Knowledge Management in the Major Knowledge Repositories in India

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Abstract—The present paper aims to investigate the growth and development of knowledge repositories in India, impact of knowledge repository on library staff, infrastructure facilities available in libraries for hosting knowledge repositories and barriers in providing knowledge resources to users through knowledge repositories.

Ten KR attached to universities, institutes and other higher learning centres in the country were selected with the help of simple random sampling to conduct the study.

The results of the study show that, all the ten libraries under study have instituted publically accessible digital knowledge repositories. Establishment of knowledge repositories has made significant impact on library staff and eight libraries have adequate ICT infrastructure facilities for hosting knowledge repositories with sufficient number of terminals for their users for searching and accessing knowledge resources. Lack of expertise and lack of training is the major barriers faced by 70 percent of librarians, while providing knowledge resources to their users through KR.

The paper also puts forward some suggestions derived from the analysis of data for further improvement of the management of knowledge repositories.

Index Terms—India, knowledge management, knowledge repositories, knowledge resources.

I. INTRODUCTION

The open access movement is playing a great role among libraries and information centers in disseminating information. Most of them are responding to this movement by developing library portals, publishing open access journals and establishing institutional or knowledge repositories.

The open access initiative has also gained momentum in India especially by creating knowledge repositories for wide dissemination of all kinds of scholarly materials such as research papers, conference papers, teaching materials, technical reports, photographs, news clippings and electronic theses and dissertations etc. The present paper discusses the growth and development of knowledge repositories in India, type of contents available in knowledge repositories and its management, software used for developing and maintaining knowledge repositories, impact of knowledge repository on library staff, infrastructure facilities available in libraries for hosting knowledge repositories and barriers in providing knowledge resources to users through knowledge repositories.

II. OBJECTIVES OF THE STUDY

The present study includes following objectives:

1) To find out familiarity among librarians with the concept of knowledge repository.
2) To understand growth and development of Knowledge Repositories (KR) in India.
3) To know the type of contents available in knowledge repositories and its management.
4) To learn most popular open source software being used for development of knowledge repositories in India.
5) To ascertain the infrastructure facilities available in the libraries for providing knowledge resources to their users.
6) To examine the barriers being faced by the libraries while providing access to knowledge resources to their users.
7) To know participation in training programs by librarians for better utilization of knowledge resources.
8) To provide necessary suggestions for promoting knowledge initiatives in Indian libraries.

III. REVIEW OF RELATED LITERATURE

Bjӧrk, Welling, Laakso, Majlender, Hedlund & Guӧnason (2010) estimated of articles published in 2008, 11.9% were available in knowledge repositories [1]. Raghavan (2006) discussed that knowledge repositories could be of different types depending on their function and scope. They could be domain-specific, material-specific, institution specific or even open access digital knowledge repositories of research output of an author created by the authors themselves. The various forms of knowledge repositories are as below: 1) Institutional Repositories 2) Discipline-Specific Open Archives and 3) Material-type-specific digital repositories [2]. Bell, Foster and Gibbons (2005) reported that many institutions have set up knowledge repositories to meet a variety of institutional needs, including: 1) showcase for the scholarly output of faculty; 2) a relatively inexpensive means for disseminating faculty research results; and 3) a possible tool to leverage journal prices downward [3]. Jones and Andrew (2005) identified a number of packages that have been developed for developing knowledge repositories. The main open source software (OSS) are: 1) DSpace, developed by the Massachussetts Institute of Technology (MIT) Libraries and Hewlett-Packard (HP), 2) EPrints.org developed at the University of Southampton, and iii) ETD-db from Virginia Tech in the US [4]. Yeates (2003) identified DSpace and Fedora (Flexible Extensible Digital Object and Repository Architecture) as knowledge repository software, which are freely available under open source package [5]. Law,

Macgregor, McCulloch & Wallis (2005) describe that open access repositories serve as a way to market the institution by showcasing its intellectual output in addition to disseminating information. Institutional repositories help meet the desire to showcase an impressive research capacity. Institutional repositories can support universities by providing a readable means of generating, organising, disseminating, managing and retrieving information pertaining to the research outputs of academic staff and institutions [6].

IV. Research Methodology

Though there are various methods of research available such as historical, experimental, descriptive etc., the investigators have adopted survey method as one of the descriptive research methods to investigate the knowledge management activities in the major knowledge repositories in India through different data collection techniques.

A. Literature Survey

Investigators have conducted a survey of related literature prior to launch of the study to understand the topic and various aspects of knowledge management and knowledge repositories. Investigators have carried out an extensive literature search for related resource materials on selected aspects published in various scholarly journals and seminar/conference proceedings, etc. and prepared a bibliography of the most relevant and related research articles for referring to the original sources.

B. Population and Selection of Sample

The population of the study consists of those libraries in India, which have developed their own knowledge repository to make their institutional research output accessible online. In India twenty eight libraries attached to universities and other higher learning/research institutes of national importance located in different parts of the country have developed knowledge repositories.

Due to large number of libraries, it is not feasible to include all the libraries in the study. Therefore, only selected libraries have been included in the study.

For this study, authors have selected fourteen libraries out of twenty eight with the help of simple random sampling. Out of 14 libraries, four libraries didn't respond in spite reminders; therefore, the present study was conducted following knowledge repositories of ten select libraries in India.

1) Knowledge Resource Centre (KRC), Central Drug Research Institute (CDRI), Lucknow
2) University Library, Cochin University of Science and Technology (CUSAT), Kochi
3) Central Library, Indian Institute of Technology (IIT), Delhi
4) Mahatma Gandhi Central Library, Indian Institute of Technology (IIT), Roorkee
5) Central Library, Indira Gandhi Institute of Development Research (IGIDR), Mumbai
6) National Information Centre for Marine Sciences (NICMAS), National Institute of Oceanography (NIO), Goa
7) Biju Patnaik Central Library (BPCL), National Institute

of Technology (NIT), Rourkela
8) Ananda Rangapillai Library, Pondicherry University (PU), Puducherry
9) Central Library, Saurashtra University (SU), Rajkot
10) Knowledge & Learning Resource Centre, SDM College of Engineering & Technology (SDMCET), Dharwad

C. Data Collection Methods

For the present study, several techniques are adopted for collecting relevant and authentic data. Though there are different data collection techniques are available such as questionnaire, schedule, interview, observation, document review, psychological test etc., investigators have used questionnaire and document review methods for collecting necessary data to achieve the objectives set forth for the research work.

V. Analysis and Interpretation of Data

The data which are collected from librarians/librarian-in-charges of CDRI, Lucknow, CUSAT, Kochi, IIT-Delhi, IIT-Roorkee, IGIDR, Mumbai, NIO, Goa, NIT-Rourkela, PU, Pondicherry, SDMCET, Dharwad and SU, Rajkot through various data collection techniques have been organized, analysed, compared, consolidated, tabulated and interpreted by using, tables and percentages. In the light of the analysed and interpreted data, findings and conclusion have been derived at the end.

A. Familiarity with Knowledge Repository Concept

This part of questionnaire is designed to find out respondents familiarity with the concept of knowledge repository. Data in Table I shows that all librarians (100 percent) are familiar with the concept of knowledge repository.

TABLE I: Familiarity with Knowledge Repository Concept

S. No.	Library	Category	
		Yes	No
1	CDRI	√	---
2	CUSAT	√	---
3	IGIDR	√	---
4	IIT-D	√	---
5	IIT-R	√	---
6	NIO	√	---
7	NIT-R	√	---
8	PU	√	---
9	SDMCET	√	---
10	SU	√	---
Total (*N*=10)		10 (100)	0 (0)

(Figures within parenthesis are percentage)

B. Availability of Knowledge Repository

Knowledge repositories are digital archives that capture, preserve and disseminate the scholarly output of an institution such as research articles, theses and dissertations, research reports, conference proceedings etc. and stored on the institution's server.

Table II shows that all the ten libraries under study have instituted knowledge repositories which are registered under ROAR (Registry of Open Access Repositories) and also publically accessible to provide archival and access to the

institution's research output.

TABLE II: AVAILABILITY OF KNOWLEDGE REPOSITORY

S. No.	Library	Category	
		Yes	No
1	CDRI	√	---
2	CUSAT	√	---
3	IGIDR	√	---
4	IIT-D	√	---
5	IIT-R	√	---
6	NIO	√	---
7	NIT-R	√	---
8	PU	√	---
9	SDMCET	√	---
10	SU	√	---
Total (*N*=10)		10 (100)	0 (0)

(Figures within parenthesis are percentage)

C. Type of Contents Available in Knowledge Repository

Various kinds of documents in digital format are stored in knowledge repositories. They are the result of the research and teaching activities of teachers and researchers, scientific output, institutional output, and learning object (Alfa Network Babel Library, 2007).

The analysis of the responses received from the librarians has been given below in Fig. 1. It is clearly depicts from Fig. 1 that journal articles are most preferred content provided by all repositories (100 percent). Six (60 percent) out of ten libraries under study i.e. CUSAT, IIT-D, IIT-R NIT-R, PU and SU have maintained electronic theses and dissertations. 70 percent libraries i.e. seven out of ten libraries namely CUSAT, IIT-D, IIT-R, NIO, PU SDMCET and SU have included research and technical reports in their open access repositories. Conference proceedings are maintained by 5(50 percent) libraries including CUSAT, IIT-R, IIT-D, SDMCET and SU.
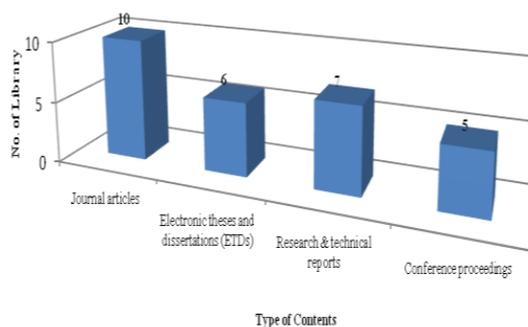

Fig. 1. Type of content available in knowledge repository.

D. Software Used for Developing Knowledge Repository

The availability of open source software has accelerated the development of knowledge repositories. There are number of open source software packages available for creating a repository such as Fedora, DSpace, EPrints, CDS Invenio, ARCHIMEDE, i-TOR, MyCoRe and GSDL.

For establishing knowledge repositories, DSpace developed by MIT Libraries and HP Labs, is the most preferred (90 percent) open source digital repository software in the select libraries (Table III). While Saurashtra University Library uses EPrints open source software for establishing open access repository.

TABLE III: SOFTWARE USED FOR DEVELOPING KNOWLEDGE REPOSITORY

S. No.	Library	Name of Software
1	CDRI	DSpace
2	CUSAT	DSpace
3	IGIDR	DSpace
4	IIT-D	DSpace
5	IIT-R	DSpace
6	NIO	DSpace
7	NIT-R	DSpace
8	PU	DSpace
9	SDMCET	DSpace
10	SU	EPrints

TABLE IV: METHODS USED TO PROMOTE KNOWLEDGE REPOSITORY AMONG LIBRARY USERS

S. No.	Types of promotion	CDRI	CUSAT	IGIDR	IITD	IITR	NIO	NITR	PU	SDMCET	SU	Total	%
1	Organize training programs and lectures on knowledge repository	√	√	√	√	√	√	√	√	-	-	8	80
2	Discussion with users about knowledge repository	√	√	-	√	-	-	-	-	-	√	4	40
3	Display of promotional materials on knowledge repository like posters	-	√	-	√	-	-	√	-	-	-	3	30
4	Provide information regarding knowledge repository on library website	√	√	√	√	√	-	√	√	√	-	8	80

(Multiple answers were permitted)

E. Methods Used to Promote Knowledge Repository among Library Users

As shown in Table IV, majority of respondents i.e. 80 percent of libraries (*N*=8) promote knowledge repositories through organizing training programs and lectures on knowledge repositories and providing information regarding knowledge repositories on library website. Four librarians (40 percent) state that they discuss about knowledge repositories with users, whereas 30 percent of respondents adopt display of promotional materials on knowledge repositories like posters as a method for promoting knowledge repositories among library users.

F. Availability of Infrastructure Facilities

Table V reveals that 8(80 percent) out of ten libraries have adequate ICT infrastructure for hosting knowledge repositories with sufficient number of terminals or workstations for their users for searching and accessing resources available in knowledge repositories, whereas 20 percent of them are still facing problems of insufficient infrastructure facilities due to the lack of fund.

TABLE V: AVAILABILITY OF INFRASTRUCTURE FACILITIES

S. No.	Library	Category	
		Yes	No
1	CDRI	√	---
2	CUSAT	√	---
3	IGIDR	√	---
4	IIT-D	√	---
5	IIT-R	√	---
6	NIO	√	---
7	NIT-R	√	---
8	PU	√	---
9	SDMCET	---	√
10	SU	---	√
Total (*N*=10)		8 (80)	2 (20)

(Figures within parenthesis are percentage)

G. Participation in Training/Workshop on Knowledge Repository

Data in Table VI shows that 80 percent of the librarians have attended training/workshops organized for developing and managing knowledge repositories and resources, whereas 20 percent of them never attended any kind of training/workshop.

TABLE VI: PARTICIPATION IN TRAINING/WORKSHOP ON KNOWLEDGE REPOSITORY

S. No.	Library	Training/Workshop attended	
		Yes	No
1	CDRI	√	---
2	CUSAT	√	---
3	IGIDR	√	---
4	IIT-D	√	---
5	IIT-R	√	---
6	NIO	---	√
7	NIT-R	√	---
8	PU	√	---
9	SDMCET	---	√
10	SU	√	---
Total (*N*=10)		8 (80)	2 (20)

(Figures within parenthesis are percentage)

H. Barriers in Providing Access to Knowledge Resources Available in Knowledge Repository
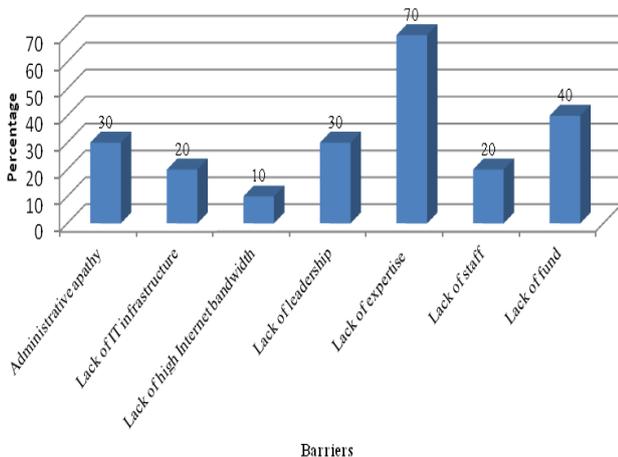

Fig. 2. Barriers in providing access to knowledge resources available in knowledge repository.

Fig. 2 shows the responses of the librarians of select libraries on obstacles and constraints faced by them in providing resources available in knowledge repositories to library users. 70 percent of respondents feel lack of expertise as a main barrier. Lack of fund is considered as other important obstacles by 40 percent respondents. Lack of leadership and administrative apathy are other problems mentioned by 30 percent libraries. Lack of staff is considered as another obstacle by IIT-D and SDMCET. The respondent in SU reported problem in high internet bandwidth.

VI. MAJOR FINDINGS OF THE STUDY

Major findings of the study the basis of analysis are given below:

1) The study reveals that all the librarians/librarian-in-charges are familiar with the concept of knowledge repository (Table I).
2) All the ten libraries (100 percent) under study have instituted publicly accessible knowledge repositories which also provide knowledge to the institution's research output (Table II).
3) The libraries under study preserve various kinds of contents in knowledge repositories for disseminating their research output. It includes journal articles, electronic theses and dissertations (ETDs), research & technical reports and conference proceedings. Journal articles (100 percent) are most preferred content to the repository (Fig. 1).
4) Seven out of ten libraries namely Cochin University of Science and Technology, Indian Institute of Technology, Delhi, Indian Institute of Technology, Roorkee, National Institute of Oceanography, Pondicherry University, SDM College of Engineering & Technology and Saurashtra University have included research and technical reports in their knowledge repositories (Fig. 1).
5) Six (60 percent) out of ten libraries under study i.e. Cochin University of Science and Technology, National Institute of Technology Rourkela, Pondicherry University, Indian Institute of Technology Delhi, Indian Institute of Technology Roorkee and Saurashtra University have maintained electronic theses and dissertations in their knowledge repository (Fig. 1).
6) Conference proceedings are maintained by 5 (50 percent) libraries including Cochin University of Science and Technology, Indian Institute of Technology Delhi, Indian Institute of Technology Roorkee, SDM College of Engineering & Technology and Saurashtra University (Fig. 1).
7) For developing knowledge repositories, DSpace an open source software of MIT Libraries and HP Labs, is the most preferred (90 percent) open source software in the select libraries. Only Saurashtra University Library uses EPrints open source software for establishing their knowledge repository (Table III).
8) Majority of respondents i.e. 80 percent of libraries promote knowledge repositories through organizing training programs and lectures and providing information regarding knowledge repositories on library website (Table IV).
9) Four libraries (40 percent) namely Central Drug Research Institute, Cochin University of Science and

Technology, Indian Institute of Technology Delhi and Saurashtra University state that they discuss about knowledge repositories with users to promote their knowledge repository (Table IV).

10) Eight libraries have adequate ICT infrastructure facilities for hosting knowledge repositories with sufficient number of terminals for their users for searching and accessing knowledge resources (Table V).

11) Only two libraries namely SDM College of Engineering & Technology and Saurashtra University are facing problems of insufficient infrastructure facilities due to the lack of adequate funds (Table V).

12) Majority of librarians/librarian-in-charges (80 percent) have attended training/workshops organized for developing and managing knowledge repositories and resources (Table VI).

13) Lack of expertise is the major barrier faced by 70 percent of librarians while providing knowledge resources to their users. Some other constraints mentioned are lack of fund (40 percent), lack of leadership and administrative apathy (30 percent each) (Fig. 2).

VII. SUGGESTIONS AND RECOMMENDATIONS

In the light of analysis of data received, findings of the survey, the opinion and recommendations received from the librarians/librarian-in-charges participated in the study and personal observations of Investigators, the following suggestions are made in order to improve the efficient management and utilization of open access resources in libraries.

1) The Government of India should take initiative to design a comprehensive policy for establishing knowledge repositories for each and every academic institution.

2) In compliance to the National Knowledge Commission's (NKC) recommendation, every library should launch OAI-compliant knowledge repositories to enhance the visibility and impact of the research output of the university/institution. It can provide an interoperable preservation system, securing research from loss. It will also raise the profile of the work, the faculty and the institution itself. Universities and other academic institutions should introduce a mandate to its faculty members and researchers for the deposit of all research publications in knowledge repositories.

3) The knowledge repository websites should be RSS (Rich Site Summary) compliant, so that users get frequently updated information. This facility informs the user of any updates on knowledge repository website once users subscribe to website RSS.

4) All the knowledge repositories may provide statistics regarding downloads, submissions and hits.

5) Awareness program about knowledge repositories, its scope and merits should be conducted at regular intervals for library users.

6) The libraries that do not have adequate ICT infrastructure for setting up and maintaining knowledge repositories are recommended to set up a central knowledge repository.

7) Voluntary/commercial agencies should come forward to provide services to libraries in the installation and maintenance of open source software used for developing knowledge repositories at nominal charges.

8) Universities, institutions and colleges in India should form a consortium which will plan, coordinate and implement a national level knowledge repository for the benefit of researchers and students of the country.

9) Increased availability of computer terminals may increase the use of knowledge resources among users. Higher configured computer terminals should be installed in the Libraries, Departmental Computer Labs and Computer Centres of the Universities and Institutions.

10) Need for more qualified staff with better exposure to modern technological devices for knowledge repository has been stressed in all ten libraries.

11) Libraries should provide assistance to faculties and students to deposit their research articles in knowledge repositories.

12) It is suggested that proper training for setting up knowledge repositories should be provided to the library staff.

VIII. CONCLUSION

The study reflects growth and development of knowledge repositories in India. Nine out of ten knowledge repositories under study use DSpace open source digital repository software for running their knowledge repositories. Organizing training programs and lectures on knowledge repositories and providing information regarding knowledge repositories on library website among users are the different strategies adopted by libraries to promote and increase use of resources available in knowledge repositories. Eight out of ten libraries have adequate ICT infrastructure for hosting knowledge repositories with sufficient number of terminals or workstations for their users for searching and accessing resources available in knowledge repositories. There are some technical and financial difficulties in terms of lack of expertise and lack of fund are considered to be main barriers by librarians to provide open access resources to their users.

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