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Designing a Metadata Application Profile in Academic Libraries: A Case Study

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Designing a Metadata Application Profile in academic libraries: A Case Study

Abstract: The purpose of this paper is to design a metadata application profile to organize content objects of Shahid Beheshti University of Medical Sciences libraries based on analytical-systematic approach. The population under study included content objects from 23 libraries (central, hospital and college libraries). A researcher-made questionnaire was used to collect data related to the local features and needs of generating metadata records in libraries. Some questions of the questionnaire were answered by the librarians of the organizing department, and some of them were completed by researcher's observation of the libraries' metadata databases. The native needs and intend of libraries in terms of content objects organizing were determined and an application profile was designed for describing and organizing different types of content objects based on them. The application profile contains 63 elements, 22 of which are mandatory elements and the other elements are optional. Among those 63 elements, 54, 7 and 2 elements have been selected from the UNIMARC as the basic standard, the Dublin Core Metadata Initiative (DCMI) and the Metadata Object Description Schema (MODS), respectively. Finally, the structure and semantics syntax of the designed metadata application profile based on the local context of the libraries were determined.

Keywords: Metadata Application Profile, Academic libraries, Information Organization, Content Objects, Shahid Beheshti University of Medical Sciences

1. INTRODUCTION

Obviously, libraries are one the most important and vital center for organization. In the mid-1990s, After the advent and development of the Web as the largest part of the Internet, the diversity of content objects, the weakness of Web search engines, and the new tools in response to the increasing demands and needs of users led to

some alterations, which raised doubt about the efficiency of description and traditional organization tools in modern information environment. Therefore, this situation provided the opportunity for the appearance of new tools and standards (Taheri *et al.*, 2012; Taheri, RostamiLatLayli and Norouzi, 2018). Applying the metadata is one answer of the knowledge organization systems to the media and modern information environment (Taheri, 2011). Metadata is data about data. In other words, metadata is a kind of structured data which describes the other data. Metadata by which the structure and characteristics of the described data are registered, controlled and published by a person or an organization (Sa'adatAlijani, 2006; Taheri, RostamiLatLayli and Norouzi, 2018). Hence, the approach to describe content objects based on the use of metadata in a digital environment and even beyond that, such as printed and traditional environments, has been somewhat successful. Nowadays, the aforementioned approach has been able to fulfill the user needs in information society.

A metadata schema is a unified and structured set of rules developed for object documentation and functional activities. A schema is a conceptualization that is represented or formalized in a specification. The term metadata schema is often used interchangeably with metadata specification and metadata standard (*Dublin Core Metadata Initiative (DCMI)*, 2018).

There is a huge amount of metadata on the web and still more is being published by various communities such as libraries, research institutions. These datasets are used for different purposes across different communities, domains and countries (Ochiai, Nagamori and Sugimoto, 2014). Various information contexts and whose needs are the cause of the appearance of diverse metadata schemes and standards such as Dublin Core, MODS, METS and PREMIS. Nonetheless covering the metadata needs of different information organizations and centers, and also interoperability between them are a matter of concern. Traditionally, it is favorable that different organizations use the same schema basis in the digital environment. But, the application of an appropriate schema to the needs and specific requirements in the various contexts is more important. Therefore, the aforementioned favor is in conflict with other demands in the digital environment. In other words, it can be said that a selection of proper metadata standard for local needs and in consistent with

communicating infrastructure with other communities for organizations and various contexts has always been problematic(Nagamori and Sugimoto, 2007).

Therefore, various metadata standards have been developed to provide a suitable tool for the storage and retrieval, organization and exchange of information(Taheri *et al.*, 2012).

However, nowadays organizations are using a set of metadata schemes since there are various metadata schemes and standards, each of which has various capabilities in describing the appearance and content features of content objects. In fact, there are three main reasons which cause an appearance and popularity of a metadata application profile, including the inadequacy of a metadata plan or the lack of all elements of a metadata schema, the lack of consideration of the local features of organizations or information context when compiling metadata, and the existence of various metadata schemes with different or similar functions(Taheri, 2014) .

Metadata application profiles are a set of metadata standards that give specific definitions of metadata elements according to the local needs of the organization. Thus, not only do application profiles open up a possibility for the required elements to be extracted in relation to a database or information centers, but they also make connection between these elements(Taheri, 2014; Taheri, RostamiLatLayli and Norouzi, 2018) .

Academic libraries are considered as one of the target centers for designing and implementing application profiles because universities are among the most important and main centers for producing information and knowledge in the world. Although the produced and available information at these centers is precious and valuable, the organization of this information can have greater values for users (Taheri, 2014).

Libraries and information centers as metadata user centers are classified into different types based on affiliation and organizational context, the content of the collection, and the user community. The difference between these centers also affects their needs, policies and goals. Therefore, the use of a metadata profile, which is according to their organization needs, has increased in importance in libraries like other information context of different organizations(Taheri *et al.*, 2015) .

Shahid Beheshti University of Medical Sciences (SBMU) as one of the most important medical universities in IRAN, which has provided a wide range of content

objects required for researchers in the field of medical sciences and related sciences. It is currently facing two important issues in terms of management and organization of the content objects, both on the inside and outside of the organization.

As regards inside organization, integrated management of the content objects, a help to create a framework for interaction and integration between the central library and its hubs can be pointed, while in respect to outside organization, interoperability with other organizations or joining to national and international content consortia as well as standardizing the description and presentation of content objects based on webometrics standards can be posed. It is obvious that one method to improve the position of SBMU in webometrics ranking systems is to empower the university to describe the content objects of its related libraries in a structured and context-based manner.

These two important issues in relation to content objects are worthy for SBMU reputation, so it is necessary to design the metadata application profile for improving the university status at the two aforementioned levels, as well as the optimal management of metadata.

Considering the fact that there is difference in the expectations of each organization in terms of using metadata and also each functional profile metadata is a specific organizational tool which is entirely created based on the local needs and features, so, it seems that it is necessary to design that profile for each organization such as SBMU's libraries.

The outcomes of this research can help to provide an appropriate framework for interacting libraries with each other or other related information centers, improve existing metadata management, and maximize the efficiency of metadata standards along with proper utilization features that are in relation with local needs.

2. Aims and Objectives

The main aim of this research was to design a metadata application profile for organizing the content objects of the libraries of SBMU. In order to achieve this goal, the following questions were designed:

1. What are the current and future local needs and features of SBMU libraries in knowledge organization?

2. Which metadata elements, structure, and semantic syntax are included in the metadata application profile of various types of content objects in the libraries of SBMU?

3. Literature review

Research related to this study can be divided into two groups:

A: The first group is the research that focus on designing application profiles based on the local needs of specific organizations such as libraries and information centers, including research into this group,(Taheri, RostamiLatLayli and Norouzi, 2018) , who has designed a metadata application profile to describe and organize content objects at the databases of the Computer Research Center of Islamic Sciences (Noor) on the basis of metadata standards. According to the needs of this center, the MODS standard was chosen as the basic standard for designing the application profile, and the profile included 23 metadata elements (12 mandatory elements and 11 optional elements).

PashaZadeh (2016), Najafzadeh (2014) and Babaei (2018) designed application profiles for the Tebyan Cultural and Information Center, Malek National Library and Museum Institution, and the National Library and Archives of Iran, respectively, with the aim of describing and organizing content objects of the particular organizational contexts. The Library of Congress has designed a metadata application profile for a variety of content objects accessible in the library. The purpose of this activity was to meet the needs of users, including identifying, discovering, accessing and, finally, increasing the access points to content objects. In this study, Marc21 and Resource description and access (RDA) were used as the base standards. The metadata application profile was devoted to eleven categories of content objects, including text monograph, rarer books, audio records, moving images, electronic resources and archival sources (Program for Cooperative Cataloging, 2014) .

Another example of the efforts made in this scope is the development of a metadata profile for use in the New South Wales State Library. In this study, an application profile has been designed with the aim of achieving desirable performance, increasing interoperability and adapting to international metadata standards(Wilson *et al.*, 2007) .

B: The second group is the metadata application profiles based on the needs and the native context of special data repositories of specific subject domains. One of these studies was Onyancha, Keizer and Katz (2001) which proposed an application profile based on the Dublin Core Metadata standard containing 13 elements for data repository in agriculture domain. Another research related to Manouselis, Kastrantas and Tzikopoulos (2007)) examined the role of metadata in online repositories with learning content objects. The standard application profile was designed based on the "IEEE LOM" in accordance with the local needs of related data repositories.

Stuempel *et al.* (2009) designed the digital repository application profile of content objects with the subject of training in the field of The Food and Agriculture Organization of the United Nations.

The fourth edition of the Australian Vocational Education and Training (VET) sector's national Metadata Application Profile (MAP) was conducted with the goal of efficient management, exchange and improvement of the discovery and access to the educational content objects by Bird *et al.* In this edition, the Institute of Electronical and Electronics Engineers Learning Object Metadata (IEEE LOM) metadata standard was considered as the base standard. The designed application profile has 37 metadata elements implemented in syntax of extensible markup language (XML) (Bird G, V. Blanksby, G. Brownfield, 2014).

The third edition of the application profile of the Digital Public Library of America (2014) aims to collect and integrate content objects of the cultural heritage of various US agencies as well as other efforts of this group of researches that the point of sharing all these studies emphasizes the data repositories of a special subject area(*Digital Public Library of America » DPLA Metadata Application Profile (MAP)*, 2014).

In addition to the researches that developed the application profiles based on the information context, another research by Andrade and Baptista (2015) aimed at identifying and determining the use of application profiles and metadata schemas in digital repositories based on the data collected from 2165 repositories managers. Only 13 repositories have used application profiles. Dublin Core metadata schema, Mark 21, Metadata Encoding and Transmission Standard (METS) and Metadata Object Description Schema (MODS) has the most application in the designation of these application profiles. The findings of this study indicated that the lack of managers' awareness about the benefits of using the application profiles and the

lack of clarity of the type of data elements used in these repositories were among the factors influencing the lack of sufficient use of the application profile.

A review of the studies in the field of compilation of application profiles shows that the process of using application profiles in various organizations is growing. Although the acceleration of this trend has been slow in the early years, but libraries and information centers are now more interested in designing it. So that the study of the field of metadata application profile by Malta and Baptista (2014) in the period 2001 to 2012 showed that among various scientific and information context (content objects with educational nature, data and library repositories, cultural heritage context, Interdisciplinary domains, e-government, science and agriculture, etc.), libraries and data repository, were the second organizations that designed and applied application profiles.

4. Research Methodology

The present study is an applied research. To conduct the research, the analytical-systematic method has been used. The research population has established existing metadata records in 23 libraries (one central, 10 hospital and 12 college libraries) affiliated to SBMU.

A researcher-made questionnaire consisting of 29 items was used to collect the data on the goals and local needs of the above-mentioned libraries. The questionnaires were completed by the librarians of the organization department and researcher's observation of the metadata databases related to aforementioned libraries.

Accordingly, the current features and needs of libraries in describing and organizing content objects using metadata, and their purpose in the future were identified. Also, given the fact that the libraries of SBMU use the format of the UNIMARC metadata because of the use of the same library software system, a check list was used to the selection of the elements of other metadata standards such as Dublin Core and MODS. The validity of these tools was confirmed by the professors and experts in the field of information science.

Interviews and observation were used for data collecting. The structure and semantics of the Application profile was designed by analyzing collected data.

5.

Findings

5.1. The current and future local needs and features of SBMU libraries in organizing knowledge

The findings showed that the content objects of SBMU's libraries are of high diversity. A large part of the content objects of the libraries of SBMU are books, periodicals, theses and dissertations. The Metadata has produced for the most of these sources that can be retrieved and viewed through the using library software system.

The other part of content objects that includes audio-visual materials, photos, maps and other printed materials that are not well-positioned in terms of generating metadata records in the library software system.

Among subject entities presented in the libraries, conceptual entities have the highest number, and with regard to the trends in the field of medicine and allied sciences, the subjects of the content objects have the highest overlap with the NLM classification schedule.

At present, subject entities are not separated in any of the libraries, and from the bibliographic entities only the entities "item" is separated. However, due to the librarians' desire to separate other subject and bibliographic entities and cover all entities the researcher has considered some elements and attributes based on the Library Reference Model (LRM) in designing the application profile.

All centers currently use the UNIMARC metadata standard. Because of the high diversity of elements and sub-elements contained in this standard, in many cases the elements for a single source are not uniformly matched by librarians of different libraries. There is less uniformity in describing and organizing resources such as theses and periodicals.

Overall, the findings show that there is no uniformity in the description of the types of content objects. Therefore it was tried to achieve coherence by limiting the number of elements and sub-elements, and matching the features and local needs of the libraries in the field of description and organization of content objects.

All centers use ISSN, ISBN, record number, identifying number, directory number, and library code; only one center does not use the library code because it does not use the library software system used in other libraries.

Of the libraries surveyed, 43 percent agreed with other standards along with the standard UNIMARC, of which a number of selected elements of other standards have been described. Seven elements have been selected of 22 elements of Dublin core, among which; the "audience" element has been most welcomed by the libraries of SBMU. The librarians have selected 2 elements of the MODS, also.

5.2. metadata elements, structure, and semantic syntax which are included in the metadata application profile

Currently, the studied libraries use AZARSA'S digital library software. This software is based on the UNIMARC metadata standard. In fact, the description of the content objects, according to the general structure of the UNIMARC standard, consists of 9 main blocks, each of which contains elements and sub-elements for describing the resources. The origin of the selected elements is of two different ducts:

A. The worksheets of the library software used for a variety of content objects have been investigated, and given the frequency of the completed elements and sub-elements and the experts' viewpoint, the elements of application profile selected from the UNIMARC standard.

B: The data obtained from the questionnaire and a check list containing elements of the Dublin Core and MODS provided to librarians and the librarians select some sub-elements of these standards.

It should be noted that the sub-elements appearing in the application profile do not only include the UNIMARC standard elements, and the two mentioned sources have been considered in the selection of all the sub-elements, also. The table 1 shows the features and sections needed for each element in metadata application profile.

In Table 2, the elements of the metadata application profile are expressed in a concise manner. Due to the large size of the application profile, it is avoided to mention the details of the relationship between the elements, attributes, and sections

of each element that represent the complete structure and semantic syntax of the profile.

TABLE 1: FEATURES AND SECTIONS OF THE ELEMENTS IN THE METADATA APPLICATION PROFILE

Element name	the name of the element
Tag in metadata standard	the element tag is written in the metadata standard
Tag in library software	the name of the element is mentioned in the library software
Metadata standard	The name of the metadata standard which the element has been selected from.
Local definition	a local definition of a element
Description	The outline of element and sub- elements
type	Element or sub- element
Refined by	In this part, the section of source that the element will be complete based on it, will be mention. For example, an element like a keyword can be refined by abstract. It means that the abstract is used to complete the keyword element. This section is based on the cataloged source and is not used from the external sources.
Coding scheme	In this section, standards, guidelines, and documentation used to complete the values of elements are generally mentioned.
Required?	In this section, the optional, mandatory and recommended elements are specified.
Data type	Code Being or Writing Element
Repeatable?	element repeatable or not

Table 2: the elements of the metadata application profile

Row	Element name	Metadata Standard	Row	Element name	Metadata Standard	Row	Element name	Metadata Standard
1	Access statement(local)	UNIMARC	22	Internal Bibliographies/ Indexes Note	UNIMARC	43	Publication, Distribution, etc	UNIMARC
2	Acquisition Status	UNIMARC	23	International Standard Book Number (ISBN)	UNIMARC	44	Record Identifier	UNIMARC
3	Bibliographic record information(local)	UNIMARC	24	International Standard Serial Number	UNIMARC	45	Record number	UNIMARC
4	call number	UNIMARC	25	language	UNIMARC	46	References (local)	UNIMARC
5	Cartographic Materials – Physical Attributes	UNIMARC	26	Library of Congress Classification	UNIMARC	47	Series	UNIMARC
6	Cartographic Materials – Specific Material Designation	UNIMARC	27	Local record number(local)	UNIMARC	48	Sound Recordings – Physical Attributes	UNIMARC
7	Cataloger information(local)	UNIMARC	28	Name and Title Used as Subject	UNIMARC	49	Sound Recordings and Music	UNIMARC
8	classification codes	UNIMARC	29	Notes Pertaining to Edition and Bibliographic History	UNIMARC	50	Summary or Abstract	UNIMARC
9	Coded Data Field: Continuing Resources	UNIMARC	30	Notes Pertaining to Physical Description	UNIMARC	51	Textual Resource Form	UNIMARC
10	Coded Data Field: Textual Language Materials, Monographic	UNIMARC	31	Notes Pertaining to Related Titles	UNIMARC	52	Title and Statement of Responsibility	UNIMARC
11	Corporate Body Name - Other Primary	UNIMARC	32	Personal Name - Alternative Intellectual	UNIMARC	53	Topical Name Used as Subject	UNIMARC

	Responsibility			Responsibility				
12	Corporate Body Name – Primary Responsibility	UNIMARC	33	Original Version Note	UNIMARC	54	Uncontrolled Subject Terms	UNIMARC
13	Corporate Body Name – Secondary Responsibility	UNIMARC	34	Originating Source	UNIMARC	55	Format	Dublin core
14	Corporate Body Name Used as Subject	UNIMARC	35	Periodical subscription(local)	UNIMARC	56	Instructional Method	Dublin core
15	Country of Publication or Production	UNIMARC	36	Personal Name Used as Subject	UNIMARC	57	Rights holder	Dublin core
16	Cover Title	UNIMARC	37	Personal Name- Primary Responsibility	UNIMARC	58	Audience	Dublin core
17	Edition Statement	UNIMARC	38	Personal Name- Secondary Responsibility	UNIMARC	59	Provenance	Dublin core
18	Edition statement(local)	UNIMARC	39	Personal Name - Alternative Intellectual Responsibility	UNIMARC	60	Relation	Dublin core
19	General Note	UNIMARC	40	Physical Description	UNIMARC	61	Source	Dublin core
20	General Processing Data	UNIMARC	41	Preferred Access Point	UNIMARC	62	Gener	MODS
21	Geographical Name Used as Subject	UNIMARC	42	Publication statement(local)	UNIMARC	63	Table Of Contents	MODS

6. Conclusion

Efforts in the context of application profile for the organization of content objects have been organized in both areas of institutional and subject repositories. In both types of institutional and subject repositories, there are special needs and objectives which not

only do they have a direct influence on the number and diversity of selective elements, and the semantic structure and context for designing the application profile, but they also explain the necessity of designing this tool.

In general, application profiles can be defined as two different groups in terms of the use of standard types. The first group is profiles in which one standard type for element selection is used, such as the application profile designed by Babaei (2018) that has used from EAD standard. The second groups are profiles in which a combination of standards, with an emphasis on one basic standard. The current research and also metadata application profiles which are resulted from Taheri and et al, Bird and et al, Statemple and et al, Manussellis and et al, Wilson and et al, and the Library of Congress have been designed based on the combination of different standards(Manouselis, Kastrantas and Tzikopoulos, 2007; Wilson *et al.*, 2007; Stuempel *et al.*, 2009; Bird G, V. Blanksby, G. Brownfield, 2014; Program for Cooperative Cataloging, 2014; Taheri, RostamiLatLayli and Norouzi, 2018).

In an application profile, basic standard is a standard which the most elements and semantics syntax are taken from, although the other metadata standards have been also used in designing application profile.

If you can design a separate profile for any type of content object or consider a comprehensive profile for all types of content objects, such as SBMU's application profule profile? Studies in the backgrounds of this research indicate that application profile of the Library of Congress (2010) has been designed separately for each resource, whereas the studies by other researchers, as well as the present study, are comprehensive profiles for all types of content objects (Manouselis, Kastrantas and Tzikopoulos, 2007; Stuempel *et al.*, 2009; Bird G, V. Blanksby, G. Brownfield, 2014; Babaei, 2018; Taheri, RostamiLatLayli and Norouzi, 2018) .

In Fig. 1, a schematic representation about the diversity of metadata application profiles is presented.

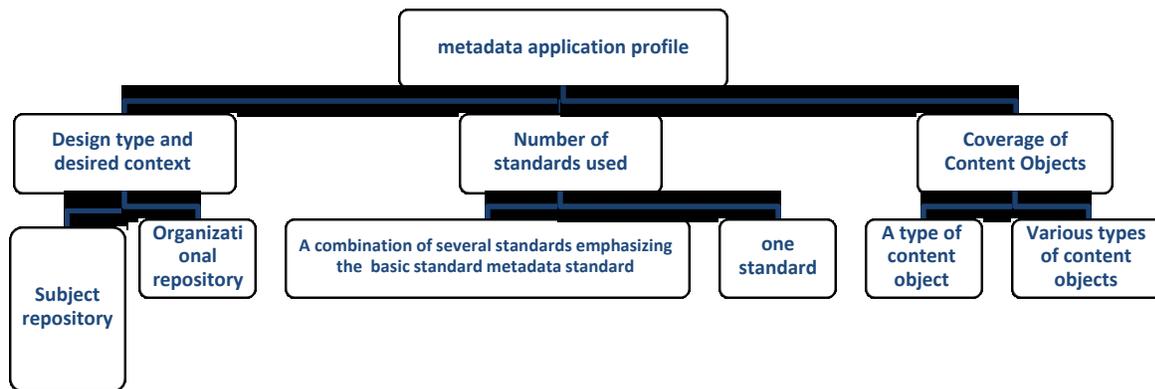


Figure 1:diversity of metadata application profiles

According to this study, as well as the literature review it is obvious that the trend of using the application profiles is increasing. Although in the early years, this trend was growing slowly, the organizations and information centers are now more interested in designing it than the past. The lack of enough information about capabilities and features of this useful tool between managers could be one of the main reasons why functional profiles were not used a lot in the past.

It seems that the inability of the organizers to use integrated standards because of different levels of interoperability among metadata standards, was other reason for using it less, whereas, the high ability of specialists in this field is vital for integrated implementation of standards and the management of several aspects of local needs.

Taheri (2014) states the most important reasons for not using this valuable tool in Iran: on the one hand, the lack of clarity of the local features of organizations and information contexts. On the other hand, the lack of precise determination of the objectives and functions expected from metadata. Therefore, the lack of sufficient attention to support of metadata standards in design of software is seen in Iran.

It goes without saying that the Web has substantial effect on libraries and information centers. Hence, it is essential for them to describe the data based on the informational context since the data are meaningful when they are the context-based. If libraries want

to be an influential part of the metadata, firstly, they have to make the data retrievable through the Web and, secondly, they need to provide the opportunity to be connected to other information centers. It is clear that the use of application profile in information centers for accurate and appropriate description of data is inevitable.

It seems that in a competitive atmosphere between different standards, the application profile fulfills local needs of organizations and contexts in order to provide services for users and the target community, follow the relationship between essential standards in an organization or specific context, and keep interoperability between different communities. By the design and utilization of profile in libraries of SBMU, they can be considered as one of the centers in this field and can be an exemplary of libraries in Iran.

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