost of cataloging the transition from "copy cataloging" to "linked data" was inevitable. The introduction of "Library Linked Data" [1]

by W3C took place in the beginning of the second decade of 21st century, almost a century after the Library of Congress invented "copy cataloging". In this rapidly changing environment, old theories and practices seem not enough to fit the new world. New practices, rules and schemas have to come out to fill the gap.

In this context, conceptual models seem to be a prerequisite in order to define the cosmos within which specific schemas and rules obtain their meaning. Conceptual models are *mutatis mutandis* the Constitution, i.e. the Fundamental Law, providing a framework for the specific laws. What happens in the bibliographic universe is that we find ourselves among many metadata standards, which guide us with specific rules answering to "how to" but without providing a coherent theory to build upon the "why". Functional Requirements for Bibliographic Records (FRBR) [2], as a conceptual model itself, attempts to generate a coherent theory and yield a new Paradigm [3] of cataloging.

Main focus of this study is to examine the conceptualization of FRBR Group 1 entities considering various perceptions of what constitutes the cataloguing object, meaning the different aspects of what is perceived as the intellectual or artistic endeavour, within the FRBR models family with a focus on how these different perceptions affect semantic interoperability. The study deploys between three main axes. The first one deals with FRBR Group 1 entities itself, the second one with library metadata as expressed through Resource Description and Access (RDA) [4] and FRBRization projects. And finally, the third one is related to (meta)data of Cultural Heritage Institutions, an aspect of which is the harmonization of FRBR to CIDOC-CRM which led to $FRBR_{OO}$.

FRBR GROUP1 ENTITIES: A CRITIQUE

A significant innovation in the FRBR's conceptualization is the first group of entities where a clear effort is being made of dissociating the description from what was its focus up-to-now, namely the object in which the work is embodied. Equally prominent is the attempt to outline a hierarchy that leads the description from the abstract notion (Work) to the specific object (Item).

In this section a general critique to the FRBR Group 1 entities itself is delivered. The thought behind this critique is more towards stimulating discussion on some aspects that may lead to controversial interpretations and implementations rather than arguing on the model's fundamental principles. Of course isolating the four entities from the set is risky. Group 1 entities are part of a model and they do not stand independently, but, because they constitute a coherent subunit, they could be studied separately as long as the set properties are taken into consideration.

A conceptual model is abstract and as such "*it is open to various interpretations and implementations*" [5]. We examine some of the ambiguous sides of it which may lead to contradictory results. As Smiraglia states "*In the online catalog of the digital age, it is time to put away our bibliographical blinders, and instead to turn to a concept of resource description that engages the resource fully so as to better permit its intellectual*

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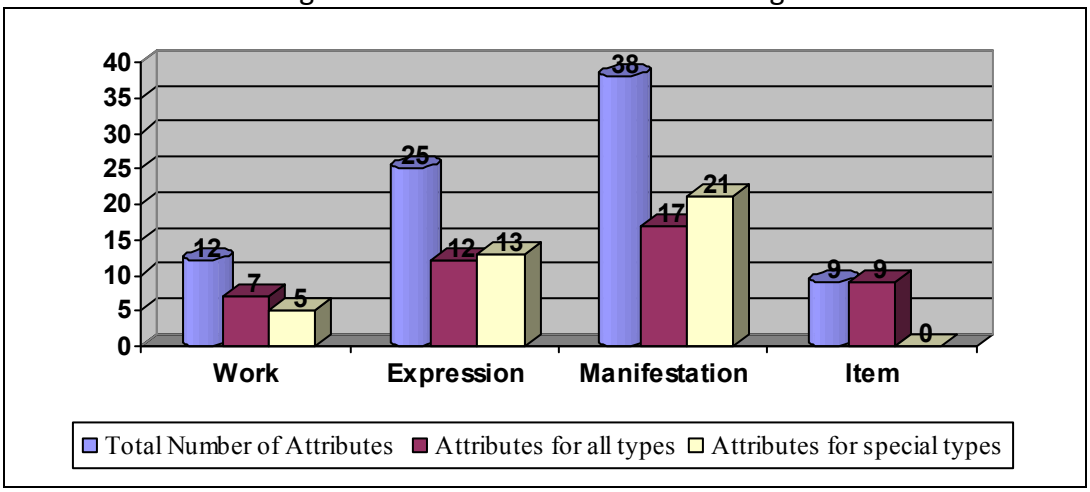
exploitation."[6]. Well, there is no argument that the introduction of Group 1 entities was an innovative move within the spirit of FRBR but it seems that they do not go all the way down the road. Any attempt for better intellectual exploitation of the resources is limited as long as we stay faithful to the "objects" and the structures they already carry. Trying a comparison between the attributes' distribution among the entities reveals that Work has 12 attributes, Expression 25 and Manifestation 38 (see Figure 1). It looks as if FRBR still have much to say about what is already known and well-established but less for the newcomers. If a user is asked to describe Shakespeare's "Hamlet" it is highly unlikely that she mentions any details concerning the physical aspects of the publication. Disregarding this fact, library catalogs dedicate most of their fields to this direction.

Figure 1: Attributes distribution among entities



The description used to be material-centric while in the digital era tends to become object-centric. Another issue that strengthens our suggestion is that the only autonomous entity of Group 1 is Manifestation. Work, Expression and Item attributes are not enough by themselves to identify the entities but must be linked to Group 2 entities to carry a definite meaning. Manifestation attributes are adequate to identify an entity without enriching it with any further information concerning its broader context of creation.

The next very significant change that FRBR brings is the reverse order of description. Instead of describing the physical object, the kernel became the abstract notion of the Work. From this point on the problems of inheritance come into question. Renear and Choi suggest that, despite the initial plausibility of this widespread view, such inheritance does not exist in the model and is not compatible with the general FRBR modeling strategy [7]. Taniguchi also has doubts about the inheritance seeing it from an opposite point of view, i.e. when attributes "*of the manifestation are needed to fulfil user tasks related to the work and expression*" and calls this "*upward pseudo-assignment*" [8].

Problems of inheritance representation are also allocated in the area of "*Whole/Part Relationships at the Work Level*". According to the FRBR text (section 5.3.1.1, p. 67 [9]) there are two categories within the whole/part relationships: dependent and independent, but "*it is assumed that in both cases, the work that represents the whole is an independent work*." This is why in every collection of works we count the number of

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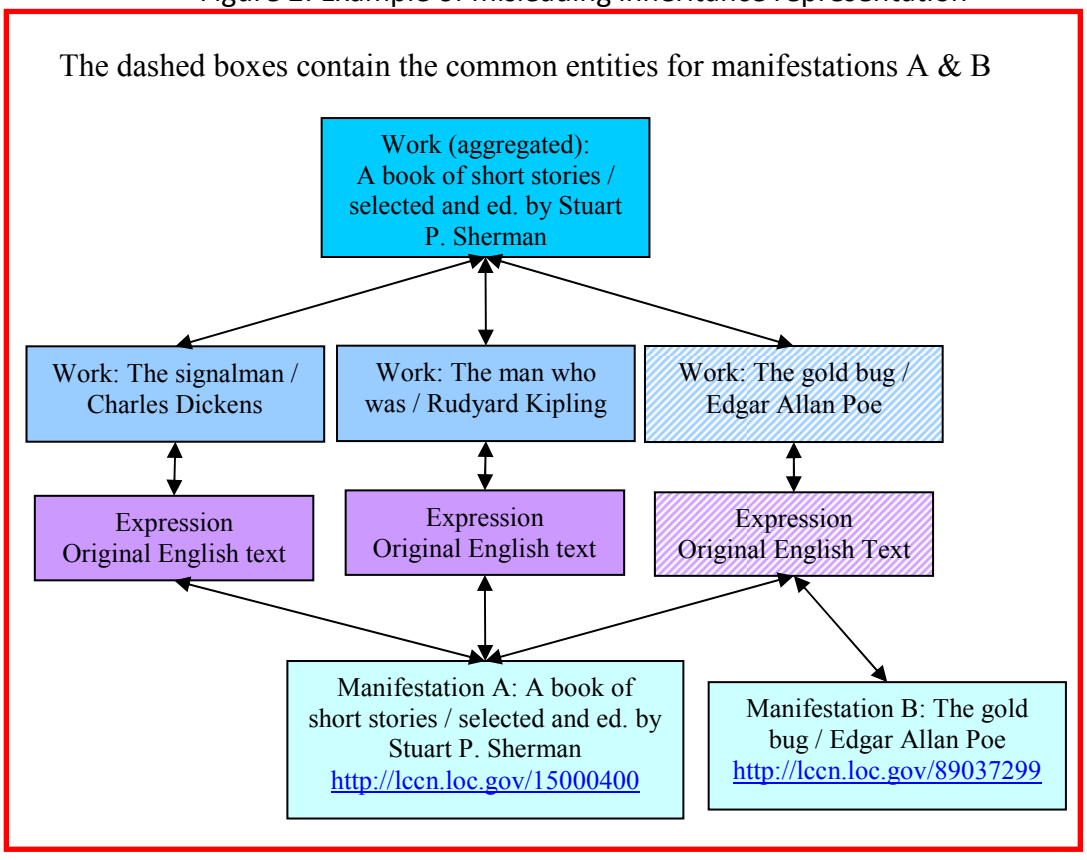
individual works plus one for the aggregated work. This could lead to a misleading interpretation which I will try to outline via an example using real records from the Library of Congress.

I select two different books: the first one is titled “A book of short stories, selected and ed. by Stuart P. Sherman” (Manifestation A, LC permanent link http://lccn.loc.gov/15000400) in which is contained -among others- [10] the novel “The gold bug by Edgar Allan Poe”. The second book is titled “The gold bug” and contains only the novel “The gold bug / Edgar Allan Poe” (Manifestation B, LC permanent link http://lccn.loc.gov/89037299). It is obvious that we have two Manifestations, A and B, which share a common Expression of a common Work.

Figure 2 outlines the outcome of following the inheritance for the aforementioned case. To elaborate on the illustration, at the bottom of Figure 2 we find the two manifestations previously described. As illustrated in the two dashed boxes on the right, both manifestations share the Expression (original English text) and the Work description (The gold bug by E.A. Poe). However, the resulting connection between Manifestation B and the aggregated Work shown on top of Figure 2 seems to be inconsistent since it is already established that manifestation B is not connected whatsoever with the specific aggregated work. It is inevitable that, following the inheritance, Manifestation B is presented as embodying the aggregated Work. Evidently, at this point, some kind of… “debugging” seems appropriate.

Figure 2: Example of misleading inheritance representation



FRBR GROUP 1 ENTITIES IN THE LIBRARIES' CONTEXT

"*Once the specification is completed, the most difficult activity begins—the implementation of the specification. And this is where most people who write about standards —and most standards organizations— fail*" [11]. FRBR primarily aims at libraries and their catalogs but without providing a clear implementation guide; only a general framework. Thus, specific schemas and rules must be developed in order to carry out the implementation. Two different approaches of implementing FRBR Group 1 entities are indicated here. First is how they are implemented and specified by libraries using RDA and, second, how Group 1 entities are treated in the context of FRBRization projects. This distinction is triggered by the fact that in the first case original cataloging takes place, while in the second case, FRBRization projects deal with the mandate of massively managing existing records.

RDA

At first glance RDA seems completely aligned with the FRBR inasmuch RDA borrow their entities, attributes and relations from FRBR. FRBR conveys a new Paradigm and, in spite any kind of adherence they experience to soon-to-be obsolete practices, they do set the cataloging object on a new basis. The question is whether RDA takes a step forward with this new Paradigm.

"*Because the notion of a work is abstract, it is difficult to define precise boundaries for the entity. The concept of what constitutes a work and where the line of demarcation lies between one work and another may in fact be viewed differently from one culture to another*" (FRBR, p. 17). The previous statement raised expectations for RDA in terms of defining and specifying the entities. However, contrary to these expectations, RDA did not offer any further specifications leaving this issue at one's own discretion to deal with.

A key point at the visualization of FRBR structures is that we have to deal with a graph (with its mathematical meaning) and not with a simple tree view. As Pisanski and Žumer state "*true FRBR displays should not really be hierarchical but in fact have network structure, not unlike the one found in world wide web*" [12]. Towards this direction, the Resource Description Framework (RDF) triples seems suitable to express such a structure because "*unlike information represented hierarchically in typical XML documents, resources published as Linked Data allow information to be freed from use-case-specific hierarchies and thus available for unexpected reuse*" [1]. Here arises a crucial question: how a graph (still referring to a mathematical graph) could be described using plain text? Does RDA, as cataloging rules, offer this potential?

The following example attempts to shed a light on the previous question. Let us consider the "Iliad" of Homer using a specific Manifestation (LC permanent link http://lccn.loc.gov/98040340) which embodies two different Expressions of the Work "Iliad". The first Expression is the ancient Greek text and the other is its English translation by A.T. Murray. Figure 3 represents graphically the case. Starting the description from the Work level and following the Greek Expression we end up to the Manifestation. Following the English Expression, we, again, end up to the same

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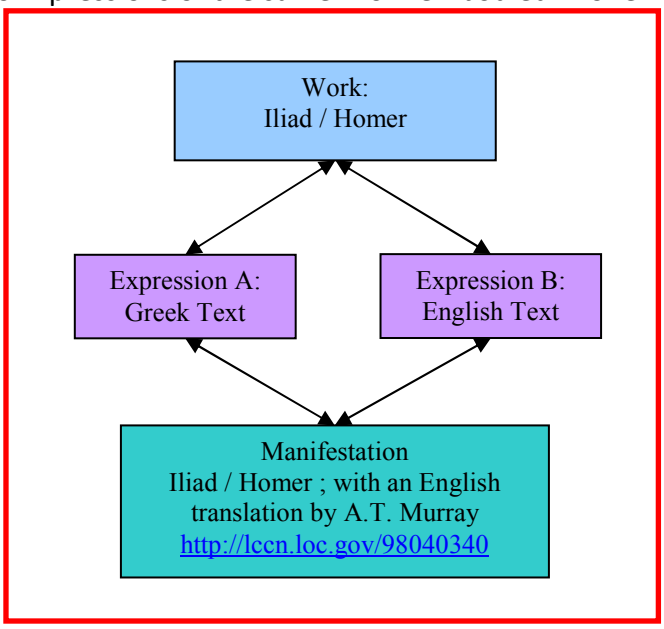
Manifestation. In a text view the Manifestation would have to appear below every Expression. This means that we would have to either describe the same Manifestation twice or create a link to declare that it is the same.

RDA seems to be skipping the problem of top-down description while insisting on a Manifestation-centric approach where the kernel of description remains the object. The resource is treated as a tangible object and, therefore, its description aligns to this and does not try deconstructing it to its abstract components. Following this it is safe to state that the three ways of description contained in rule 1.5 [13] of RDA have the same starting point as AACR, meaning the Manifestation. Of course we have to admit that the description of Expressions and Works are more coherent and consistent within RDA.

Figure 3: Two Expressions of the same Work embodied in one Manifestation



FRBRization

FRBR offers a contemporary perception of the bibliographic data, but, as I have already stated in the Background section we have to make the best out of existing data and reduce the cost of cataloging. As Rajapatirana [14] states, "*re-cataloguing is not an option*". "*The main challenge for libraries is, therefore, the use of existing bibliographic records in order to provide value added services. This decision leads to inventing methods which will allow the reconstruction of existing data to new formats.*" [15]. FRBRization is defined as "*the processing of existing information in order to convert it or interpret it according to the FRBR model*" [16]. Babeu supports that the terms *FRBR catalog, FRBRized system, FRBR implementation* are used interchangeably in order to describe the process but without them bearing a clear meaning [17]. In this section an attempt is being made to discuss how FRBRization projects treat Group 1 entities. Manifestations and Items will not be discussed here in detail since their identification is trivial because these entities are present with very explicit ways in the existing records.

"*Starting point for any FRBRization effort is the identification of the bibliographic records which represent a Work and then the identification within this group of the potential Expressions and Manifestations. The identification of Works is the most critical step because it engages the whole database and defines all subsequent steps.*" [15]. In most of the approaches an author-title key is constructed and clustered using various methods [18]. The existence of Uniform titles plays a key role for the effectiveness of the procedure as the Uniform Title fields are the only clue, contained in MARC records, which is close to the notion of a Work. An important issue is that "*MARC records have a structure that is tailored to publications that contain a single work/expression*" [19]. An additional issue is that even in the cases where the entities could be identified "*the more difficult part of the process is to determine the relationships between the entities that are identified*" [ibid.].

On the other hand the identification of the Expression takes place only in the subset of records which constitutes the Work. Yee [20] says that elements to identify Expressions are present in the bibliographic record but "*they were designed to be read and comprehended by human beings, not by machines. Thus, the discriminatory data is usually not normalized*". Bennett argues that sometimes "*forms of expressions constitute subtler variations in content that may not be discernable from data in the records*" and in "*these cases, manual inspection of the physical items of the expressions are required*" [21]. Aalberg states "*The identification of Expressions is highly problematic because relevant information is distributed over several fields* […]. *Much of the information needed to identify expressions is, additionally, often present in an inconsistent way*" [22]. Finally Hickey and O'Neil support that "*We spent a great deal of time experimenting with ways to detect expressions automatically and how to do the best clustering possible to bring variations of a work together. Finally, though, we decided that a simpler approach would be both easier to scale to tens of millions of records and easier for librarians to understand*" [23].

Of course the quality of results from FRBRization procedures "*depends on various important factors, such as the quality and consistency of bibliographic records, local cataloguing practices, cataloguing rules and formats*" [24]. At this point I have to make it clear –in order to avoid generating any false impressions– that, by implementing the FRBRization process, the production of genuine FRBR records is highly unlikely. The reason behind this suggestion is no other than the fact that FRBR records a series of elements (entities and attributes) which were not foreseen within the traditional practices of cataloging bibliographic data. Such an example constitutes the Work's Date of Creation, which is not recorded in a traditional description, since Work was not introduced as an entity in former schemas/ standards.

Additionally, it is not always certain where and how some information contained in existing traditional records can be mapped into FRBR attributes. In FRBR Appendix A there is a mapping to ISBD (and UNIMARC where applicable). In this mapping the logic is closer to human reading but not towards creating an automatic conversion algorithm from MARC to FRBR. For example, there is an attribute about Date of Publication but how will this date be coded. To insert values to the attribute of the Manifestation's Date of Publication we have to choose from the fields described as follows (FRBR, p. 124-5):

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- *Date of publication, distribution, etc.*
- *Notes on the publication, distribution, etc. area - [note relating to the date of publication/distribution]*
- *General processing data - publication date (UNIMARC 100 a/8-16)*

The first field (UNIMARC field 210, MARC 21 field 260) is semi-coded, the second of them is free text (Notes fields) and the third one (UNIMARC field 100, MARC21 field 008) is strictly coded. The information contained in these fields is recorded in various ways because it serves different needs.

The attempt to fit FRBR entities into MARC by mapping some of the attributes in some MARC fields is quite risky because, in this way, one of the most significant characteristics of FRBR, that is the ability to differentiate one entity from another, perishes. Putting the elements loosely in the MARC fields and using the same field for the same attribute from different entities (for example 045 field of MARC 21 for recording the date for Work, Expression and Manifestation [25]) we just enrich these records with more information (more or less ambiguous) but without them being aligned with the rationale of FRBR. Consequently, the machine-readable schema turns to be of major significance since FRBR was developed as a model but without defining a machine-readable schema. The effort to adjust them to existing schemas, such as MODS or MARC, is rather inefficient. A new schema should be introduced to fit the requirements of the new model [26]. If it is going to be the one already under consideration for the RDA by ALA, it should be released with a detailed documentation like MARC's.

FRBR GROUP 1 ENTITIES IN A WIDER CONTEXT

Primarily FRBR is addressed to libraries and their OPACs but it is unworthy wasting this revolutionary model just for the sake of a more sophisticated display of library catalogs. FRBR could do better than rearrange the alphabetical order of the catalog and cluster traditional bibliographic records in broader classes. FRBR's new Paradigm could be used, in a broader sense, in the context of the semantic web. Gradmann notices: "*I proposed having a closer look at FRBR as a means to overcome the structural incompatibilities that are the fundamental barrier to cross when attempting to free librarian bibliographic data from its golden catalogue-cage and make it systematically available on the WWW*" [27].

For the FRBR Working and Review Groups the distinction between semantics and syntax is clear; and FRBR does not cope with the latter. But, as Duval states, "*It is important, however, to keep syntax and semantics separate as far as possible*" but, at the same time, «*Agreements about both are necessary for two communities to share metadata. Two communities may agree about the meaning of the term title or creator or identifier, but until they have a shared convention for identifying and encoding values, they cannot easily exchange their metadata*» [28]. It is a true need to find a way that allows the communication of library data –through the concepts of FRBR– in the context of the semantic web. One of the key issues here is the exchange of knowledge which underlies in the structures of a FRBR catalog rather than a simple –as simple it might be– enumeration of the resources a library holds. In this context, a library's catalog could be treated not just as metadata which lead to the resource holding the actual information,

but as data which themselves carry answers. For example there should be no need for the user to consult a certain book in order to reveal when and in which context Shakespeare wrote "Hamlet" if this could be answered directly either from the information held in a library catalog or from another software agent which uses –among others– data from library catalogs to find the answers. RDF seems a suitable framework [29, 30, 31, 32] for such a hypothesis to be built upon. Additionally, initiatives like Library Linked Data [1] are a necessity in the area of metadata integration.

FRBR$_{OO}$

A very interesting collaboration has been established between the communities of libraries and museums in order to bring closer the views of "memory institutions". The harmonization of the FRBR model with CIDOC-CRM resulted to FRBR$_{OO}$ [33]. According to the authors of FRBR$_{OO}$ "*It is important to keep in mind that the aim is not to transform the IFLA FRBR model into something totally different or better, nor of course to reject it or replace it – but to express the conceptualisation of FRBR with the object-oriented methodology instead of the entity-relationship methodology, as an alternative*" (FRBR$_{OO}$. p. 11). In this section I analyze briefly how FRBR$_{OO}$ treats FRBR Group 1 entities.

First remark is the reconstruction of Group 1 entities and the increased number they resulted to. According to the list of mappings provided in chapter 3.3 of FRBR$_{OO}$ the four entities of Group 1 split into nineteen entities. Specifically, there are nine entities in FRBR$_{OO}$ that are mapped into the Work entity, six entities mapped into the Expression entity, two mapped into Manifestation and two into Item. For the Work and Expression the great majority of these entities are just specializations of the FRBR entities. There is a general notion that fits the FRBR Work (F1) and its subdivisions to more explanatory notions such as Container Work (F16), Aggregation Work (F17) and more. These subdivisions are not present in a flat line but they are parts of a hierarchy where a Work may contain either an Individual Work or a Complex Work and so on. FRBR$_{OO}$ treats Expression in the same way. It is expected that the conversion of data from FRBR$_{OO}$ to FRBR is easy in the aforementioned cases since many FRBR$_{OO}$ entities point to just one FRBR entity. The reverse procedure is certainly more difficult but not impossible –at least not always– for in some cases an entity's specific category can be deduced by looking at an entity's individual elements/attributes. For example if an entity carries data in Serial fields we can assume that the FRBR entity should be mapped to the FRBR$_{OO}$ Serial Work (F18) entity.

Nevertheless, FRBR$_{OO}$ introduces two new entities which are not just a further subdivision of the entities given by FRBR but two brand new types of resources. The first one is the Complex Work which is defined as "*This class comprises works that have more than one work as members. The members of a Complex Work may constitute components of the overall concept or be alternatives to other members of the work.* […] *As a Complex Work can be taken up by any creator who acquires the spirit of its concept, it is never finished in an absolute sense*" [FRBR$_{OO}$, pp. 44-5]. So different versions of a specific intellectual endeavour delivered in no particular temporal order are treated as a Complex Work.

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The second entity is the Manifestation Singleton which is defined as "*This class comprises physical objects that each carry an instance of F2 Expression, and that were produced as unique objects, with no siblings intended in the course of their production. It should be noted that if all but one copy of a given publication are destroyed, then that copy does not become an instance of F4 Manifestation Singleton, because it was produced together with sibling copies, even though it now happens to be unique*" [$FRBR_{OO}$, p. 39]. Manifestation Singleton leads to the Item Singleton. Manifestation Singleton is very useful for modeling the production's procedures as long as it allows the distinction between the Manifestation which is the result of an industrial process (for example a book) and the Manifestation which is a unique carrier of an Expression (such as a manuscript).

Another change was introduced by the $FRBR_{OO}$ concerning the perception of Aggregated Works. "*The $FRBR_{OO}$ solution considers that the Work itself does not contain any other work. Rather, the containment happens at the Expression level, the signs.*" [34]. This new perception about Aggregated Works comes in contrast with FRBR where a Work may actually contain another Work.

Further critique on FRBR suggests that it "*envisions bibliographic entities as static, ever-existing things that come from nowhere, and overlooks the complicated path from the initial idea for a new work in a creator's mind to the physical item in a user's hands*" ($FRBR_{OO}$, p. 13). Since FRBR "*is not event-aware.*" [ibid.], it gets involved with neither the process of creation nor the process of production of the resource. This is where $FRBR_{OO}$ introduces another novelty –one, though, not solely or strictly related to Group 1 entities– which grant FRBR the ability to model not only static entities but also processes. The harmonization of FRBR with CIDOC leads to the ability of modeling and expressing "dynamics" in the context of a procedure which, up to this point, has been incorporating the static description and representation of the object in hand. In other words, $FRBR_{OO}$ "*makes available to FRBR the general model of historical events and context of creation contained in the CRM*" [ibid.].

DISCUSSION

As shown above, FRBR sparks a plethora of interpretations in the area of memory institutions and computer science. In this study I focused on the area of how the cataloging object is perceived in terms of semantic interoperability and, to be more precise, how Group 1 entities are treated within the FRBR family. In order to achieve semantic interoperability the syntactic interoperability is an undisputed prerequisite but, as I have already argued, this has not yet been established. This fact does not affect the course of this study because syntactic interoperability mainly involves low level communication, i.e. technical aspects, between the systems.

One of the most innovative ideas that underlies within the FRBR is that the resource is not an indivisible set where a Work ends up in the item in hand; instead, it mainly comprises of many fragments and factors. A resource, especially in the digital environment, tends to comprise of fragments which can, more or less, be treated

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independently. In fact these fragments could be conceived as any notional part of the set. At present, however, approaches like the one presented by Falquet et al. –where hyperdocuments are created automatically using knowledge originating from several hyperbooks [35]– seem to be foreign to current library practices. Even if we do not adopt such an overwhelming perspective, the deconstruction of the resource to its logical/functional components is essential. Let us take for example a web page of a news site. In many cases what appears on the computer screen is unique, appearing only once. One frame shows the latest news, another plays advertisements which take into consideration the location of the user and change at every page reload and in the main frame appears the main article. This leads to us thinking that the issue is not about describing an indivisible set but the description, as well as the position and function, of its component parts. Thereby a more precise and functional description may occur concerning both the set and its component parts.

Manifestations embodying more than one Expression played a key role to this analysis. I argue that they constitute a perfect test bed to strengthen my suggestion that cataloging is still object-centric and does not deconstruct the resource to its logical components describing each of them separately and bringing them together upon users' request. Catalogs have to overtake not only what Smiraglia calls *bibliocentric* [36] but also any object-centric approaches in order to take cataloguing theory and practice one step further. This deconstruction must primarily consider the notional components of the resource in order to make computer processing more efficient. The data (metadata in the context of the catalog) is not the ultimate goal of the description but something that could set the basis for building upon it value added services. These functions could either serve the catalog itself by enriching its potential or the catalog could offer its data to external agents for further exploitation.

Traditional library catalogs used to describe and manage what a library possessed. As Gradmann [37] states:

> "*The first of the initial observations that motivate a closer simultaneous look at FRBR and Semantic Web technology is the fact that bibliographic information originated by libraries still largely remains buried within the 'hidden Web'–and that, as long as different layers of information remain blended in bibliographic records, the non-librarian world probably is better off without these thousands of identical bibliographic records pointing simply to different items or manifestations and thus 'polluting' search engine results with massive amounts of redundant information*."

The point here is not to just make available to web search engines the bibliographic records of specific Manifestations which now hide beyond OPACs [38] but to reveal the notions, such as Works, which "*consist of both semantic and ideational content*" [39], hiding behind these Manifestations. These notions, like Works and Expressions, are abstract, thus not produced necessarily by considering a specific resource. As quoted from FRBR "*Attributes, as they are defined in the model, generally fall into two broad categories. There are, on the one hand, attributes that are inherent in an entity, and on the other, those that are externally imputed*. […]. *Attributes inherent in an entity can usually be determined by examining the entity itself; those that are imputed often require reference to an external source*". (FRBR, p. 31). This leads to the basic assumption that all

the characteristics of Work, as well as some of the Expression, are externally imputed. These two entities are artificial fabrications; they do not actually have a physical status. This is why they cannot be considered as simple metadata describing a specific resource but more like some kind of knowledge related to the resource. In order for this knowledge to become useful in the context of the semantic web and to enable information interoperability and integration every entity should acquire a URI regardless any problems this holds for the Work entity [40].

At this point, considering all the above, we may accept that general entities, such as Works and Expressions, especially for classical Works, may not be a task for every library to carry out. Many catalogers would agree that this is the job of an expert, not in cataloging but, from each discipline involved. This ability to use the same data in different environments is a key issue in the context of interoperability in which libraries could be proved an asset as part of a wider interdisciplinary effort. Besides, "*Libraries gain credibility when they can offer organization of the full spectrum of resources of interest to their researchers*" [41]. This cannot be achieved simply through a traditional catalog which gives access to the full text, meaning text, images, video etc. To fulfill this goal requires the development of a catalog which could be used as a "tool" to communicate information, even knowledge, in a broader and wider sense. This kind of catalog would inform the user not only whether a library holds a copy of "Hamlet" but also when and where "Hamlet" was written, i.e. the historical context, who Shakespeare was, where Denmark is, just to name a few of the possibilities. All this information is already out there and library catalogs could not just ignore it. It is their duty to build upon this information and help towards creating new. I suggest this is the future through semantic web and Linked Data and libraries should be a part of it preferably not just as observers but as moderators.

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