Significance of Web 2.0 in Digital Libraries

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***Abstract*-The rapid development of Information and Communication Technologies has provided a well sophisticated environment to develop the digital libraries. A digital library is a large-scale, organized collection of complex and dynamic multimedia information and knowledge, and tools and methods to enable search, manipulation and presentation of this information and knowledge via Internet. User-Centered approach for the digital libraries would increase its usage [1]. Web 2.0 technologies provide better user-centered services with rich user experience for Web applications. Hence this paper deals with the significance of Web 2.0 in building of digital libraries and presents the architecture of Web 2.0 enabled user interface system for DSpace digital repository.**

Keywords : *Digital libraries, Web 2.0, User Interfaces*

I. INTRODUCTION

The contemporary technologies like Internet, World Wide Web and modern databases have provided a well sophisticated environment for the development of digital libraries [2]. A digital library is a large-scale, organized collection of complex and dynamic multimedia information and knowledge, and tools and methods to enable search, manipulation and presentation of this information and knowledge via Internet. A large number of digital library projects have taken place across the globe due to its advantages in preservation and dissemination of multimedia information to the common man. For building of digital libraries several approaches are employed which includes System, Activity, Content and User centered approaches. However, research has shown that the User-Centered Approach is suitable for digital libraries in order to increase its usage [1].

"Web 2.0" describes the changing trends in the use of World Wide Web technology and web design that aim to augment creativity, communications, secure information sharing, collaboration and functionality of the web. Web 2.0 concepts and technologies have provided to develop web applications for social networking, audio/video sharing, information book marking, blogs, wikis and folksonomies with a rich user experience.

Hence this paper discusses the significance of Web 2.0 in designing of User-Centered Digital Libraries. The paper is organized as follows. Section 2 describes Web 2.0 framework and characteristics section 3 provides significance of Web 2.0 in digital libraries Section 4 presents architecture of Web 2.0 enabled user interface system for DSpace digital repository. Finally, Conclusion follows.

II. WEB 2.0

"Web 2.0 is the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an 'architecture of participation' and going beyond the page metaphor of Web 1.0 to deliver rich user experiences" [3]. The characteristics of Web 2.0 are as follows

- User Participation
- Open Standards
- Decentralization
- Modularity
- User Control
- Rich User Interactions

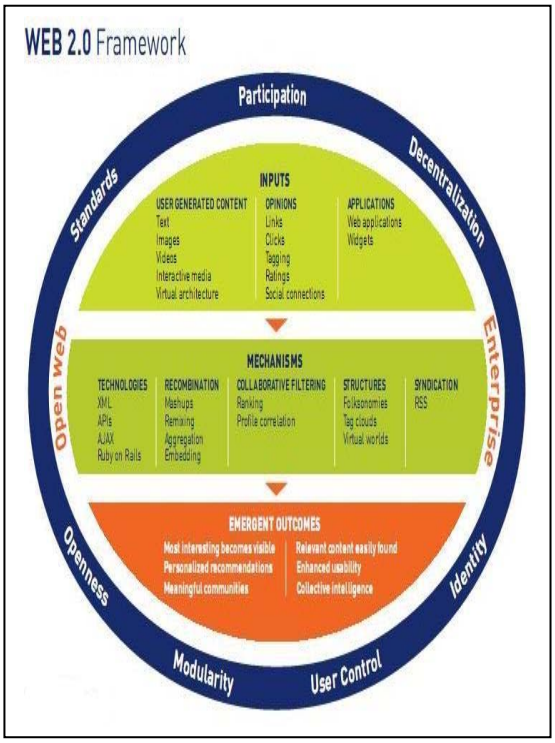

Figure 1: Web 2.0 Framework [4]

III. SIGNIFICANCE OF WEB 2.0 IN DIGITAL LIBRARIES

The contemporary experience of users on the Web has undergone remarkable transformations owing to trends such as Web 2.0, Cloud Computing and the associated user-centered propensities [5]. There is an increase in dynamism: declaring, creating, modifying and disposing entire digital libraries "on demand" [6, 7]. These new developments are urged to incorporate a richer set of user-centric services offering functionalities beyond the traditional IR scope [8] into the digital libraries. Applying the Web 2.0 concepts to digital libraries often results in a conflict between cooperation and control [11]. However, developing the digital libraries with Web 2.0 will facilitate more user-centered design for its effective implementation.

The following are the several technologies, services and applications of Web 2.0, which are very useful to adopt in design of digital libraries as more user-centered.

- Rich User Interactions
- Blogs
- Wikis
- Really Simple Syndication (RSS) feeds
- Multimedia Sharing
- Social Networking
- Bookmarking
- Tagging

A. *Rich User Interactions*

The powerful feature of Web 2.0 is its Rich User Interactions. Asynchronous Java Script and XML (AJAX) is one of the key components of Web 2.0 [3], which facilities to develop rich user interactive web applications. Digital library users are come from various psychological, educational and academic backgrounds, to support all type of users digital library must provide effective and interactive user interface [2]. Hence developing the user interfaces of digital library system with Web 2.0 technologies would defiantly increase its usability. The following diagram illustrates the AJAX web application model which supports the rich user interaction in asynchronous process.

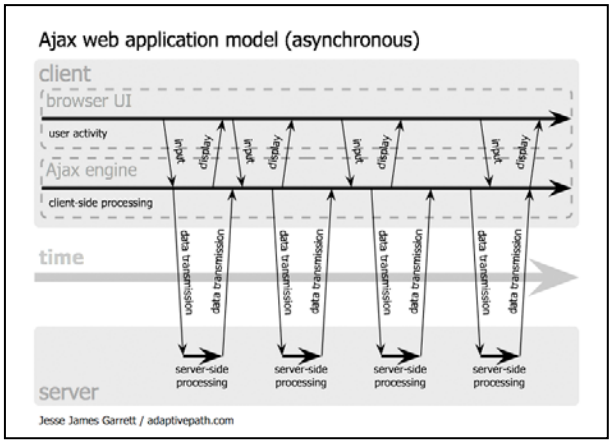

Figure 2: AJAX Web Application Model [13]

B. *Blogs and Wikis*

Blogs and Wikis are Web 2.0 application, which facilitates the users to share their ideas, knowledge. A wiki is a way of constructing knowledge; a blog is a way of distributing news [9]. Ultimately, blogs and wikis have been used as support for collaborative work.

Wikis are useful in digital libraries in several ways:

- To support collaborative work, substituting old .doc or .pdf documents.
- To produce a course or study corpus in cooperation with all academic stakeholders: lecturers, students …
- To distribute information to students, in order to facilitate the updating of materials by the professor.

Blogs are useful in digital libraries in several ways:

- Blogs provide an easy way to produce dynamic learning environments even though without basic knowledge of web page construction.
- Blogs are useful as an alternative digital portfolio or as a learning log.
- Blogs are very useful for collaborative work on the Web.

C. *RSS feeds*

RSS is a family of formats that allow users to find out about updates without actually having to go and visit the relevant sites. RSS makes it possible to spread information, replacing traditional emailing lists and reducing e-mail overload; it also allows users to read all its news in one place [10]. Building the digital libraries by integrating RSS feeds, user can get up to date information on particular interested topics at his Homepage without navigating or searching in the DL system.

D. *Multimedia Sharing*

Web 2.0 technologies provide better access and sharing mechanisms for multimedia information. Podcasting is one among them which provides a different way to share the audiovisual material. Video on-line is another which facilitates the better video delivery to the user in online. By using these technologies and services digital library can disseminate multimedia information to its users in a better way.

E. *Social Networking*

Web 2.0 is Collaborative and Interactive. Social networking services enable users to share information within a network of colleagues through user profiles, linking users to others posting similar information. A social network thus can be formalized into a net structure comprising nodes and edges. Nodes represent individuals or organizations. Edges connecting nodes are called ties, which represent the relationships between the individuals and organizations. By enabling this in digital libraries will build a network among the interested group in discussing the common interest and

users can add the information to the digital library like books reviews and comments etc.

F. Bookmarking

These systems allow users to create lists of bookmarks or favourites, to store them centrally on a remote service, and to share them with other users of the system. By enabling this feature in digital libraries, users can create and share a set of resources with other users.

G. Tagging

A tag is a keyword that is added to a digital object (e.g. a website, picture or video clip) to describe it, but not as part of a formal classification system. The concept of tagging has been widened far beyond website bookmarking, and services like Flickr (Photos), YouTube (video) and Audio (podcasts) allow a variety of digital artifacts to be socially tagged. By enabling this feature into digital libraries will facilitates the efficient lateral searching.

IV. ARCHITECTURE OF WEB 2.0 ENABLED USER INTERFACE SYSTEM

According to the survey findings and results, most of the Indian universities are using DSpace digital repository software[15] for building their digital library/institutional repository system[14] and it is clear that there is a great need to enable the Web 2.0 and other contemporary technologies in digital libraries to increase its usability in Indian universities [12]. According to the investigated user requirements and needs we developed the Web 2.0 enabled user interface (UI) system for DSpace digital repository based on user interface design principles for digital libraries [2]. This UI system is built upon Model-View-Control (MVC) framework using Java Server Faces (JSF) technology with Tiles Template Framework.

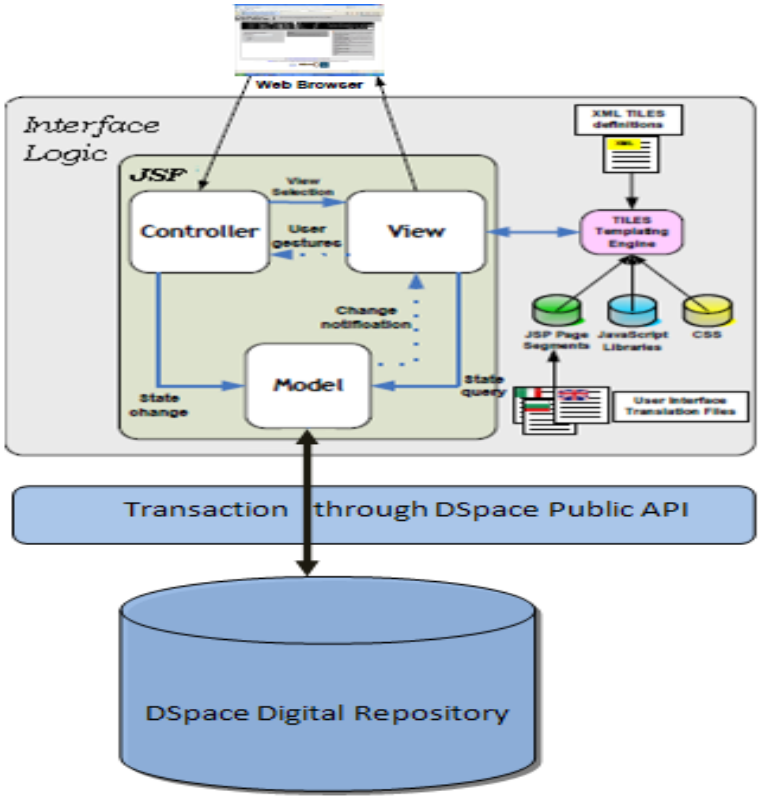

Figure 3: Architecture of Web 2.0 UI System for DSpace

Figure 3 shows the architecture of newly developed Web 2.0 enabled user interface system for DSpace digital repository. This UI system fits in the Application layer of the DSpace Three layered architecture. As shown in Figure 3, when the browser requests a page, the JSF controller asks the TILES engine to put together the page components, according to instructions provided by an eXtensible Markup Language (XML) configuration file. Then, TILES loads the Java Server Pages (JSP) reusable code segments to create the page skeleton, adds the AJAX and JavaScript libraries needed for enhancing the user interaction, fills the page with the contents provided by the JSF controller, applies the necessary Cascading Style Sheets (CSS) for formatting the page, and return the dynamically created page to the View layer of JSF, which, in turn, sends it to the browser. This UI system uses DSpace public Application Programming Interface (API) for making transactions with the DSpace digital repository. This UI system is platform independent and easily accessible with rich user interactions on the user

browsers. The prototype interface of the system is under usability test.

V. CONCLUSION

Enabling Web 2.0 functionality for digital libraries would certainly evolve as more user centric with improved interactions and services. The initial test results of the developed Web 2.0 enabled prototype user interface system are encouraging towards the development of production system.

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