

Dinesh Rathi, School of Library and Information Studies, University of Alberta, Edmonton

Ali Shiri, School of Library and Information Studies, University of Alberta, Edmonton

Shannon Lucky, School of Library and Information Studies, University of Alberta, Edmonton

Paper: Evolving and Emerging Trends in Digital Libraries User Interfaces

Abstract. This paper reports on the ways in which two national and two public digital libraries from four different countries (Canada, United States, Britain, Australia) have made use of metadata elements and social media features such as social tags and recommendations to support searching, browsing and navigation of digital information.

Résumé. Cette communication porte sur les façons dont deux bibliothèques numériques nationales et deux bibliothèques numériques publiques de quatre pays (Canada, États-Unis, Royaume-Uni, Australie) ont fait usage des métadonnées et des fonctionnalités sociales telles que l'étiquetage social et les recommandations pour aider la recherche et la navigation de l'information numérique.

INTRODUCTION

Digital libraries provide access to digital collections of material (Lesk, 1997 as cited in Zaphiris, et al., 2004) i.e., “*digital library is a set of digital objects and services that allow a community of users to access and re-use the digital objects*” (Meghini, 2010). Digital libraries (e.g., Haathi Trust [<http://www.hathitrust.org/>], ACM Digital Library [<http://dl.acm.org/>], etc.) (Malizia, 2010) are becoming popular in their use and one of the reasons for their popularity is that they have been effective in reducing spatial and temporal barriers i.e., the users are able to, with ease, search and browse the collection anytime from anywhere using the Internet. Digital libraries are multifaceted and complex information structures that offer a wide range and variety of information bearing objects and digital libraries requires multiple features and access points so that users can access, retrieve and browse the collection in the digital library. Harper (2006) argued that the addition of features in digital libraries' interface is limited only by time, the functionality of digital asset management systems, and the ingenuity of digital library developers and “*a digital library is only as good as the interface it provides to its users*” as noted by Arms (2000). Therefore, it is critical to evaluate different digital library user interfaces to learn more about newly emerged features so that they “*compare well with other web destinations in appearance and in navigation . . . When users interact with intuitive interfaces and visually appealing sites elsewhere on the web, libraries feel challenged to offer interfaces that work just as well and look just as good*” (Breeding, 2007 as cited in Yang and Hofmann, 2011).

Thus, this research aims to examine and evaluate the features used and implemented in digital libraries, and also to identify the adoption of new features and functionalities, such as social tags, in digital library user interfaces that would support and help users in providing access to the collection and encouraging a rich interaction experience with digital library user interfaces. Four digital

libraries were selected from four English speaking countries, namely Canada, United States, Britain and Australia for analysis in this study.

LITERATURE OVERVIEW

Fox and Urs (1993) suggest that digital libraries are becoming the main repository of mankind's knowledge, and as a result the design of user-friendly interfaces to access, understand, and manage digital library content has become an active and challenging field of study. Harper (2006) identified five key elements to develop good a digital library and these include system architecture, digitization of content, metadata development, visual interface and preservation of digital objects. The author argued that visual interfaces of digital libraries and good metadata elements for the digital objects are very important from end user perspective. Wan (2006) also recommended that designing of user-friendly interfaces is crucially important in exploration (and retrieval) and management of contents in the digital libraries.

Parandjuk (2010) argues that creation of metadata standards is an example of best practices in information architecture in digital libraries because metadata makes interoperability easier between different digital libraries. Greenberg (2010) notes that the creation of metadata is crucial for digital libraries's success as the metadata allows users to have multiple access points. The users can search the material in digital libraries through multiple access points (e.g., topics, media type, title, authors, etc.) i.e., practically all the elements of metadata can be utilized as access points in digital libraries as compared to limited known item search access points (e.g., author, subject, and title) in physical library using card catalogue. Many such access points in digital libraries are either part of the basic search or advanced search features (Morville and Rosenfeld, 2007 as cited in Parandjuk, 2010).

The emergence of social media has led to incorporation of social media tools and technologies (e.g., social networking, social tagging, etc.) on many digital libraries websites. One of the main objectives of adding new features in digital library user interfaces is to make effective use of crowdsourced (Howe, 2006) data to improve searching, browsing and retrieval. Rubin et al. (2011) in their research work found that 26% and 6% of the examined library websites have links to Facebook and Flickr respectively. In addition, they found evidence of the use of Twitter, social tagging, etc. on library websites. Social tags, also commonly known as folksonomies, are generated by users (Sun, 2008; Smith, 2004) and are now seen as "a form of emergent indexing" (Woolwine et al., 2011; p. 81). It is also described as social indexing process (Hassan-Montero and Herrero-Solana, 2006). Folksonomies are a form of crowdsourced (meta)data that serves as an alternative mode of access to content in digital libraries and the tag cloud generated from social tags is becoming increasingly popular "interface model for visual information retrieval" (Hassan-Montero and Herrero-Solana, 2006). At the onset, the interface designers may not be able to think of or incorporate all the emerging features (e.g., social tagging) in digital library user interfaces that will be helpful to the user in resource discovery. However, some features in digital libraries become popular over a period of time (e.g., tag cloud) and befit to become standard features. For example, Na et al. (2011) argued that "*the sentiment-based browsing and searching would be a standard feature in future digital libraries of social media content (e.g., expert reviews, user reviews, blog postings, and discussion board postings) as they enhance the usability of the digital library*" (p. 310).

THE STUDY

The objective of this research is to examine and evaluate the features used and implemented in digital library user interfaces, and also to examine the adoption of new features and functionalities in digital libraries. The study was conducted on four digital libraries from different institutions and countries i.e., Edmonton Public Library (EPL), Canada; Trove: National Library of Australia (NLA), Australia; The Ann Arbor District Library System (AADL), United States; and British Library (BL), UK. It was decided to choose two national and two public libraries to be able to compare features and functionalities across different types of institutions. The rationale for this selection lies in our interest in international digital library developments and innovations.

Methodology

The analytical categories of different features offered by digital libraries were developed by using Grounded Theory (Glaser and Stauss, 1967; Pandit, 1996). The advantages of the grounded theory is that it provides a strong theoretical foundation in discovering features and their properties from either single or multiple sources of data through an iterative process without having a priori categories (Pandit, 1996). Thus, in this research, the use of grounded theory approach helped in developing the feature list which was not pre-determined but was developed incrementally when researchers browsed and interacted with the selected digital libraries. In our analysis we took into account the notions of richness and variety of metadata elements used and the ways metadata elements were used to support searching, browsing and exploratory interaction. More specifically, we developed a set of analytical categories based on metadata elements. These elements include basic and advanced search functions, query formulation and reformulation, collection level metadata, visual representations as well as such emerging features as social bookmarking, social tagging and other types of user –generated content.

RESULTS OVERVIEW

Current digital library user interfaces incorporate new visual and graphical representations of digital collections. This research is complete and we found many interesting features, some of them are discussed here and detailed findings will be presented at the conference.

We found that users can choose such elements as format, genre, date or language to search for and browse through digital collections, but there were a few unique features or variation of standard features (like date) to refine search. One of the interesting features we found was the item-level metadata elements that exist in all four digital libraries but not all the item level metadata elements are available for browsing, searching or query refinement. For example, the Trove digital repository has Dewey Decimal Classification (DCC) number as one of its item level metadata, and some items in EPL have Library of Congress Classification and DCC numbers but the user interface does not provide any mechanism either in basic or advanced search functions based on those schemes. For instance, EPL used feature like ‘date acquired’ to allow users to look at the displayed results based on the acquisition date, while AADL used different versions of date features (e.g., ‘this week’, ‘this month’, ‘this year’, and ‘just added’) to identify the most popular items based on such date stamp. Another interesting finding was that the digital library interfaces provided support for query formulation and refinement based on metadata elements. For example, EPL makes use of the term ‘Explore Further’ to help users narrow down their searches using such metadata elements as user generated tags and subject headings while Trove offers users such metadata elements as availability, format and language to support users search reformulation.

The study also revealed that the use of social media or Web 2.0 tools and technologies is one of the emerging trends on the visual interfaces of all the four digital libraries. Each library had different types of social media tools incorporated, including twitter, bookmarking (e.g., Delicious, Connotes), blogs and links to social networking site like facebook. The examined digital libraries had such features as social tagging and tag clouds/lists to provide additional access points to retrieve material from digital collections. The tags enhance and expand standard metadata elements and controlled vocabulary terms. The tags could be used to organize the information based on users' collaborative perception, which would then support browsing, serendipitous discoveries (Twidale et al., 1997; Mathes, 2004), navigation of the collection (Goh et al., 2009), and the search process (Sun, 2008). Another interesting feature found on three libraries' visual interfaces (except for the British Library) is the inclusion of user ratings and comments. These features assist users in learning about and searching for information on top or highly rated resources as recommended by the community members. These developments are in line with the current trends in many e-commerce websites where the systems use opinion mining techniques to gather, index and present users' views, comments, and ratings on various services and products.

To conclude, through this research we found the implementation of new features from social media domain (tagging, tag cloud, reviews, etc.) as well as variations of standard metadata elements (like 'date acquired', 'this week', 'this month', 'this year', etc.). This in turn will impact users' interaction with digital libraries and affect their experience in searching, retrieving and browsing the collection.

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