A Metadata Case Study for the FRBR Model Based on Chinese Painting and Calligraphy at the National Palace Museum in Taipei

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Abstract

In 1998, the Functional Requirements for Bibliographic Records (FRBR) model which is composed by four entities (work, expression, manifestation and item) and their associative relationships (primary, responsibility and subject), was proposed by the International Federation of Library Associations and Institutions (IFLA). The FRBR model can be deployed as a logical framework for proceeding metadata analysis and developing metadata format. This paper presents a case study of the National Palace Museum (NPM) in Taipei to examine the feasibility of the FRBR model. With the diversified needs from various content communities, an analysis model is introduced at Academia Sinica to refine and enhance the FRBR model, in order to meet metadata requirements across diverse knowledge domains, which is composed of three facets (function, subject domain, data type and style) and one supportive community layer.

Keywords: *Metadata, IFLA, FRBR model, Chinese painting and calligraphy*

1. Introduction

Catalogue has been used traditionally as a means for the description of collections in library and museum communities. As the world moves into new era of digital library, metadata analysis, with its inherent dynamic and diverse features, becomes a new technique to deal with networked resources which are often in lack of structure. In order to clarify the process of metadata analysis, cconceptual models could be used to help developing metadata framework, for example, the Functional Requirements for Bibliographic Records (FRBR) model has been applied to descriptive and rights-management metadata [1], the Harmony ABC model is designed to support multimedia metadata [2].

The National Palace Museum (NPM) in Taipei is the biggest museum of precious Chinese culture collection in the world, most of its collection is inherited from the imperial court of Ch'ing Dynasty. There are over 10 thousands pieces of Chinese painting and calligraphy alone in its collection which includes many rare Sung (AD 960) and Ming (AD 1368) artwork. Since Chinese painting and calligraphy often appear together and are created by similar means, they are often regarded as sister arts. When combined with poetry and the seal, the work is complete in form and spirit to create one of the enduring features of Chinese painting. Because of the uniqueness of the above nature, Chinese collection differs greatly from its western counterpart both in content and presentation. In this paper, we use a case study approach to examine the feasibility of the FRBR model for the metadata framework on Chinese painting and calligraphy at the NPM .

2. Practices of the FRBR model

The FRBR model was proposed by the International Federation of Library Associations and Institutions (IFLA) in 1998, and caused much discussion especially in digital library domain. It is deserved to be explored about applying this model for digital library systems and services. This section will review the FRBR model and discuss the application of FRBR model to two selected cases. Then, the practice of FRBR

model on Chinese painting and calligraphy will be described and discussed.

2.1 The FRBR model

The FRBR model is the research result of the IFLA Study Group on the FRBR using entity-relationship（ER） modeling to build up a conceptual model for bibliographic records. The model was approved by the Standing Committee of the IFLA Section on Cataloguing in 1997. There are four entities in the model including WORK, EXPRESSION, MANIFESTATION, and ITEM. There are also three relationships, namely, primary, responsibility and subject relationships associated with the four entities. These concepts are illustrated in Figure 1,2,3 [1]. WORK and EXPRESSION are defined to reflect intellectual or artistic content; MANIFESTATION and ITEM are to reflect physical form. In the case of subject relationship, the FRBR model represents a set of entities that serve as the subjects of works which may include concept, object, event, and place.

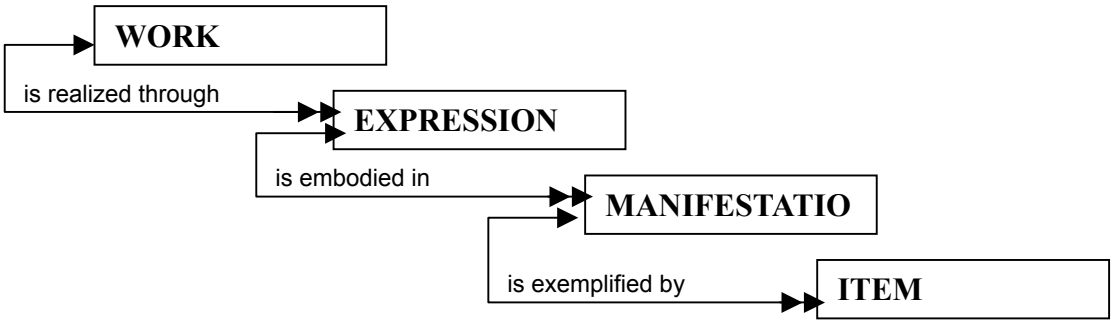

Figure 1. Entities and primary relationships [based on IFLA FRBR Figure 3.1]

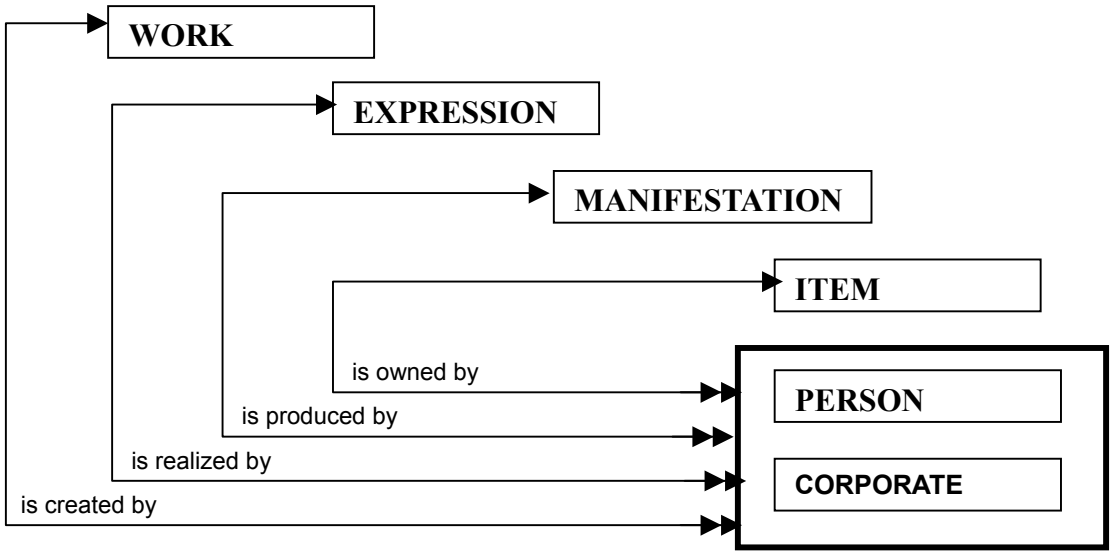

Figure 2. Entities and "responsibility" relationships [based on IFLA FRBR Figure 3.2]

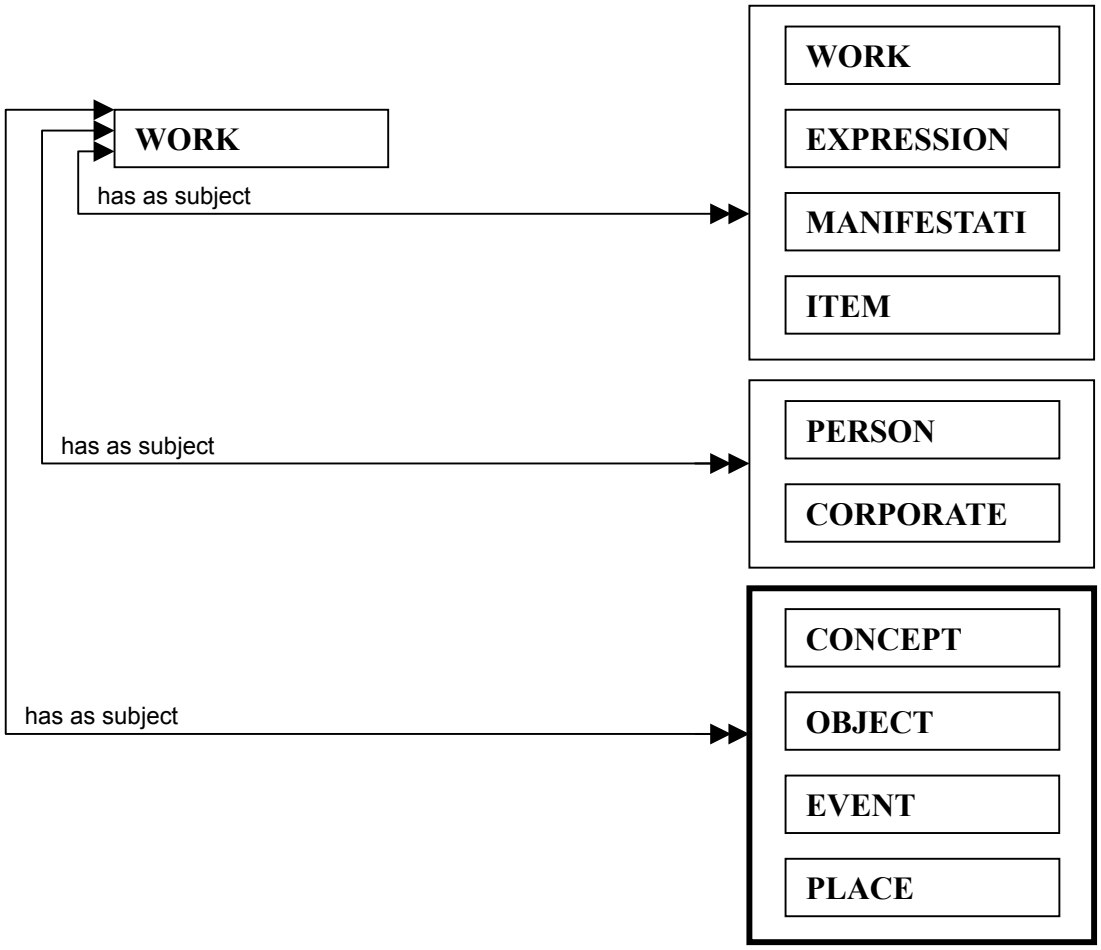

Figure 3. Entities and "subject" relationships [based on IFLA FRBR Figure 3.3]

Day [3] has conducted a research on the comparison of Dublin Core, FRBR model, and Common Information System (CIS) in terms of data modeling. Furthermore, He offers a comparative table of FRBR entity with proposed attributes and Dublin Core label, he also emphasized six types of relations from the FRBR model including *created by, embodied in, exemplified by, has a subject, realized by, and realized through relationships.*

2.2 Selected case studies

It becomes popular to adopt the FRBR model as a foundation framework for proceeding metadata analysis and developing metadata format. Two selected cases are chosen to review the state-of-the-art on the FRBR model practices in metadata development. One is the European CHronicles On-line（ECHO） Project in European Union IST Programme, and the other is the INteroperability of Data in E-Commerce Systems （INDECS） Project in Info 2000 Programme.

The ECHO Project aims at developing a long term reusable software infrastructure and new metadata models for films in order to support the development of interoperable audiovisual digital libraries. The project is funded by the European Community within the Fifth Framework Program which was launched in 2000 and its completion is expected by 2002 [4]. As the recognition of the fact, that metadata elements as presently defined, does not describe film information well, therefore, the ECHO Metadata Model has been developed to address the problem of devising new metadata elements to better describe film information as well as automating the metadata analysis.

The ECHO Metadata Modelling Report was generated in 2000 which was composed of two key parts: ECHO metadata model and ECHO metadata fields. Four entities of the FRBR model in the ECHO Project are interpreted into (WORK ↔ ***AV-DOCUMENT***), (EXPRESSION ↔ ***VERSION : VIDEO / AUDIO / TRANSCRIPT***), (MANIFESTATION ↔ ***MEDIA***), and (ITEM ↔ ***STORAGE***) as illustrated in Figure 4 [5]. Obviously, some points of explanation are in order:

- ECHO metadata model is built on the FRBR model with the corresponding AV-DOCUMENT, VERSION, MEDIA, and STORAGE entities to support digital films

archives.

- The construction of ECHO metadata fields are based on the media-centric approach for audiovisual resources metadata both in traditional and digital format.

The <in*d*ecs> project was established at the end of 1998 with support from the European Commission, which stands for ***in***teroperability of ***d***ata in ***e-c***ommerce ***s***ystems. It is recognized from the outset that metadata would be generated in diverse ways and by diverse players in the value chain [6]. The initial goal of the <in*d*ecs> Project focuses on intellectual property rights and the Project uses the FRBR model as a logical foundation and framework for metadata development and implementation. Some revisions are proposed, subsequently, to achieve the <in*d*ecs> Project's requirements as in the following:

- Instead of a clear division of MANIFESTATION and ITEM, the <in*d*ecs> Project integrates these two entities into one in order to meet the requirements of intellectual property rights.
- The <in*d*ecs> Project also emphasizes on the equal importance of information resource, agents and actions, time, and place in order to formulate the <in*d*ecs> model as in Figure 5 [7].

One may draw conclusion based on the above studies:

- It is useful to adopt the FRBR model as a base model of metadata framework for different purposes and clarify relationship among diverse entities, such as person, event, time, space, thing.
- The focus of the FRBR model is on functionality of material (i.e. thing object) for bibliographic records. Gill in the Research Libraries Group also finds the similar result [8]. It uses an integrated approach of surrogate-based and ER modeling to define relationships associated with entities to re-examine and enrich functions of library catalog. Then, other typical objects such as person, event, time, and space become supportive entities, therefore, they are not parallel to thing object in this model.

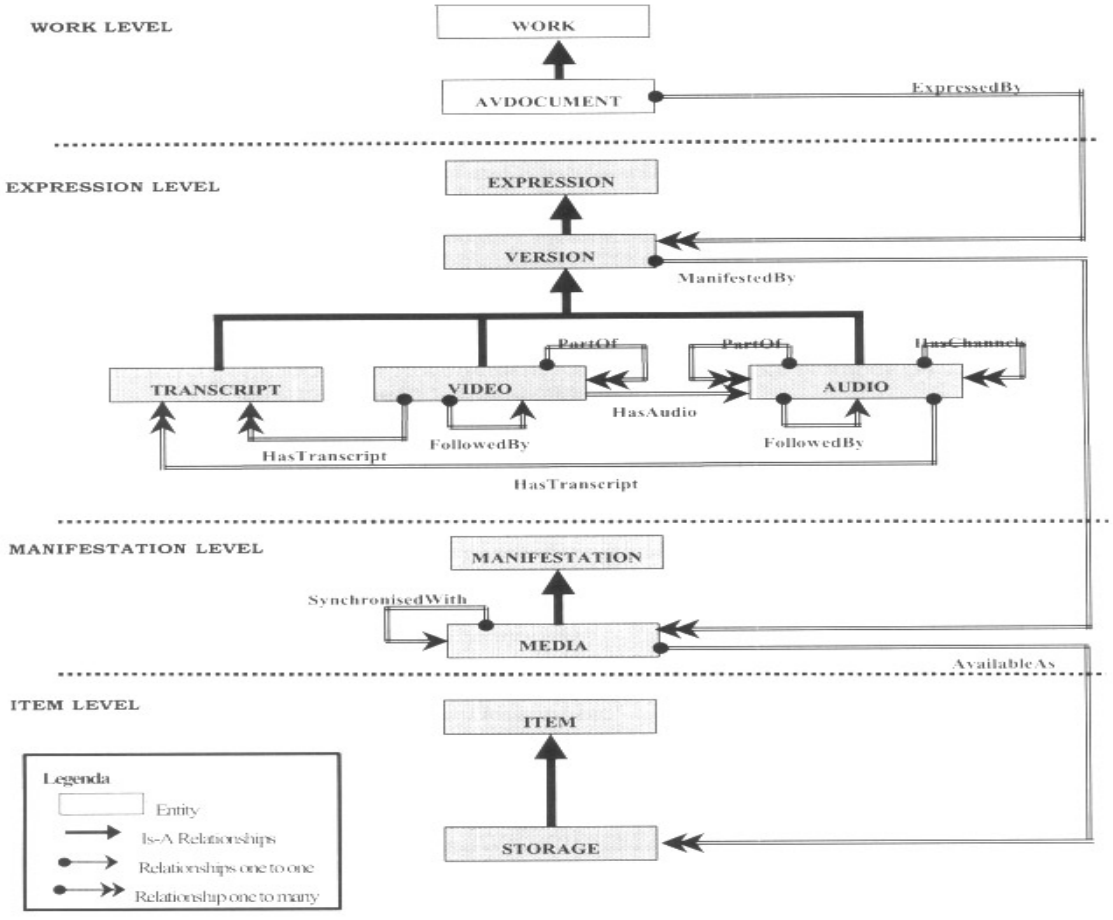

Figure 4. The ECHO metadata model

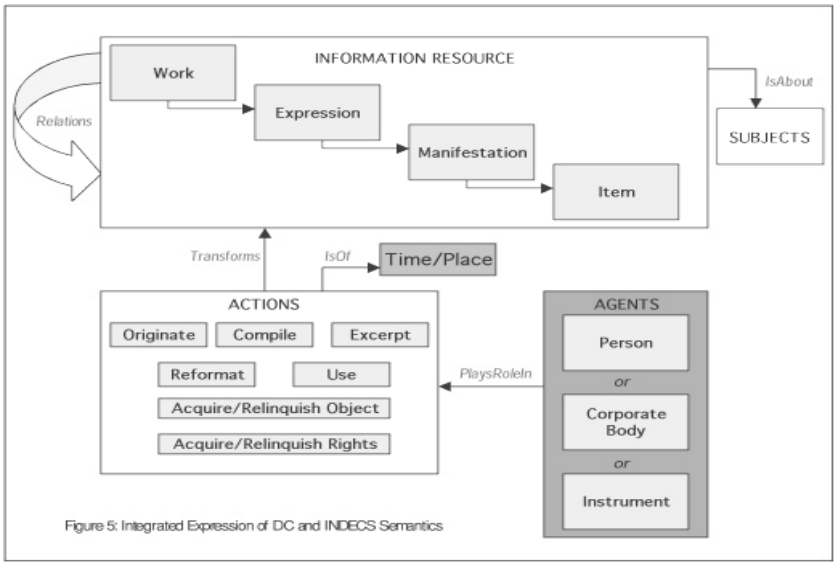

Figure 5. A high level model for DC and INDECS semantics

2.3 A case study of Chinese paintings at the NPM

We adopt a two-stage approach to apply the FRBR model to the metadata design for the NPM collection. Firstly, one develops an analysis process to meet the requirements of metadata for a particular community since different domain communities or institutions often have very diversified concerns. This analysis process is composed of three facets: *function*, *subject discipline*, *data type and style*. There is also a community supportive layer which would provide user requirements and mandate. Based on this analysis process, the Metadata Team in Academia Sinica can focus on the metadata requirements, for example, the NPM collection has the function needs of research, repair, archive, exhibition and system management. The data types have three different forms with different access management requirements which may have linkage needs with other databases (see Figure 6). Secondly, the FRBR model is applied to analyze the attributes and relations for each element as demonstrated in Table 1. We have found the following observations based on the FRBR model:

- The relation between works, expressions, manifestations and items can be illustrated explicitly.
- The distribution of metadata elements after the analysis for work, expression, manifestation, and item entities can indicate the completeness of metadata elements, which can be used further to detect whether metadata element is lost or required during the transformation from one entity to another.
- One can examine the elements' distribution to provide advices on re-organizing metadata elements for deletion, addition, or re-arrangement.
- Function of metadata elements for different purposes can be identified easily such as indexing keys, representation, etc.
- Two kinds of relationships should be re-examined. Logical relations among concepts in different knowledge domain are crucial for the proper structure determination; physical relational analysis will lead to consideration of choice for fundamental unit.
- Organizational workflow could also be re-engineered for different functional purposes.

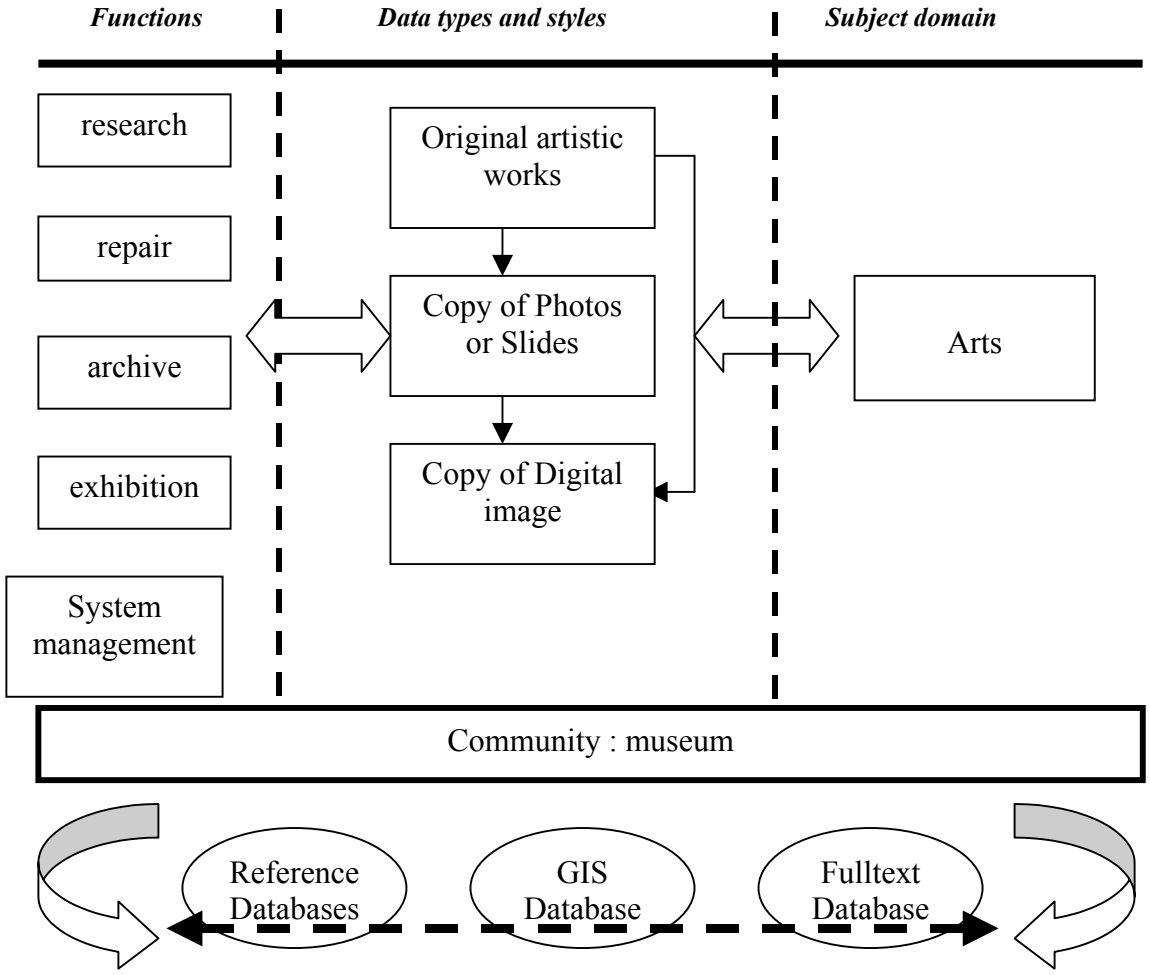

Figure 6. An analysis model for metadata at Academia Sinica, NPM collection as an example

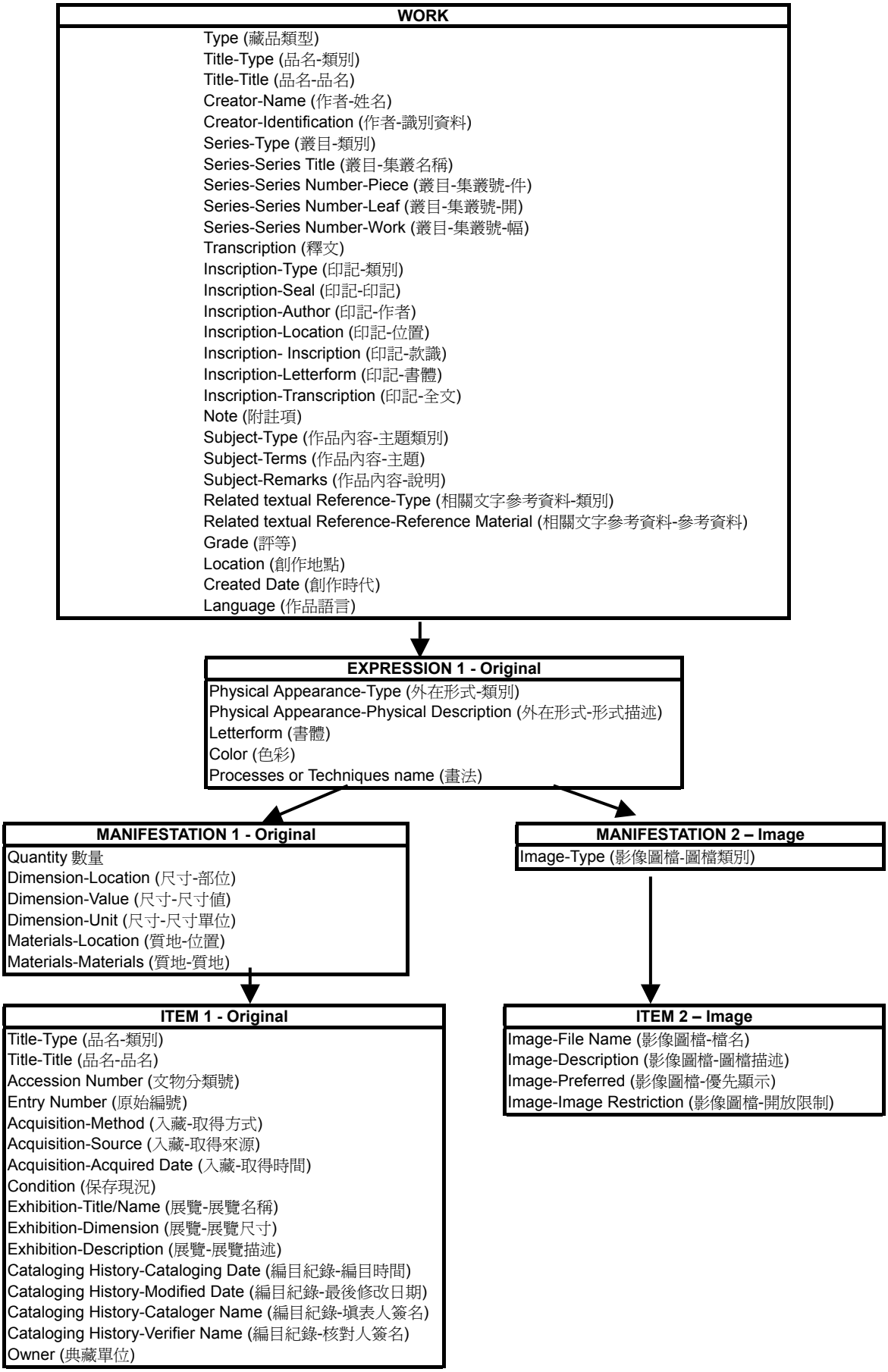

Table 1. A FRBR-based metadata format for the NPM

3. Findings and conclusion

The application of the FRBR model is thus proved to be an extremely useful conceptual model to clarify metadata elements and their relationships based on examination of the NPM practice. In this section, some findings will be presented for the FRBR model on IT system application, its focus and ambiguous distinction between entities.

3.1 IT system application

The FRBR model has been defined by four entities associated with three kinds of relationships (primary, responsibility, and subject relationship), however, the issue that how to implement them as a real IT system is not given. In 1995, Heaney [9] developed three models based on object-oriented (OO) approach for cataloging, and these models are text, publication, and copy model. According to Heaney's conceptual definitions, the text model is strings of sentences, the publication model of reformatting and republication is to cover attributes of publication, and publication is a particular text object that can be embedded in a publication. As for the copy model, Heaney further explains that every copy has its own characteristics, and it embodies all of the characteristics inherited from the publication model, which in turn embodied those inherited from the text model. In the copy model, Heaney exemplifies that functions such as loan, reservation and sending for binding can be operated in the copy model. Obviously, FRBR model is more general than Heaney's OO models since the inheritance is not required in the four entities of FRBR model. One may find that expression entity is identical to the text model, manifestation is identical to the publication model, and item is identical to the copy model, if explicit inheritance is required in the FRBR model.

With the understanding of Heaney's approach, one may use FRBR model as a conceptual framework for developing metadata system suitable for effective indexing. Firstly, these entities and relationship can be considered as a basic structure for record representation. Secondly, entities and their metadata elements could be used as a basis for system development in light of indexing key, record structure, access point, and so on. Thirdly, the manifestation entity is helpful to record the transfer of intellectual property rights. Fourth, the item entity is useful for operation considerations, such as circulation, collection management, transfer of ownership of physical format, etc.

3.2 Focus of FRBR

The FRBR model aims originally to develop a logic framework for bibliographic record, nevertheless, that bibliographic record is supposed to cover a variety of materials included textual, music, cartographic, audio-visual, graphic, three-dimentional materials. They can cover the full range of physical media (paper, film, magnetic tape, optical storage media, etc.) described in bibliographic record, also cover all formats (books, sheets, discs, cassettes, cartridges, etc.), and reflect all modes of recording information (analogue, acoustic, electric, digital, optical, etc.)[1]. FRBR model adopts a surrogate or aboutness approach that Burnet et al. [10] proposed in 1999 to analyze a variety of entities and relationships for bibliographic records. Its purpose is to re-examine the appropriateness of the cataloguing theory and practice. The model could be extended to cover the additional information that are normally recorded in authority records [1].

Basically, FRBR model is still a material-centric approach, though entities and their relationships had been defined. We also find that FRBR model could extend its focus into person, event, time and space, as well as their relationships in the same level after the examination of the NPM practice. In effect, inheritance is an unspecified characteristic in FRBR model, so a reciprocal connection of metadata elements between entities would be achieved in a seamless way if ad-hoc inheritance is introduced. It could be convenient and cost-effective for end users in terms of data creation and record representation since metadata elements needn't repeat the same elements structure based on the feature of inheritance. Otherwise, it may become a challenging task on system architecture, indexing, linkage, and so on.

3.3 An ambiguous distinction between entities

During the analysis process, a problem has been raised in distinguishing whether collector's seal （收藏印記） element is located at work or item entity in FRBR model for the practice of Chinese painting and calligraphy. From the perspective of FRBR model, the element of collector's seal is for recording the transferring of ownership, so it can be included into item entity. From the researcher's perspective at the NPM, collector's seal is considered as an important part of Chinese painting and calligraphy, and it can be located in work entity. In order to solve this problem, two options based on previous analysis model of Figure 6 are offered. Firstly, collector's seal is separated into another independent database of seals and a linkage between them is also created. Secondly, this element is included into work entity.

Of course, this issue has no conflict with our analysis since the supportive community layer in our approach actually allows for the choice and thus the resolution of the ambiguity. Eventually, researchers at the NPM chose the second option.

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