IMPACT OF DIGITAL LIBRARIES ON OPEN SOURCE SOFTWARE BASED ON USER'S PERCEPTIONS: A REVIEW

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Abstract— Digital libraries are repositories of e-resources that focus primarily on the searching, browsing and accessing of scholarly content in an educational environment. While during the earlier days digital libraries were constructed by others, however lately, the act of constructing a digital library especially in building your own content is itself an invigorating learning exercise. The emergence of popular open source digital library software such as Greenstone, EPrints, Fedora and DSpace to name a few has made building a digital library or an institutional repository so easy. This new development in the process raises pertinent issues regarding the use including educational potential of digital libraries construction along with its implications on the design of digital library software. Selection of digital library system software differs in some significant ways from traditional software implementations with careful planning right from the initial stages keeping in mind the institution expectations. Success of such implementations heavily depends on how the user community is comfortable with its functionality while interacting with the system. Understanding that no software package will be able to meet the entire expectations of an institution what is vital is to ensure that a feedback system exist so that the requirement is communicated back which are to be reflected in the improved systems. After all, users who had been exposed to interactive systems will inevitably expect the same pleasant experience in digital libraries established on open source software. In view of this scenario it is perceive that the use of digital libraries creates an impact on open source software especially on the technological aspect related with future development and improvement in the design of open source digital library software.(Abstract)

Index Terms— Digital Libraries, Open source software, ICT application in libraries, Computer Interface Design, Information Retrieval

I. INTRODUCTION (HEADING 1)

Digital libraries are thought of as repositories that students use for searching, browsing and accessing the contents. Earlier, majority of educational institutions usage of digital libraries involved around resources constructed by others. Lately, the act of constructing a digital library especially in building your own content is found to be an important learning experience. Hence in today's world the topic of digital librarianship as in "[1]" is subjected to rapid change. This change is also partially defined by the availability and functionality of appropriate software. The ease of building a digital library or an institutional repository has been radically changed over the past decade by the emergence of popular open source digital library software such as Greenstone, EPrints, Fedora and DSpace to name a few. This new development raises issues surrounding the use including educational potential of digital libraries construction and also its implications on the design of a digital library software as in "[2]".

II. DIGITAL LIBRARIES

Digital libraries are institutions which offer scholarly resources for access generally by a specific group of information seekers with an objective to preserve the digital resources over a period of time as in "[3]". It is a digital representation of physical materials housed in a traditional library organized to assist users to locate them without any hindrance for use and further dissemination as in "[4]". While viewing from a technological point of view, a digital library allows users to communicate with the available information over a dedicated network as in "[5]". They are intelligent systems on which activities upon enable readers, authors, librarians and researchers to collaborate and share electronic content as in "[6]". They are digital collections which include text, video, and audio, along with mandatory features to access and retrieve the organized collection as in "[7]".

III. OPEN SOURCE SOFTWARE

Open Source Software (OSS) came into the mainstream in recent years and its scope is set to increase. Originating in United States academia in the early 1970s, open source software continued to become increasingly used widely throughout the 1990s and into the 2000s. Its liberal licensing policy and free community support that it thrives upon may be one of the reasons for its popularity. However, its scope and appeal looks promising in future due to the advent and expansion of the Internet. Anybody who wishes can freely download open source software modules from sites like sourceforge.com and respective homepages. Such mode of open source software delivery is similar to other software delivery techniques that the Internet powers viz. virtualization, software oriented architecture (SOA), software as a service (SaaS) and cloud computing all of which are gaining popularity as in "[8]".

As in "[9]", in many Information and Communication Technology (ICT) applications, open source software has been found to be relevant when considering long-term sustainability. Due to this, in the area of electronic archiving and digital libraries application, the open source software license GNU General Public License (GPL) as in "[10]" has been recommended for software that handles data that needs to be kept for a very long time. This has a significant effect on the preservation requirement of such data and creates a suitable environment around the software that is independent of the organization that generates it. In this context open source software is seen as a strategy for long-term maintainability while minimizing the risk of lock-in.

As in "[11]" it was believed that open source software development, as vividly expressed in "[12]" too, propagated through the idea of sharing and giving away information to improve our place in this world is similar to the principles of librarianship. Just as Jefferson's

"informed public" as in "[13]" is a necessity for democracy, open source software is necessary for the improvement of computer applications. The distribution terms of open source software must comply with the criteria which include free redistribution, availability of source code and maintaining its integrity, promote modifications and derived works, lack of discrimination against persons or groups or against fields of endeavour and flexible distribution of the license.

IV. OPEN SOURCE DIGITAL LIBRARY SOFTWARE

It was opined as in "[14]" that selection of digital library system software differs in some significant ways from traditional software implementations. There is a need for careful planning right from the initial stages related with type and format of content the institutional repository is expected to host. It should be ensured too that an average person in the user community is comfortable with its functionality while interacting with the system. Understanding that no software package will be able to perform all of the required functionalities in the exact manner the organization require, hard decisions have to be taken on what functionality is required at present and what can potentially be given up or deferred to a latter time or perhaps implementation of a particular function in another way or as an add-on later and its implications. Considerations on vendor viability require close scrutiny vis-à-vis product support, long-term cost and future maintenance. Recently introduced software versions may exhibit functional limitations including bugs within software modules especially related with security and authentication issues. Careful thought on whether your library/institutions have the necessary resources to deploy and maintain the application including aspects of training and documentation needs to be evaluation too.

However additional criteria required for the selection of open source digital library software is that they should be freely downloaded and publicly available using an open source license and compliant with Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) and be supported on commonly used platforms viz. Linux or Windows. Secondly, the software should be stable, standards-based and had a reasonable number of installed bases worldwide as in "[15]".

V. USER'S PERCEPTION OF DIGITAL LIBRARIES

The general perception of digital library is how they influence their users and society as a whole. However, when viewed from a librarian's angle, perception of using a digital library is experiencing a situation in which information can be effectively access with great efficiency as in Marchionini (2000). The Human Computer Interaction (HCI) community, define usability of digital libraries as the effectiveness, efficiency and/or satisfaction of the user with a particular interface as in "[18]" and "[19]". Earlier perceptions of digital libraries are defined based on usability of multiple online databases with a focus on technical and performance issues rather than on interaction issues as in "[20]"Perceptions about usability of a digital library are defined as how easily users can interact with the interface of the digital library. Improvements in the designing of a open source digital library are based on inputs that the community of developers received from its users as in "[18]". Thus open source digital library software with such an open community will no doubt be able to develop a well-designed digital library with good usability features based on findings of Human Information Behaviour (HIB) studies. Based on the above definitions on general user's perceptions of digital library, operational definition of digital library is proposed as online services whose key components comprising of content, functionality and user interface are to be develop by taking into consideration user's perceptions.

VI. USER'S PERCEPTION ON IMPACT OF DIGITAL LIBRARIES

As a result, digital libraries established using open source software could be customized through source code modifications which will ensure improvement in the workflow and navigation style to reduce search time This method of improving the functioning of the one's digital library will further have an impact on open source software or code usage/modifications in order to further develop other digital libraries. Thus as mentioned earlier, it could be proved that using digital libraries can have an impact on open source software and more specifically on the development and improvement in the design of open source digital library software. Digital libraries as in "[21]"define it as a functionality which users prefer it to be learnable and reliable instead of one which is aesthetically pleasant. Since learnability and reliability are established characteristics of open source software due to their open standards, digital libraries established with open source software will have a positive impact on its users especially in the context of the above-mentioned characteristics. Studies further indicate that in comparison with the respondents from developing countries, users irrespective of organization and library types in developed countries have positive perceptions towards Open Source Software (OSS). Such positive perceptions raises the ability to identify usability issues e.g. issues related to DSpace and Greenstone web user interface for mobile devices to improve performance as in "[22]". Perceptions on digital library impact could be defined not only based on the technical aspects of features and functions of digital library design (e.g. architecture, interfaces and search tools) but also on issues surrounding globalisation, localisation, language, culture issues, content and human information behaviour with respect to their target users, applications and contexts as in "[23]".

VII. IMPACT OF DIGITAL LIBRARIES ON OPEN SOURCE SOFTWARE

The goal of digital library evaluation is to assess the impact of digital libraries on their users and how it influence them and society as a whole as in "[17]"To librarians,   usability is the efficiency and effectiveness to access information. The Human Computer Interaction (HCI) community, define usability as the effectiveness, efficiency and/or satisfaction of the user with a particular interface as in "[18]" and "[19]". Earlier studies on usability of multiple online databases focused on technical and performance issues rather than on interaction issues as in "[20]". As a result, digital libraries established using open source software could be customized through source code modifications will ensure improvement in the workflow and navigation style to reduce search time as mentioned earlier. This method of improving the functioning of the one digital library will further have an impact on open source software or code usage/modifications in order to further develop other digital libraries. As in "[23]" usability of a digital library primarily relates to how easily users can interact with the interface of the digital library. Improvements in the designing of a open source digital library are based on inputs that the community of developers received from its users. Thus open source digital library software with such an open community will no doubt be able to develop a well-designed digital library with good usability features based upon findings of Human Information Behaviour (HIB) studies. Further reference could be therefore drawn to prove that using digital libraries could make an impact on open source software and more specifically on the development and improvement in the design of open source digital library software. It was also identified that there are four types of usability issues arising out of digital libraries for small screen devices of which it was revealed that Greenstone and DSpace open source digital library software have web user interfaces for mobile devices to improve their performances as in "[22]".

The implications of constructing digital library software in educational context can be an important learning experience which can raise issues surrounding the educational potential of digital library construction and also its implications and impact in the design of open

source digital library software as in "[2]". Using digital library software as an educational tool, can highlight advantages and disadvantages of a particular software in terms of workflow support, platform independence and module complexity, lack of 'rollback' features. It was further indicated through the review that in the case of open source digital library software, these issues could be easily integrated through software customization in order to meet the requirement of the users which will further have an impact on the process of addition or removal of features in open source digital library software.

The popular open source digital software viz. DSpace, EPrints, Fedora and Greenstone, DSpace were able to fulfill almost all of the selected features expected to be present in a digital library software as desired by users. However, it was opined that each software has its own strengths and weaknesses that appeal differently to organizations and individuals depending on their needs as in "[24]". Comparative evaluation of open source digital library software viz. CDS-Invenio, DSpace, DoKS, EPrints, Fedora, Greenstone, MyCoRe and SOPS based on features available in the software provides users and library staff information as to which area with respect to a set of features of a software is more important which formed the basis of software selection for implementation in a specified environment as in "[25]".

VIII. CONCLUSION

Reviews established the fact that the use of open source digital libraries software not only will be beneficial to the respective libraries but as in "[26]" participation in open source projects can bring some tangible rewards like new promotions and employment opportunities. Consequently, in future, this will have a positive impact in the overall development of the open source software and its community since as in "[27]" users will be motivated to participate in open source activity. In case this trend is established, the use of open source digital library software will increased due to availability of users/community support. Such a trend will further increase the availability of overall support and have a positive impact on open source software which as in "[28]" is a major concern when associating with open source software in general. Based on the above-mentioned definitions user's perceptions of digital library impact, operational definition of digital library could be further propose as a platform where it's impact on open source software could be based on user's perceptions. The outcome thus will lead to the overall technological improvement to establish interactive digital spaces as in "[29]" in order to meet the user needs. Lastly, it may be concluded that assessing the impact of digital libraries on Open Source Software (OSS) based on user's perception results in the higher technological ranking of open source digital library software which will be of great benefit to modern libraries.

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