From Information to Knowledge: SuperWorks and the Challenges in the Organization and Representation of the Bibliographic Universe

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by

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From Information to Knowledge: SuperWorks and the Challenges in the Organization and Representation of the Bibliographic Universe

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Abstract

The values of the library catalog lay in its ability to help the user not only find relevant information but also provide him/her with knowledge about the bibliographic universe (a network of works, related works and works about a work). The library catalog should represent an integrated picture of bibliographic families (entities and their relationships) understandable to the user. The approach by which a bibliographic family is organized and represented provides an ontological context for a better understanding of the bibliographic universe. However, the linear structure of current online catalogs lacks such an approach.

This paper describes how the catalog and the bibliographic record can be re-structured and redesigned to facilitate the process of turning information into knowledge. This process is highly contextual in which the user can acquire knowledge not only through finding, identifying, selecting and obtaining but also through learning, distinguishing, integrating, and understanding the information presented to him/her. This paper also suggests a conceptual model, i.e., the SuperWork record which merges and integrates bibliographic data to transfer knowledge rather than information. The SuperWork Record is a meta-record covering and integrating all records representing all the instances of a work and works about a work. As a knowledge tool the SuperWork record incorporates elements necessary for the better understanding, differentiating, relating, organizing and synthesizing information about bibliographic families. It illustrates: a) how big a bibliographic family is (the size), b) what types of entities are related to a work (the categories), c) what types of relationships exist between and among works (the association), and d) how related works are arranged (the organization). These elements help the user cognitively process the information and get more knowledge about the bibliographic universe. Rethinking about the theoretical basis for the functions of the library catalog makes it possible to develop catalogs representing knowledge rather than information. More user tasks and more advanced objectives and functions can be developed for the library catalog to serve as a gateway to knowledge.

Keywords: SuperWorks, Bibliographic records, Bibliographic universe, FRBR, Knowledge-base library catalogs

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1. Introduction

This paper aims to identify the approaches by which library catalogs would be able to take into consideration the conceptual models of entity-relationships proposed for the better organization of the bibliographic universe. The ultimate aim is to propose new approaches for restructuring the bibliographic record for the design and development of knowledge-oriented catalogs. It highlights the potentials of the FRBR as well as the Superwork models in supporting the user transfer information into knowledge.

a. The library catalog: the gateway or the barrier to knowledge?

During the last two centuries the structure and form of the library catalog have seen much developments to support its various functions and user tasks. The cataloging community has been trying to develop principles and formulate rules for the catalogs to achieve more advanced functions. However, with the overwhelming growth of information (printed and electronic) in the bibliographic universe in one side and rapid developments in information technology on the other side the existing catalogs and cataloging rules need more developments to fulfill further functions in response to a variety of users' needs. A review of the history of the catalog production technology shows us some good points in this respect.

The book catalogs in the 18th and 19th centuries were far more manageable tools for listing, collocating and better display of works by an author. The hierarchical display made it possible to represent the reader with the whole idea of how related works are organized under a work. A good example is the British Museum Catalog. Bianchini and Guerrini (2009) and Svenonius (2000) state that the structure of the book catalog had some advantages which were lost in the card catalog. Similar to a bibliography, the book catalog (printed or manuscript) was more complete and more responsive to the needs of the user. The card catalog, due to its physical limitation, was not able to represent the relationships between/among bibliographic entities as expected by the catalog user.

With the advent and development of OPACs it was expected that the new technology overcomes the limitations imposed by the card catalog. However, OPACs had again some disadvantages in comparison to the card catalog in that they did not provide facilities such as sorting, browsing and meaningful arrangement of records. One of the main shortcomings of the online catalog arises from the flat structure for storage and retrieval of information which leads to uncontrolled retrieval and display of different editions and manifestations of a given work. For example, searching under "Hamlet" in some OPACs will retrieve too many records for browsing (i.e., different expressions and manifestations, works about Hamlet, even works with the title 'Hamlet' written by other writers) (Fattahi, 1996, 1997). In the mid-1995 Nicholson Baker stated that the computerized catalog had many limitations due to its design and structure. In a 1994 article published in the *New Yorker*, titled "Discards" Baker admonished library administrators for destroying card catalogs, a bibliographic format that Baker viewed as invaluable accretions of unique, specialized knowledge. Baker has asserted that this knowledge and data is lost in the conversion to electronic databases. Online catalogs were not able to present a clear picture of the bibliographic universe. Scattered search results multiplied by bulky retrievals leads to long lists of retrieved records which need to be reorganized, if they are to be of any use. As Korfhage (1993) points out, our information systems do not provide

any clear indications of the relationships among the retrieved documents. In other words, the linear structure of information storage and retrieval ignores many of users' needs and behaviors. For example, the information in the one-line one-record display is often inadequate or confusing for identifying items, and it does not help the user acquire sufficient *knowledge* about the retrieval results and the possible associations among them. Lin, Soergel and Marchionini (1991) state that, instead of being a tool for analysis and discovery of the relationships within and among documents, the information retrieval system is more like a simple search mechanism.

Currently almost all of our retrieval tools are capable in performing at least two functions. 1) Being fed (accepting terms) and 2) giving results. OPACs are by no means of any exception. This simplifies the user tasks. However, with a closer look at the works of Novak (1998), Kuhlthau (2004), Marchonini (1995) and other experts, one infers that there is some sort of disengagement manner in such an approach (quoted in Williams, 2007). Modern information systems (including OPACs) have focused a great deal on search/retrieval processes. They do not help the searcher in the process of his information seeking behavior. Novak and Canas (2008) suggest that by engaging the searcher less in information seeking process we may possibly lessen his/her emotional commitment to relate new with existing relevant knowledge. But what would be the resort?

b. How the library catalog can support learning through knowledge creation and transfer

Searching a library catalog requires the user be actively involved in a process known as information seeking behavior. It requires the user to go through a cognitive process of submitting a query and/or browsing an index to find relevant information. The user observes and browses what is represented to him/her. Then he/she attempts to identify, distinguish and understand the information in relation to his/her needs and beyond it. Finally the user interprets and internalizes the information and turns it into knowledge to relate it to or compare it with his/her existing knowledge. The ultimate aim is to add to his/her knowledge about the specific need(s) or case(s). As will be discussed later, the catalog should be able to perform part of this process for the user that is, helping the user turn information into knowledge. The library catalog is an information environment with a potential to be upgraded and enriched as a knowledge environment.

But what is knowledge as compared to information? Knowledge enjoys a higher level of values. That is the reason why in developed societies, instead of generating and improving access to information, the emphasis has turned towards exploring ways of transforming information into knowledge. We are facing an overwhelming growth of information on the web but have much trouble to access knowledge. Three decades ago John Naisbitt (1980) stated that "We are drowning for information but starving for knowledge". Nevertheless, when conditions are ready, for examples, through advanced information systems, which can intelligently filter information, we are capable of turning information into knowledge (Fattahi and Afshar, 2006).

While the borderline between knowledge and information is not always clear, there are some differences. Knowledge is a more encompassing term and consists of know-how, concepts, perspectives and expectations while information is know-what. Knowledge consists of information integrated and organized to describe specific concepts, objects,

and events. We apply knowledge to interpret information and make better reasoning/decisions. Knowledge is created in a situation. In other words, it is "situated". This definition, too, reiterates the fact that people would like to access knowledge because it helps them understand better, learn deeper and decide wiser. Knowledge "is information acted upon cognitively, i.e. transformed into some conceptual framework and hence manipulable and usable for other cognitive uses" (Green, 1996).

These definitions can illustrate the significance of providing knowledge to the catalog user rather than concrete and disperse facts only. Thus we need efficient tools and situations to help turning information into knowledge. In other words, information has the potential to be converted into knowledge. The design, structure and context of the catalog should facilitate knowledge access and knowledge creation. The catalog user can acquire it through observation and understanding of what and how bibliographic data are inter-related, organized and displayed. This, in fact, is a "learning process" which has an important role in knowledge creation. According to learning theories such as objectivism, pragmatism, and interpretivism, knowledge is an objective that is attainable through either reasoning or experience (Siemens, 2005). Similarly, constructivists believe that "learners create knowledge as they attempt to understand their experiences" (Driscoll, 2000, 376, quoted by Siemens, 2005, 3). Also cognivists and behaviorists view the learning process as the act of internalizing knowledge (ibid, 3). Thus the catalog should facilitate the learning process by providing the user with sufficient information and in-context data about the bibliographic families.

From another perspective we know that the catalog, as an information environment, has a very important role in the conduct of research and knowledge production. The user's tacit knowledge grows as he/she interacts with the information environment and goes through a process known as "information seeking behavior". Library catalogs can support the information seeking behavior and guide the user towards "knowledge seeking behavior". Thus comparing the information seeking behavior against the facilities and elements of the catalog which can help the user conduct a more effective search would illustrate the potential of converting information into knowledge.

c. The catalog and the information seeking behavior

There are a number of models in the literature illustrating the information seeking processes/stages. As can be seen in the comparative table below, the major stages which are common in most of these models and which imply cognitive activities by the user include:

1) Coming to a problem: information/knowledge gap,

2) Identifying the information need,

3) Submitting a query,

4) Browsing and analyzing the results,

5) Recognizing and distinguishing, and

6) Learning and meta-recognition.

As the content of the Table 1 shows, what is being carried out by the searcher in all the stages is the cognitive processing of information which leads to his learning with a final

outcome of tacit knowledge. The "feelings of uncertainty" and the "need to recognize or connect new ideas to existing knowledge" in the first stage is an example in which the catalog can help the user develop his/her state of knowledge. Belkin points to this as the "Anomalous State of Knowledge (ASK) theory" that is "the cognitive and situational aspects that are the reason for seeking information and approaching an IR system" (in: Saracevic 1996). Similar processes (such as "to identify the most useful areas of inquiry", "understanding and reduce the feeling of uncertainty", "feeling of increased confidence", "selecting and reviewing information", and "completing" can be facilitated in the next stages if the catalog provides mechanisms and facilities to support the user in all stages of his/her search processes.

Table 1. Stages in different models for information seeking behavior

Kuhlthau, 1991	Belkin et al., 1993	Ellis, 1997
1. Initiation - beginning the process, characterized by feelings of uncertainty and more general ideas with a need to recognize or connect new ideas to existing knowledge. 2. Selection - choosing the initial general topic with general feelings of optimism by using selection to identify the most useful areas of inquiry. 3. Exploration - investigating to extend personal understanding and reduce the feelings of uncertainty and confusion about the topic and the process. 4. Formulation - focusing the process with the information encountered accompanied by feelings of increased confidence. 5. Collection - interacting smoothly with the information system with feelings of confidence as the topic is defined and extended by selecting and reviewing information. 6. Presentation - completing the process with a feeling of confidence or failure depending how useful the findings are.	1. Browsing - scanning or searching a resource. 2. Learning - expanding knowledge of the goal, problem, system or available resources through selection. 3. Recognition - identifying relevant items (via system or cognitive association). 4. Meta - information-interacting with the items that map the boundaries of the task.	1. Starting is identifying the initial materials to search through and selecting starting points for the search. Starting, as its name implies, is usually undertaken at the beginning of the Information Seeking process to learn about a new field. Starting could also include locating key people in the field or obtaining a literature review of the field. 2. Chaining is following leads from the starting source to referential connections to other sources that contribute new sources of information. 3. Browsing is casually looking for information in areas of interest. This activity is made easy by the nature of documents to have tables of contents, lists of titles, topic headings, and names of persons or organizations. 4. Differentiating is selecting among the known sources by noting the distinctions of characteristics and value of the information. 5. Monitoring is keeping up-to-date on a topic by regularly following specific sources. 6. Extracting is methodically analyzing sources to identify materials of interest.

On the other hand, the process of acquisition and creation of knowledge, which is a cognitive process, includes the following stages:

1. Observing/Browsing/Finding,
2. Identifying,
3. Distinguishing/differentiating,
4. Interpreting/judging,
5. Integrating/relating,
6. Organizing and internalizing the information.

As pointed out earlier, the design and structure of the catalog and the bibliographic record can help the searcher follow the information seeking process with clarity, ease and efficiency. Belkin, (1980) believes that a good system design using a network of associations between items cat act as a means of filling the knowledge gap. If the user's knowledge changes through the interaction with the catalog, then it would be possible that he/she acquire new knowledge about the bibliographic universe.

2. Redefining and restructuring the bibliographic record and the catalog

The values of a knowledge-oriented catalog lay in the way the bibliographic information is structured, organized and displayed to the user with an ontological approach. Focusing on the definition of knowledge as compared to information would lead us rethink about the bibliographic record. As IFLA has defined, the bibliographic record is a set of data elements that describes and provides access to a bibliographic resource and identifies related works and expressions (IME ICC, 2009). We can redefine the bibliographic record as "a structured framework encompassing sufficient data elements (knowledge artifacts) for describing of and providing meaningful access to bibliographic entities in a learning context." Thus acquiring knowledge rather than information requires us identify some elements which can facilitate more useful structure and organization for the bibliographic record with a meaningful display of relationships between and among bibliographic entities. From this point of view concept mapping might be of help, since the 1960's it has been proposed as a tool to facilitate learning through displaying a meaningful structure for representing entities and their relationships. But now it is still an emerging tool for organizing and representing knowledge (Williams, 2007: 36).

In a knowledge-oriented catalog, context affects the meaning. This means that the information represented about each record or entity can be understood and interpreted based on the context and the additional information presented. In such a situation one can realize the relevance of information retrieved to his information needs. It facilitates the process of knowing a network of works and their diverse families. For many users it is important that the catalog facilitates access to and discovery of knowledge rather than information retrieved and displayed in the catalog. Like in any other retrieval tool OPAC users would like to see the records retrieved be displayed in a meaningful context and arrangement so that they can understand the type, nature and value of each work (i.e. acquire knowledge about the work). For every human being the need for discerning patterns and regularities in events and objects and putting them in relation with his existing knowledge is a basic requirement in internalizing new knowledge (Novak & Canas, 2008). Thus it is not so hard to infer that OPAC users would also like to distinguish between and among entities retrieved in order to recognize or connect new ideas to their

existing knowledge. Thus the more structured and arranged display on the system's side, the more understanding and knowledge on the user's side would happen.

Soergel (2008) states that supporting the learning process through a structured display of information is one of the most important functions of knowledge organization tools. Building hierarchical search/retrieval interfaces and hierarchical taxonomies/concept maps based on users' needs and feedbacks would be an important facility of the catalog to represent knowledge to the user. As Novak (1993) points out, knowledge is organized hierarchically in cognitive structure, and most new learning involves subsumption of concepts and propositions into existing hierarchies. In such a framework, the relationships of dependence and subordination, of similarity and difference between or among related entities would be more clearly demonstrated and understood. Superordinate and subordinate entities can then be displayed and browsed in the hierarchy of the bibliographic family. This is stated in FRBR model as a goal (Carlyle, 2006: 267; Carlyle & Summerlin, 2002). The hierarchical structure should be flexible enough to let the catalog user to move from the highest level (i.e., the abstract work, it's deferent expressions and related works) to lower levels or physical objects (i.e., manifestations, items). This structure facilitates the gradual addition of attributes from different levels of the bibliographic family to the record. Looking through a FRBRized glass, searchers are usually concerned with a combination of attributes from both the 'abstract' Work and Expression, such as intellectual level, topic, language and genre, and some attributes from the 'objective' level of Manifestations and Items, such as date of publication, place and name of the publisher, the extent of the item, standard numbers, physical format, etc., which add more bibliographic information about the relevance or accessibility of the item to their needs.

The main tool for providing description of and access to bibliographic information is the catalog record which consists of metadata representing entities, attributes and their relationships. Metadata in the bibliographic record can be seen as knowledge processing artifacts. Based on metadata elements we can develop a new structure for the bibliographic record capable of more advanced functions. All the functions of the catalog (i.e., finding, identifying, selecting and obtaining in the FRBR model) would not be possible to be fulfilled by a record with a flat structure. Instead, we need a new structure, a Meta-record with a multi-level approach linking the work record and all its related entities to one another through a multi-level structure. Such an approach would lead to a concept mapped structure which would certainly be more responsive to the user's different needs and tasks during the different stages of his/her information seeking behavior. Recent advances in software technology can provide the catalog user with more knowledge about the bibliographic universe through the processes of justifying, judgment, inference, and relating based on what and how information is presented to him/her. Thus needless to say that the technology would also enable us develop flexible hierarchical structure maintaining the description of and access to all the instances of bibliographic entities.

The bibliographic record should therefore convey attributes from the abstract work as well as attributes from its lower levels to the physical object. Such an approach would help the different functions of the catalog be fulfilled efficiently which the user can understand better and can have more control over them. It is worth noting that, with all considerations taken into account, the new codes for Resource Description and Access (RDA) is trying to provide all possible ways for the catalog user to access entities at different levels in the FRBR model, from the work to expression and then

manifestation and at last to the item. This concept (i.e., focusing on the Work as well as the Item) was emphasized by Lubetzky (1963, p. x) years ago: "The two functions are complementary, but both are essential to the effectiveness of the catalog." Fattahi (1996) reiterates the concept by listing the reasons: 1) many users usually do not know ahead of time that a work may have several different editions or manifestations. The point is that the catalogue may contain more than the user may be expecting: other works or items related to the sought item, 2) also it should be added that while some users may find any edition of a work useful, others may require a specific edition with a particular feature, 3) there are also users who look in the catalogue for a particular manifestation of a work or an expression of a work in a particular format. The structure would allow the users not to do his/her search for related works again but keep staying at the same record and decide which entity (entities) in the hierarchy of the bibliographic family suit his/her needs the best. This is done based on the user's understanding about the place of each entity in the hierarchy and the type of relationships among entities. Since the documents to be cataloged are not always stand-alone items but they may be dependent works.

On the other hand, the user's tasks and requirements are more extensive and various in comparison to the past. This is a major challenge for the cataloging profession to respond. Regarding the facilities the global networked environment has provided us, one of our main concerns is to provide the user with better description and efficient access to the bibliographic universe. The catalog user would like to have better understanding of and more control over the search/retrieval and display facilities. With all those new technologies available (e.g., hypertexts, information visualizations, Web 2.0 tools and gadgets, etc.), it is possible to design better user-oriented interfaces (Kemp, 2008).

Knowledge enriched environments provide us with structured display of relationships between and among the entities/works. Only such displays would foster the user to internalize knowledge. Let's begin with a simple example outside the boundaries of OPACs. Think of a highschool student who is eager to know about Shakespeare' Hamlet. He collects every possible entity which fulfills him in this regard. From time to time he searches the Internet using Hamlet as a key word. Now just think what if in response to his search for Hamlet movies, the results would have been displayed to him in a Relfinder-like manner as shown in figures 1 & 2.

3. The SuperWork approach

During the last two decades there have been some attempts to develop conceptual models for the organization of the bibliographic universe. Fattahi's (1996) Super Record approach, Carlyl's (1996) Super work-set approach, IFLA FRBR (1998), and Taniguchi's (2002) are among such new approaches. The concept of SuperWork in this paper can be considered as a clear, structured map of knowledge about a specific bibliographic family. It continues the concept of Super Records developed by the author in the mid-1990 which introduced a new approach to the description and organization of different editions and manifestation of a work (Fattahi, 1996, 1997). The main purpose of the SuperWork concept is to provide a learning environment by which the catalog record facilitates the organization and representation of knowledge in the catalog as well as acquiring, processing and internalizing knowledge by the catalog user. The Superwork record is a meta-record covering and integrating in a structured

Figure 1. Ontological modeling representing Hamlet by William Faulkner and its influence from Shakespeare's Plot[1]

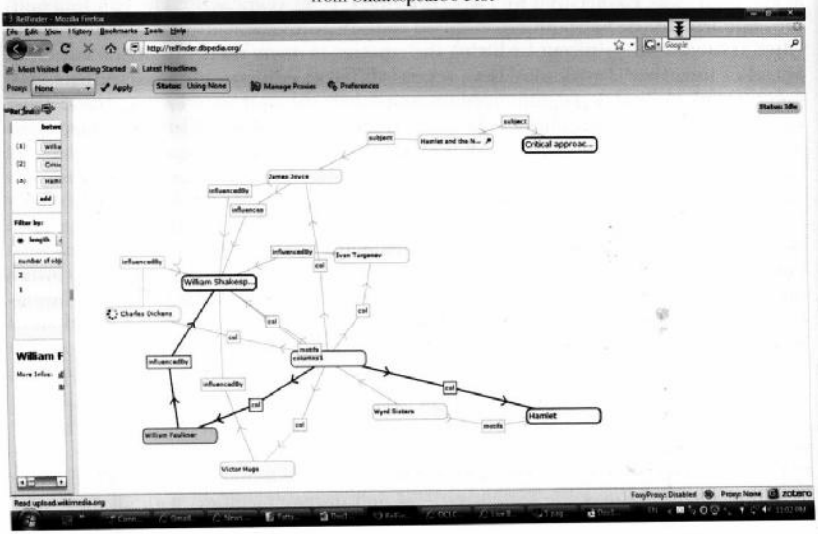
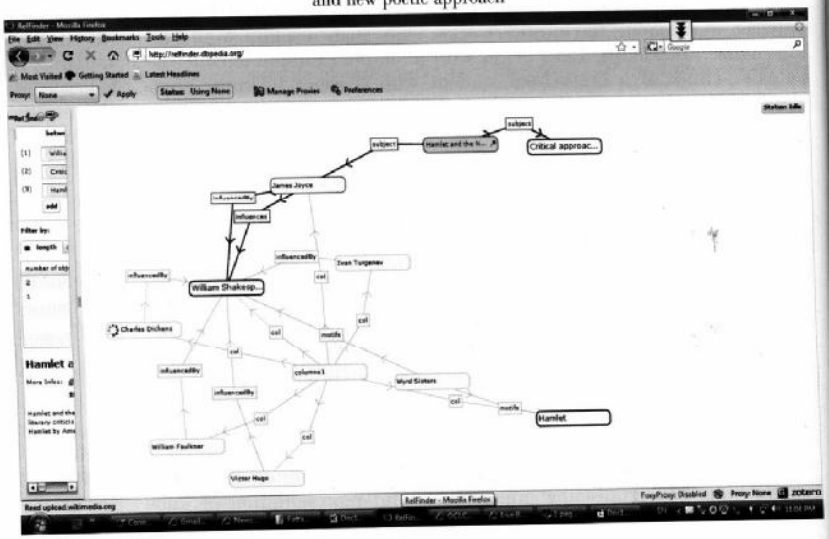


Figure 2. Ontological modeling illustrating James Joyce's critical view towards Hamlet and new poetic approach



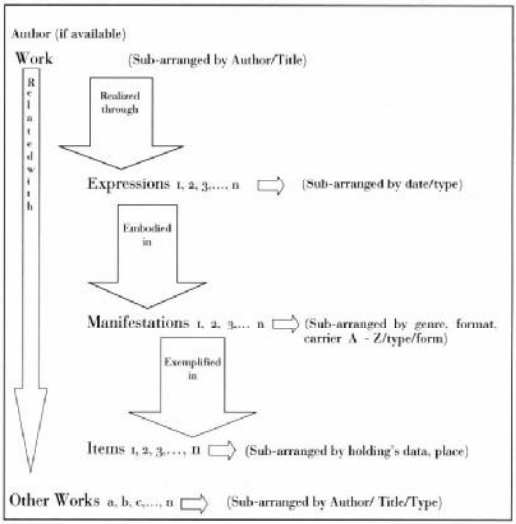
[1] Figures 1 and 2 are snapshots of a search result in "http://relfinder.dbpedia.org/"

and understandable format all records representing all the instances of a bibliographic family. Not only the data elements in the SuperWork record (the content) but also the organization (the structure) of the elements help the cognitive processes be carried out regarding access and use of the library catalog be facilitated.

In comparison to the existing bibliographic record (the ISBD and/or MARC format) the SuperWork record represent a clearer picture and explains complex parts of the catalog. It brings together the unexpected or things otherwise difficult to learn and understand. This would help the user acquire more knowledge than he/she expects from the catalog. The SuperWork record brings together entities which may not have the same main entry heading. It complements the concept of main entry. For example, different editions of Shakespeare's *Hamlet* which are entered under 'Shakespeare, William' (as the main entry heading) as well as different modifications and adaptations based on *Hamlet* in which 'Shakespeare, William' is an added entry can be brought together. In current catalogs added entries do this function but not as explicitly as in the SuperWork record. With the SuperWork records in place OPACs would be more capable of meaningful arrangements of entries than the current structure of catalogs. This can lead to better learning about the bibliographic universe.

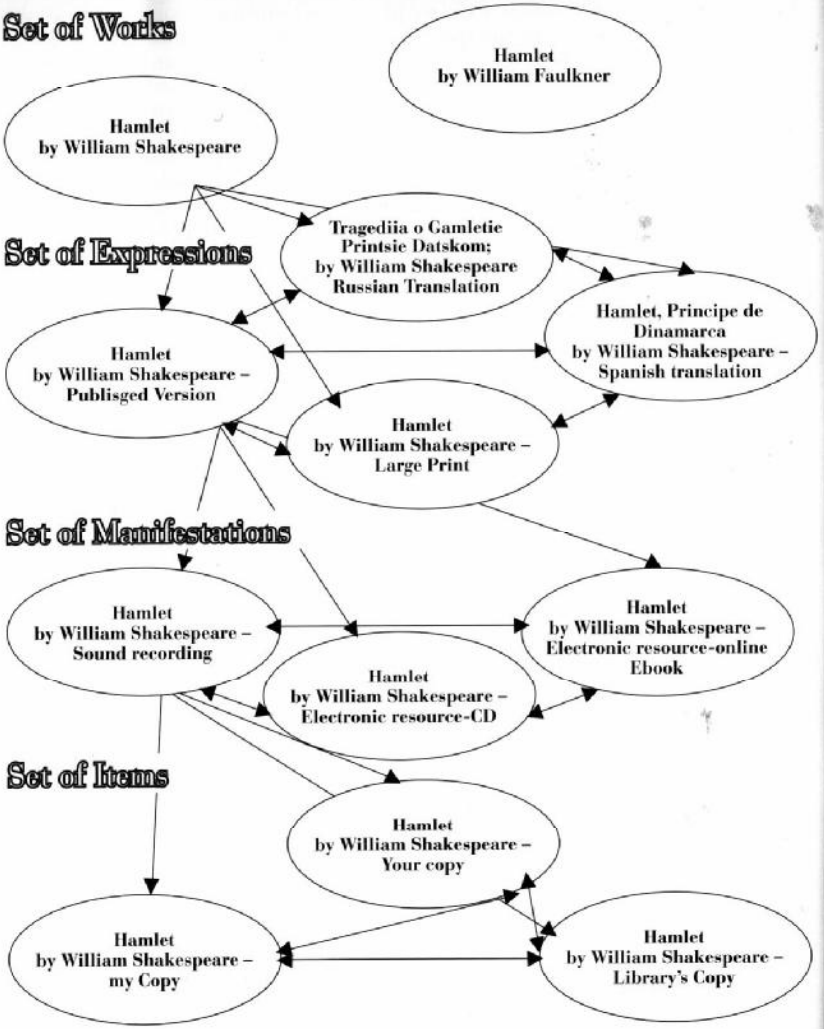
In figure 3 the SuperWork model illustrates how a work can have both hierarchical as well as horizontal structures encompassing and displaying different types of associations among related works. The model also shows the approach to the arrangement of related works among themselves by pointing out to the type of arrangement (e.g., by date, type, genre, form, etc.). Figure 4 has a similar approach illustrating the two types of structures with relatively detailed information. All the elements help transfer knowledge about the work and its family to the searcher in an ontological context.

Figure 3. Conceptual model for the SuperWork record aligned with FRBR



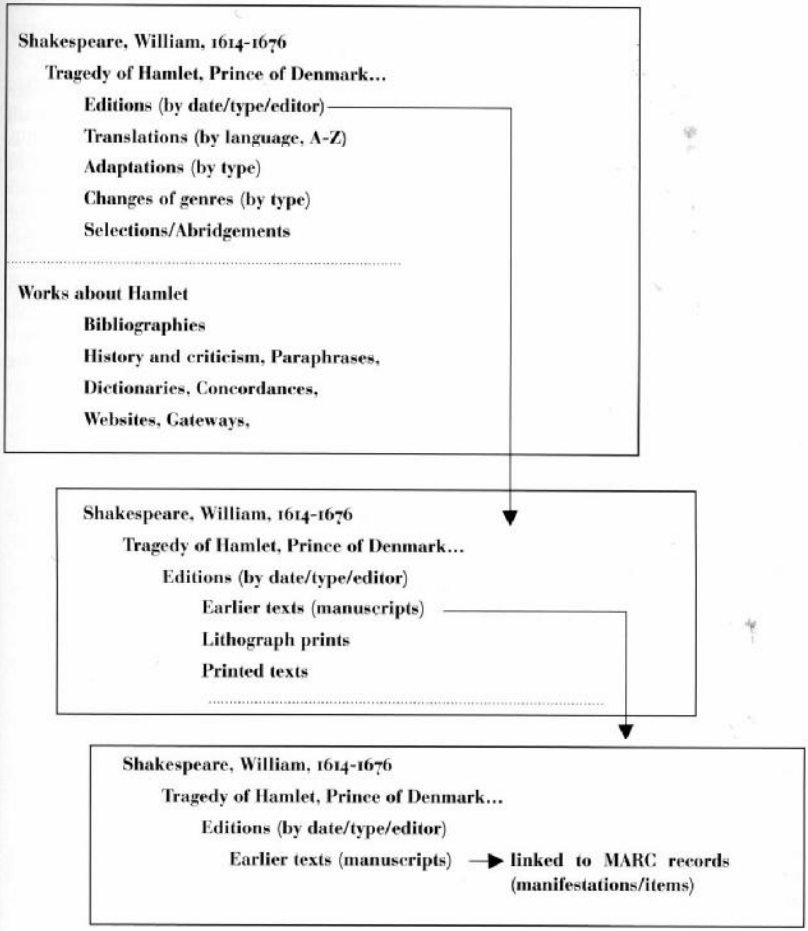
Based on this model, a typical example of Hamlet in the FRBR model is presented in the following figure.

Figure 4. Modeling a few of related entities in the Hamlet's bibliographic family



As can be seen in the figure below (Figure 5), the browsing context of the SuperWork record represents a big picture about the hierarchy of the Hamlet family and also points to the different categories of expressions and manifestations of Hamlet at the horizontal level. It also permits the user have more control over the browsing (i.e., discovery and learning) processes. As Marchionini (1988) points out, the browsing context provides an incidental learning scenario for the user.

Figure 5. A SuperWork record illustrating hierarchical and horizontal tructure



In such a display the elements and components necessary for browsing facilitates a better understanding of the bibliographic universe. They include:

1) A clear, self-explaining "Structure" illustrating the organization of the SuperWork family,
2) Relevant "Names/Designations" for sub-ordinate categories,
3) Proper "Sub-structures" for the arrangement of sub-ordinate works/entities in each category
4) The "Relationships" (Properties) between and among works/entities,
5) Sufficient "Data elements" (Attributes) for describing sub-ordinate works/entities.

Thus the SuperWork record creates a faceted browsing environment with a knowledge context appropriate for navigating the bibliographic universe. The context in which all the necessary elements for identifying works and their related entities are structured is very important for learning and acquiring knowledge. Through a pre-arrangement of categories and sub-categories of bibliographic families (i.e., works and their various editions and manifestations) and the links between information entities at a higher or lower level, the systematic multi-level structure makes the organization and representation of information sources more comprehensible to the user. This structure permits the searcher narrow his/her focus by recognition and helps him make informed decision. Not only it helps the user not being lost in the information environment but also helps him save the concept in his/her long-term memory with a propositional structure. The ultimate outcome of browsing in a SuperWork catalog would be the forming of a cognitive map in the user's mind for better processing and organization of information. This gradually leads to meaningful learning and knowledge creation in users. As Novak (1993) states, "meaningful learning involves the assimilation of new concepts and propositions into existing cognitive structures".

As a whole, the ultimate goal of the Superwork concept is to illustrate: a) how big a bibliographic family is (the size), b) what types of entities are related to a work (the categories), c) what types of relationships exist between and among works (the association), and d) how related works are arranged (the organization).

4. Implications of the SuperWork concept

Implementing the SuperWork model in library catalogs requires us take the following issues into consideration:

1. It requires a degree of knowledge about the bibliographic universe, the nature of works (i.e., how they proliferate throughout time) and the categories and sub-categories to which entities belong. Catalogers need to enhance their knowledge about the network in the bibliographic universe and conceptual models such as FRBR, FRAD, etc.

2. Identification of the different categories of entities in or related to a bibliographic family requires each domain (i.e. complete bibliographic family) to be studied and analyzed so that the types and the names applying to each type be identified and normalized.

3. The types of bibliographic relationships prevalent in each bibliographic family should be identified and normalized too. This can be based on the most recent taxonomy of bibliographic relationships developed by IFLA FRBR.

4. The future cataloging codes, ISBD, MARC format (MARCXML?) for bibliographic information and other related standards such Z39.50 need to be re-examined to support the concept of the SuperWork. A MARCXML meta-record can be designed to embody the SuperWork structure.

5. The implementation of the concept may also demand a new structure for the catalog, i.e., the addition of a new file in the database for SuperWork linked to records held in the MARC database.

6. The concept of SuperWork records reiterates the underlying principle of uniform titles. Thus another important question which has to be taken into consideration is if we need uniform titles to be mandatory for every work? In the print and electronic environment every work can potentially be reproduced, recreated, edited, and adapted through time. Thus, assigning a uniform title would be a logical step to collocate and arrange related works. However, the structure of the uniform titles needs to be re-examined against a variety of functions in the online networked environment. Flexibility in the structure (regarding the title as well as all the terms indicating the category of related work, the relationship, the sub-category, etc.) is an important approach: the structure should enable the catalog help the user to navigate between and among the categories (types) of related works in the uniform title string.

Identification of the categories and subcategories covering different types of related works is very important for the restructuring of the uniform title. This requires us to develop relevant labels (names) for each category and sub-category of related works. When the structure is complete, the information in the uniform title represents knowledge about the type of entities related to a work. The structure is also tend to be useful for searching and especially browsing as well as displaying the related works based on a logical arrangement which makes sense to the user.

From this point of view, a browsable complete uniform-title index (containing work's title along with author's name where applicable) would provide easy access to the bibliographic family (the browsable index for anonymous works contains no author's name, of course). Thus uniform titles would be assigned to all those progenitor works which are considered important for collocation purposes. This requires that uniform titles should be subjected to authority control.

5. Conclusions

The library catalog is not a system by which the user acquires knowledge through trial and error experimentation. It should be a self-explaining, integrated knowledge tool which would be able to match the environment to the user's searching behavior beyond information seeking. It should show how knowledge is represented, structured and displayed in the catalog. The SuperWork concept provides the catalog user with a big picture representing general knowledge as well as specific knowledge at the different levels of the bibliographic hierarchy. The hierarchical and multi-level structure helps us navigate from one entity to others and vise versa. As such, we need to develop new and innovative ideas and concepts fulfilling this aim. The knowledge and the technology are

available now. We need to evolve our library catalogs from holding/locating tools to knowledge acquisition gateways.

With the concept of SuperWorks for bibliographic families it is possible not only to overcome some of the retrieval problems that exist in current online catalogs, but also add to the value of the catalog as a learning tool for research. From this point of view the catalog would be a knowledge environment that is of help to process knowledge creation, transfer and dissemination through meaningful structure and organization which is created by the cataloger as well as the user. Reorganizing retrieval results in a rational and meaningful way depends on identifying work-sets as bibliographic families and analyzing types of relationships between entities of these families in our bibliographic universe (Arastoopoor and Fattahi, 2009). We need to examine how the different categories and types of related works in the bibliographic universe would be treated and managed to provide a better picture of the bibliographic hierarchy. For this purpose we have to move from document-oriented to *knowledge-oriented systems*.

Identification of the implications of applying the new structure for the bibliographic record is one of the important tasks both catalogers and catalog designers (software people) should take into consideration. All attempts to develop cataloging principles and rules should aim to help catalog users access knowledge in an easy yet efficient way. Cataloging principles and rules can elaborate on the concept regarding the structure of the catalog incorporating SuperWork (including necessary indexes to it), the types of categorizations, consistency in the terms used for different categories, the links between entities at different bibliographical levels, and also on the choice and form of headings for SuperWork records. As well as rules for description and access we need more elaborate on rules for understandable organization and display of information in the catalog. This idea has already been stated by some (for example, Korfhage, 1991; Fattahi, 1997; Joachim, 2003; that "there needs to be a shift from "retrieval" to "display", that moving from a "query-answering system" to an information organization and display system would better support the searcher (Korfhage, 1991). The consequences of the concept for cataloging codes, MARC, Z39.50 and database design need further investigation. We may also need some alterations in ISBD and some new MARC fields for the meta-record to make it consistent with the multi-level/layered structure. Taking all these issues into account, FRBR and RDF can be further developed to match the requirements and functions necessary for knowledge seeking behavior.

Regarding the global networked environment and the growth in the bibliographic families (works and their related works) better organization of and more efficient access to the bibliographic universe are the main concern of the cataloging profession. Now if people like Nicholson Baker decide to tell us about our FRBR-ized OPACs, what would be their reactions?

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Dall'informazione alla conoscenza: le super-opere e le sfide dell'organizzazione e rappresentazione dell'universo bibliografico

Lectio Magistralis in Biblioteconomia

di

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Dall'informazione alla conoscenza: le super-opere e le sfide dell'organizzazione e rappresentazione dell'universo bibliografico

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Riassunto

I valori del catalogo di biblioteca consistono non solo nella sua capacità di aiutare il lettore a trovare informazioni rilevanti ma anche di procurargli la conoscenza dell'universo bibliografico (una rete di opere, opere correlate e opere su altre opere). Il catalogo di biblioteca dovrebbe rappresentare un quadro integrato delle famiglie bibliografiche (le entità e le relazioni fra loro) tale che l'utente possa comprenderlo. Il metodo con cui è rappresentata e organizzata una famiglia bibliografica fornisce un contesto ontologico per una comprensione migliore dell'universo bibliografico, tuttavia la struttura lineare degli odierni cataloghi in linea è priva di un simile modo di procedere.

Questo saggio descrive come possiamo strutturare e riprogettare il catalogo e il *record* bibliografico allo scopo di trasformare l'informazione in conoscenza. Si tratta di un procedimento fortemente contestuale nel quale l'utente può acquisire conoscenza non solo trovando, identificando, selezionando e ottenendo ma anche per mezzo delle funzioni di apprendere, distinguere, integrare e capire l'informazione che gli viene fornita. Il saggio propone anche un modello concettuale, cioè il *record* per la super-opera che fonde e integra i dati bibliografici per trasmettere conoscenza invece che informazione. Il *record* per la super-opera è un *meta-record* che ingloba e integra tutti i *record* che rappresentano le materializzazioni di un opera e le opere su un'opera; in quanto strumento di conoscenza il *record* per la super-opera include gli elementi necessari per meglio comprendere, differenziare, correlare, organizzare e sintetizzare le informazioni sulle famiglie bibliografiche. Esso illustra: a) quanto è grande una famiglia bibliografica (la consistenza), b) quali tipi di entità sono correlate a un'opera (le categorie), c) quali tipi di relazioni esistono fra due o più opere (l'associazione), d) come sono ordinate le opere correlate (l'organizzazione). Questi elementi aiutano l'utente a elaborare mentalmente l'informazione e a trarre maggiore conoscenza sull'universo bibliografico. Se ripensiamo i fondamenti teoretici delle funzioni del catalogo di biblioteca possiamo sviluppare cataloghi che rappresentino la conoscenza invece che l'informazione. Possiamo sviluppare un numero maggiore di funzioni utente e obiettivi a livello avanzato affinché il catalogo diventi un portale verso la conoscenza.

Parole chiave: super-opere, record bibliografici, universo bibliografico, FRBR, cataloghi di biblioteche basati sulla conoscenza

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