COLLABORATIVE DESIGN FOR METADATA INTEROPERABILITY IN WEBOPAC

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ABSTRACT
Most system metadata development in Malaysian libraries deploys a top-down approach in which actual users were not involved. This resulted in the failure of the system to adequately meet the users' pragmatic needs. As studies on metadata pragmatic used are rare in the library bibliographic databases, this study investigated common system metadata elements used by Malaysian libraries in describing information objects in the domain of banking and finance, and the preferred user metadata elements in locating the needed information. Specifically, this study addresses two important questions, namely (1) what are the metadata elements preferred by users when searching for library resources on Islamic finance, and (2) how compatible are the system metadata with preferred user metadata elements? This study deployed the conceptual framework of collaborative metadata approach to identify compatibility elements between user metadata and system metadata. .

Keywords: Metadata interoperability; Collaborative metadata approach; Subject access; Bibliographic databases; User metadata; System metadata

ABSTRAK
Kebanyakan pembangunan sistem metadata perpustakaan di Malaysia menggunakan pendekatan atas-bawah di mana pengguna tidak terlibat. Ini menyebabkan kegagalan sistem untuk memenuhi sepenuhnya keperluan pragmatik pengguna. Memandangkan kurang penyelidikan penggunaan metadata pragmatik di dalam pangkalan data bibliografik perpustakaan, kajian ini mengkaji elemen metadata sistem lazim bagi bidang pembankan dan kewangan, dan elemen metadata pilihan pengguna semasa mencari maklumat yang diperlukan. Secara spesifiknya, kajian ini menjawab dua soalan, iaitu: (1) apakah elemen metadata pilihan pengguna apabila mencari sumber perpustakaan mengenai kewangan Islam, dan (2) sejauh manakah metadata

sistem serasi dengan elemen metadata pilihan pengguna? Penyelidikan ini menggunakan konsep rangka kerja pendekatan metadata kolaboratif untuk mengenalpasti elemen keserasian antara metadata pengguna dan metadata sistem.

Kata Kunci: Metadata anatar operasi; Pendekatan metadata kolaboratif; Akses subjek; Pangkalan data bibliografi; Metadata penggguna; Metadata sistem

INTRODUCTION

Metadata interoperability is a standard use of metadata elements and controlled vocabularies to provide consensual understanding of particular domain in vocabulary for subject access, relates the differences in a heterogeneity metadata, system collaboration and sharing of information resources (Assche, Campbell, Rifon & Willem, 2003; Lanzenberger, Sampson, Rester, Naudet & Latour, 2008; Reverte & Salat, 2009; Yi & Chan, 2009; Zeng & Chan, 2010). Collaborative metadata approach contributes in identifying the equivalent and compatible elements between system metadata and user metadata for interoperability.

In the library environment, system metadata is developed in top-down approach where actual users were not involved, and librarians having difficulties to capture the aboutness of the information objects for the bibliographic works (Alemu, Stevens & Ross, 2011). The top-down approach had resulted in the failure of metadata interoperability to adequately meet the user pragmatic needs (Lambe, 2007). Investigation in the library system metadata is necessary to obtain the metadata usage behaviour (Zhang & Jastram, 2006).

Preferences in user knowledge are different in how they manage representation of concepts and domain vocabulary as well as user search options. As such system metadata must consider the user's knowledge on the library system because the amount of system knowledge significantly affects user search patterns (Kiestra, Stokmans & Kamphuis, 1994; Mitchell & Srikantaiah, 2012).

Islamic finance domain knowledge is evolving, therefore enhancements to the Islamic finance vocabulary and standards are essential (Aziza, Norbaitiah & Lukose, 2011). Furthermore, this domain also contributes to growth of publication and research areas for experiments and explorations (Roslina & Siti Fatimah, 2011). International Shari'ah Research Academy for Islamic Finance (2010) stated that there is a need to increase the vocabulary references in this subject matter. The increase in vocabulary references in this domain affects the development of Islamic finance bibliographic databases. Research by Muhamat, Jaafar and Azizan (2011) reveals bank customers are having difficulties to

search information on Islamic finance by using Islamic Ffinancial Arabic terms. This might be due to ineffective subject access mechanism for bibliographic works on Islamic finance. As for the library system metadata, research on exploring the use of the subject terms in the bibliographic works had been done on various domain such as medical and agroforestry (Maggio, Bresnahan, Flynn, Harzbecker, Blanchard & Ginn, 2009; Zschocke, 2012). However, there is no research done on the use of Islamic Financial Terms (IFT) for bibliographic works in system metadata.

This study assessed the vocabularies alignment as a solution to the interoperability problems in mapping the system user-generated metadata with IFT as pragmatic view for interaction in subject access. This suggested for controlled vocabularies to be further explored along with the use of thesauri and taxonomies for user subject access in library system metadata (Isaac, Schlobach Matthezing and Zinn, 2008; Mondoux and Shiri, 2009).

The investigation in the standard use of controlled vocabulary in the library system metadata and uncontrolled vocabulary in user-generated metadata is necessary to achieve the interoperability of metadata between system metadata and user metadata (Mondoux and Shiri, 2009). Identification of system and user metadata compatibility contributes to metadata optimisation, and identification of user preferred and commonly used elements could benefit from greater granularity to the level of detail at which an information object is described (Dawson & Hamilton, 2006; Zhang & Jastram, 2006; Miller, 2011). Eventually, the use of equivalence vocabularies such as IFT could promote system metadata collaboration among the Islamic Finance bibliographic databases.

BACKGROUND

Collaborative Design

Most library system metadata is developed using authoritative metadata top-down approach, in which does not involve users.

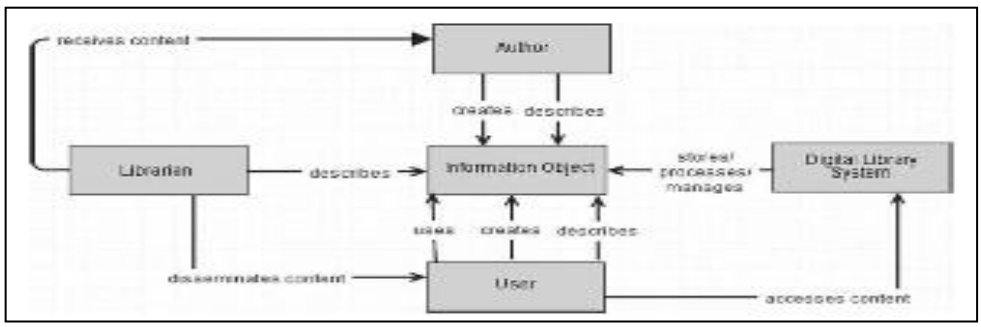

Figure 1: Collaborative metadata approach
(Alemu, Stevens & Ross, 2012)

Therefore, collaborative metadata design deploys bottom-up approach (Figure 1) in providing the metadata ecology for user metadata to contribute in system metadata (Alemu, Stevens & Ross, 2012). The user metadata defines how users use system metadata, how users create the subject access based on their domain knowledge, and how users describe elements in system metadata.

System Metadata

Most library system metadata incorporates controlled vocabularies such as thesaurus, subject heading lists, and classification schemes for user searching (Chu, 2010). Subject terminologies, taxonomy and ontology in specific domain knowledge in system metadata are also useful in supplementing for subject access to bibliographic resources.

The most common and useful type of exploratory searching is by subject terms, and the use of subject terminologies impedes effective searching and interoperability of the metadata records (Miller, 2011; Assche, Campbell, Rifon & Willem, 2003). The subject heading lists for Islamic Finance and Islamic Banking subject terms in Library Congress Subject Headings (LCSH) as follows:

Subject	Label	Vocabulary Control System	Concept Type
Islamic Finance	Finance (Islamic law)	LCSH	Topic
	Finance, Public (Islamic law)	LCSH	Topic
	Finance-Islamic countries	LCSH	Complex Subject
	Finance, Public-Islamic countries	LCSH	Complex Subject
	Finance, Public-Islamic Empire	LCSH	Complex Subject
Islamic Banking	Banking law (Islamic law)	LCSH	Topic
	Bank deposits (Islamic law)	LCSH	Topic
	Banks and banking-Islamic countries	LCSH	Complex Subject
	Banks and banking-Religious aspects-Islam	LCSH	Complex Subject

User Metadata

Many experts stressed the importance for end users' contribution in selecting metadata elements and standards for the information retrieval needs (Miller, 2011). Knowledge is a key variable in user information searching process and the variables often mention are the system knowledge and domain knowledge (Allen, 1991; Kiestra, Stokmans & Kamphuis, 1994). With the effective user metadata gains from flexibility and user-friendliness of system metadata; user has the choice to do basic search with elementary options to include subject words, exact title words and author (Kiestra, Stokmans & Kamphuis, 1994). In improving the user metadata, Hjorland (2002) listed several approaches for WebOPAC designers. Among the approaches are to conduct empirical user studies to organise domains according to user preferences, and perform terminological studies on languages for special purposes in a domain according to the pragmatic criteria.

Domain knowledge affects search behaviour and reformulation of the search tactics but does not affect the search effectiveness (Wildemuth, 2004; Zhang, Anghelescu & Yuan, 2005). Domain knowledge is the knowledge that users have of the topic being searched and use of user terms in searching is connected to their domain knowledge (Allen, 1991). Therefore, Zhang, Anghelescu and Yuan (2005) emphasise in exploring the interactions between domain knowledge and system search knowledge in user information searching. Creation of user search knowledge is connected to preferred search pattern and the natural language in their domain knowledge (Lancaster, 1991; Kiestra, Stokmans & Kamphuis, 1994; Shiri & Revie, 2003; Mu, Lu & Ryu, 2010; Xie & Joo, 2012).

User used keywords for specific information searching. User tasks are differed in how they handled hierarchical representation of concepts and the domain of vocabulary (Mitchell & Srikantaiah, 2012). The combination of keywords with certain semantic features such as noun phrases, concepts, and glossary terms have significant improvement to specific information object representation (Lin, Brusilovsky & He, 2010).

Similar Research

Anthopoulos, Siozos and Tsoukalas (2007) had explored collaborative, participatory design between system and user metadata aiming to collaborate and re-design the public services digital libraries. However, this research did not consider the experience of user community. For user metadata, Kim, Breslin and Choi (2010) performed exploratory study user generated tags to represent folksonomies for interoperability. The findings revealed major drawbacks of semantics and keyword ambiguity. Haroon (2011) performed literature review on classifying Islamic library materials towards DDC, whilst Schwing,

McCutcheon and Maurer (2012) analysed author-supplied keywords and LCSH to obtain overlapping of the semantic metadata.
Several researches focus on user search strategies attributes such as system knowledge, domain knowledge, search pattern, topic complexity, topic familiarity, search type, search moves, time taken, satisfaction, and search skills (Kiestra, Stokmans and Kamphuis, 1994; Shiri and Revie, 2003; Mu, Lu and Ryu, 2010; Azzah and Sandersen, 2011; Xie and Joo, 2012). The researchers less emphasizes in obtaining user preferred metadata elements.

METHODS

The mixed method of exploratory design and embedded design is used in this research. Data collection and analysis in this study were qualitative using content analysis and quantitative approach employed survey research. The qualitative data explored for the metadata elements used in webOPAC from selected libraries in Malaysia which have a considerable size of information resources on Islamic Finance. The institutions identified were Universiti Islam Antarabangsa Malaysia (UIAM), Universiti Sains Islam Malaysia (USIM), Islamic Banking and Finance Malaysia (IBFIM), International Centre for Education in Islamic Finance (INCEIF), Universiti Kebangsaan Malaysia (UKM) and Kolej Universiti Islam Malaysia (KUIS).

The list of available metadata elements used in these databases were embedded in the user questionnaire. Data was collected on the selection of preferred metadata elements by users, and their perception on using of IFT as keywords in searching for the Islamic finance information resources. The questionnaires were distributed to user with low level to high level domain knowledge in Islamic finance. The low level domain knowledge users were from 151 undergraduate students, medium level knowledge users from 102 postgraduate students and 35 lecturers and researchers represented for 'high level' knowledge users. The questionnaire consisted of the following items:

1. User indicated their preference using system metadata elements for searching; ranging from 'not useful' to 'very useful'.
2. User created keywords based on the following two tasks:
   Task 1: "Describe the characteristics of Islamic Financial Systems that are different from Conventional Systems"; and
   Task 2: "Briefly discuss the differences between conventional insurance and Islamic insurance".
3. User described the helpfulness of using IFT in webOPAC; ranging from 'disagree' to 'strongly agree'.
4. User described using IFT towards relevancy of retrieved information resources from webOPAC; ranging from 'not relevant' to 'very relevant'.

RESULTS

Profile of webOPAC bibliographic databases for selected institutions was tabulated in Table 1.

Table 1: Profile for Selected Bibliographic Database

Institutions	Vocabulary Control System	Search Criteria
UIAM	LCSH	General, Author, Title, Subject, Series, Periodical Title
USIM	LCSH	Author, Title, Subject, Publisher, Call Number, Journal Title
IBFIM	LCSH	Author, Title, Subject, Publisher, Call Number, Journal Title
INCEIF	LCSH	Title, Author, Keyword in, Author Headings, Subject, Keyword in Subject, Headings, ISBN
KUIS	LCSH	Author, Title, Subject, Publisher, Call Number, Journal Title
UKM	LCSH	Author, Title, Subject, Publisher, Call Number, Journal Title

From the content analysis of institutions' webOPAC, metadata available for user to create searching for the Islamic Finance resources were 'author', 'title', 'subject', 'publisher', 'call number', 'journal title', 'keyword in author headings', 'keyword in subject headings' and 'ISBN'. LCSH was the vocabulary control system metadata elements to describe bibliographic works on Islamic Finance information object.

Preferred User Metadata Elements

From the questionnaire, user preference metadata elements were ranked in Table 2.

Table 2: Preferred Metadata Elements Used by Users

Preference Ranks	Search Elements	Mean
1	Title	4.40
2	Keyword in Subject	3.99
3	Subject	3.89
4	Journal	3.82
5	Keyword in Author	3.71

6	Author	3.69
7	Abstract	3.39
8	Publisher	3.26
9	Call Number	3.13
10	International Standard Book Number	2.98

With the overall mean of 3.645, the preferred user metadata elements were 'title', 'keyword in subject', 'subject', 'journal', 'keyword in author', and 'author'. In the preference rankings, title and subject were the most selected search metadata elements by users.

Table 3 shows the pattern of keywords assigned by respondents when searching for the task assigned. The observation suggests, high and low level knowledge users preferred using IFT to search for the Islamic Finance resources.

Table 3: Patterns of Keywords Assignment

User Domain	Using IFT	Not Using IFT
Low level	63% (95 users)	37% (56 users)
Medium level	41% (42 users)	59% (60 users)
High level	62% (22 users)	38% (13 users)

Respondents were asked to indicate their level of agreement on the use of IFT in webOPAC. In *Table 4*, 71% (205 users) 'agreed' and 'strongly agreed' that using IFT in webOPAC was helpful in searching the Islamic Finance resources. In addition, 79% (228 users) perceived that the use of IFT in webOPAC as 'relevant' and 'very relevant' in retrieving Islamic Finance resources.

Table 4: Perceptions on Using Islamic Financial Terms (IFT)

Descriptions		Percent
Helpful in Searching	Disagree	2.7%
	Quite disagree	25.2%
	Agree	59.8%
	Strongly agree	11.0%
Retrieved Relevant Resources	Not relevant	0.7%
	Quite relevant	18.6%
	Relevant	64.1%
	Very relevant	14.6%

Compatibility between System Metadata with Preferred User Metadata

Compatibility for system metadata and user metadata elements is the aim for metadata interoperability in enhancing the subject access to bibliographic

databases. From *Table 5*, it was observed that 'title', 'subject', and 'author' were the equivalence system metadata in all selected bibliographic databases.

Table 5: System Metadata Used in Selected webOPAC

Search Metadata Elements	Institutions					
	UIAM	USIM	IBFIM	INCEIF	UKM	KUIS
Title	/	/	/	/	/	/
Keyword in subject				/		
Subject	/	/	/	/	/	/
Journal		/	/		/	/
Keyword in author				/		
Author	/	/	/	/	/	/

This study also investigated the compatibility between system and user vocabulary in representing works in Islamic Finance. In system metadata, IFT that described the Islamic finance information object are on the subject of *bay', gharar, ijarah, istisna, mudarabah, musharakah, murabahah, takaful, and tijarah.*

As for user metadata, user-created IFT for the tasks given in the questionnaire were as follows:

In Task 1	*Aqad, bay', faidah, gharar, istisna, mudarabah, murabahah, maisir, musharakah, qard hasan, riba, sukuk, shariah, tabarru, wadiah*
In Task 2	*Aqad, al-bay, gharar, hibbah, ijarah, istisna, kafalah, maisir, murabahah, riba, tabarruq, tabarru, takaful, wakalah, tijarah, tawarruq, takaful, shariah, yad alamanah,*

The IFT used in system metadata and IFT created by user has some similarities. However, the system metadata has less IFT representations to adequately meet the user pragmatic needs in achieving metadata interoperability between system and user metadata.

CONCLUSION

Underlying principles in cataloging rules are for user convenience, common usage of vocabulary, sufficiency and necessity to fulfill user tasks, bibliographic

significance elements, economical towards the preferences, and standardization to increase the ability for sharing the bibliographic records (Tillet, 2007). The principles signify the elements in system metadata used to describe the information objects. Collaborative metadata approach identifies standard metadata elements used by system and user, in which similarities of system metadata and users metadata vocabularies provide a solid foundation for metadata interoperability in the cross-vocabulary discovery task (Mitchell & Srikantaiah, 2012).

The user input anticipates the practicality of deploying IFT as subject vocabulary control tool in system metadata for metadata interoperability. Applying IFT as vocabulary control tool to describe the Islamic Finance information objects improves the subject access to bibliographic works on Islamic Finance. In addition, the representation of IFT as the content aboutness enhances the user pragmatic needs as semantic metadata interoperability in Islamic Finance subject access. The standardisation of vocabulary control tool in Islamic Finance then provides for content sharing and information integration among the Islamic Finance bibliographic databases in Malaysia.

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