Knowledge management and open access e-theses: Indian initiatives

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Abstract

Purpose – This paper aims to describe recent developments in the services provided by Indian electronic thesis and dissertation (ETD) repositories. It seeks to explore the prospect of knowledge formation and diffusion in India and to discuss the potential of open access e-theses repositories for knowledge management.

Design/methodology/approach – This study is based on literature review and content analysis of Indian ETD repository websites. Institutional repositories and electronic thesis and dissertation projects in India were identified through a literature survey as well as internet searching and browsing. The study examines the tools, type of contents, coverage and aims of Indian ETD repositories.

Findings – The paper acknowledges the need for knowledge management for national development. It highlights the significance of an integrated platform for preserving, searching and retrieving Indian theses. It describes the features and functions of Indian ETD repositories.

Originality/value – The paper provides insights into the characteristics of the national repository of ETDs of India, which encourage and support open access to publicly-funded research.

Keywords Knowledge management, E-theses, Electronic thesis and dissertation repository, India, Theses, Institutional repositories

Paper type Research paper

Introduction

Knowledge is imperative for development; everything we do depends on it. The World Development Report (World Bank, 1999) examined the role of knowledge in advancing economic and social well being, with the realization that economies are built not merely through the accumulation of physical capital and human skill, but also on a foundation of information, learning and adaptation. Knowledge has become perhaps the most important factor determining the standard of living: more than lands, than tools, than labour. Today's most technologically advanced economies are truly knowledge based (World Bank, 1999). According to Drucker (1993) knowledge has become the key economic resource and the dominant, perhaps even the only, source of competitive advantage. Knowledge also serves as a wealth and force multiplier. It can be used to augment the available force or wealth or, alternatively, to reduce the amount needed to achieve any given purpose (Toffler, 1992). Knowledge along with information and communication technologies (ICT) determines the growth strategy of a country. ICT is considered as a facilitator of knowledge creation in leading economies (OECD, 1996). The knowledge produced through research in universities is a major part of the total knowledge base of any nation. Hence, the issue of storage and dissemination of this knowledge base is a major concern of all nations. The development of electronic theses and dissertations (ETDs) as a system to preserve and provide access to research

knowledge invites attention of researchers. This paper sketches India's attempts to establish an ETDs system to manage the vast amount of knowledge produced through research in its numerous universities.

The Republic of India is a large country, with myriad geographical, economic, linguistic and cultural differences. With a billion people, India is the world's largest democracy and the third largest higher education system. Higher education is critical to India's aspirations to emerge as a major player in the global knowledge economy (Agarwal, 2006). Indian universities function as the focal centre of higher education. They are dynamic and innovative institutions of advanced learning and scholarship, committed to higher quality research across all disciplines. They play a key role in the generation, transfer and application of new knowledge and provide trained manpower for industry, agriculture, administration services and all other sectors.

Background

India has a long tradition of higher education dating back to the Gurukul system 700 to 500 years before Christ. At the time of independence in 1947, India inherited 20 universities and 496 colleges with 237,546 students (Basu, 2002). After independence India adopted parliamentary democracy and federal system of governance. The development of higher education and research was not easy in a multi-lingual, multi-religious and multi-ethnic society. The establishment of University Grants Commission (UGC) in 1956 was a significant event for the growth and development of universities in the country. UGC discharges the constitutional mandate of co-ordination, determination, and maintenance of standards of teaching, examination and research in universities and higher education institutions. It serves as a vital link between the Union and State Governments and the institutions of higher learning; monitors developments in the field of collegiate and university education; disburses grants to the universities and colleges; advises Central and State Governments on the measures necessary for the improvement of university education; and frames regulations such as those on the minimum standards of instruction. Mid 2012, India has 44 central universities, 285 state universities, 130 deemed universities and 106 private universities. In addition to these, there are 15 Indian institutes of technology (IIT) for engineering education and research at Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati, Roorkee, Hyderabad, Patna, Bhubaneshwar, Ropar, Rajasthan, Gandhinagar, Indore and Mandi. Moreover, there are quite a lot of premier institutions focusing research and learning, such as the Indian Institute of Science (IISc).

Methodology

The purpose of this paper is to investigate the development of a central ETD project in India to cover all theses submitted to all universities in the country. The paper identifies the factors behind the establishment of Shodhganga, the Indian ETD Repository. The author conducted a literature survey including an internet search to obtain an overview of institutional repositories and ETD projects in India. The web site of the Directory of Open Access Repositories (OpenDOAR) (www.opendoar.org/) was analyzed to establish the number of repositories that exist in India. The information about Shodhganga was collected through a content analysis of its web site. The study examines the tools, type of contents, coverage and aims of the Shodhganga.

Knowledge management

The systematic acquisition, creation, and diffusion of knowledge of all kinds, and its application to all fields of human activity have become the fundamental pursuit of every society. The process of knowledge creation and its application is not an easy task for nations. It depends on various factors. The system of higher education and research existing in a country is the most important factor for not only creating new knowledge but also selecting and absorbing knowledge from all over the world. Knowledge management (KM) is a very popular term for this and has quite a lot of definitions. It is a systematic process by which the knowledge needed for an organization to succeed is created, captured, shared, and leveraged (Rumizen, 2002). Firestone (2001) defined KM as a process where organizations have formulated ways in the attempt to recognize and archive knowledge assets within the organization that are derived from the employees of various departments or faculties and in some cases, even from other organizations that share the similar area of interests or specialization. KM connects people with the knowledge that they need to take action when they need it. The challenge is to make the right knowledge available to the right people at the right time (Kidwell *et al.*, 2000).

We are living in a knowledge society, a society that has dedicated its intellectual and technological assets towards its own future development. Many universities and higher learning institutions all over the world have adapted to their changing role in a knowledge-based society. They have realized the value of knowledge creation. They have also become conscious of digitizing, archiving and making this knowledge available online. The intellectual assets such as datasets, course material, theses, and research papers are visible over the web now as many higher education institutions have set up digital repositories (Hoorens *et al.*, 2008).

Digital and institutional repositories

A digital repository is a store where electronic data, databases or digital files have been deposited, usually with the intention of enabling their access or distribution over a network (Polydoratou, 2007). It is a set of annotated digitalized data that is offered to users in a structured manner (Calanducci *et al.*, 2008). Lynch (2003) describes an institutional repository (IR) as:

> [...] a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members.

The examples of repositories include digital libraries, specialty repositories, institutional repositories, research data repositories and e-learning repositories (Zuccala *et al.*, 2006). Digital and institutional repositories were developed as a part of the open access (OA) movement, a knowledge-distribution model by which scholarly, peer-reviewed journal articles are made freely available to anyone, anywhere over the internet (Rossini, 2007). Open access literature is digital, online, free of charge, and free of most copyright and licensing restrictions. It removes price barriers like fee of subscriptions, licensing, pay-per-view and permission barriers. Digital and institutional repositories generally conform to the OA principles. A small number of India's research institutions and universities are providing OA to their research publications through their repositories.

The concept of a repository is directly related to the KM philosophy: collecting, managing, disseminating, and preserving scholarly works created in individual institutions.

A repository offers a set of services including content submission, organization, access, distribution and preservation. Kim (2007) argues that institutional repositories can be conceptualized around three main roles: an electronic scholarly communication forum, a digital library, and a KM system. The approach to KM is relevant to the implementation of institutional repositories that manage a wide range of digital information created in a university (Branin, 2003). This study delineates how India manages the knowledge produced by its numerous researchers across the country.

Research outputs

University research findings have transformed our lives over the last century. New medicines and therapies, changes to transport systems and machinery, new materials and energy sources, and previously undreamed of channels of communication have increased life expectancy and hugely improved the quality of our lives. Most of the technological advances in the second half of the twentieth century including new biotechnological industries, information technologies, telecommunications, and advanced materials such as fibre optics and semiconductors have their origin in university research. In addition, research has given us a growing appreciation of our place in the natural environment, and a better understanding of social, economic and cultural forces.

Published research results and ideas are the foundation of the progress of the world. "Research is more valuable when it's shared". Only shared research can enable new research to build upon the earlier findings (SPARC, 2008). The number of theses submitted to Indian universities may be a huge figure in the hundreds of thousands. However, majority of these theses are unattainable and invisible to the wider public as they remain in print form in the shelves of the libraries of respective universities. The National Knowledge Commission (NKC) of India has strongly recommended OA to public-funded research literature. There are several institutions that have individually set up institutional repositories to store and provide online access to their research outputs. IIT in Kanpur, Bombay, and Delhi, the IISc, Bangalore, Vidyanidhi, Information and Library Network (INFLIBNET), National Chemical Laboratory (NCL) Pune, Indian Institute of Astrophysics (IIA) Bangalore, and National Institute of Oceanography (NIO) Goa are the pioneers of this movement. Open DOAR, an authoritative directory of academic OA repositories maintained by SHERPA services, based at the Centre for Research Communications at the University of Nottingham, lists 53 Indian repositories as of mid 2012. A number of studies have been published on the digital preservation strategies, experience of developing institutional repositories, and evaluative studies of institutional repositories in India (Jobish *et al.*, 2005; Krishnamurthy and Kemparaju, 2005; Sutradhar, 2006; Laxminarsaiah and Rajgoli, 2007; Mittal and Mahesh, 2008; Jayakanth *et al.*, 2008; Chadha, 2009; Suber *et al.*, 2009; Sawant, 2011).

Some OA repositories are specially created to diffuse intellectual outputs of the country in the form of ETDs. Vidyanidhi and ETD@IISc belong to this category. Vidyanidhi is India's premier digital library initiative to facilitate the creation, archiving and accessing of doctoral theses. It was originated with a twofold objective that to provide network access to Indian theses and to reach a global audience for research from Indian universities (Urs and Raghavan, 2001). Vidyanidhi could collect, digitize and provide OA to around 12,000 Indian theses and set a model for an effective ETDs system in the country. However, due to the absence of stipulation for the mandatory submission

of theses, Vidyanidhi could not control the flow of research knowledge in a multi linguistic and wide nation like India.

Most of the literature published on e-theses or ETDs specified the need, importance and policies of e-theses repositories and their significance at the national level. Das *et al*. (2007) took the view that academic research institutions in India were under-utilized as the access to theses, dissertations and research reports were very limited to the next generation researchers. Ghosh (2009) examined the developments in the ETDs scene in India to explore the possibilities for creating a national repository for the deposit, discovery, use and long-term care of research theses in an OA environment. Hirwade's (2011) study examined the national and institutional level ETDs repositories in India. The study discussed the UGC's Regulations and National Policy Framework for building ETDs repositories in India. Sengupta (2012) attempted to sketch an overview of the current status of e-theses repositories in the world with special reference to India. The study found 25 e-theses repositories in India. It reported that NKC and the UGC Notification (Minimum Standards & Procedure for Award of MPhil/PhD Degree, Regulation 2009) have significant role in the establishment of e-theses repositories and OA movement in India.

The papers reviewed for this study stressed the need for a central agency to control and manage the knowledge produced by the numerous universities in India. The initiation of the Indian ETDs project by the INFLIBNET, an Inter-University Centre of UGC of India is an important step towards the collection, preservation and dissemination of Indian knowledge.

Shodhganga: Indian ETD repository

The Indian ETD Repository Shodhganga was originated in 2009 with an aim to facilitate OA to Indian theses for the worldwide academic community. The project originated as a part of The UGC Regulation 2009 (Minimum Standards & Procedure for Award of MPhil/PhD Degree) of 1 June 2009. This insisted on mandatory submission of e-theses. As per the Regulation, the task of creating, hosting, maintaining and making the digital repository of Indian ETDs, accessible to all institutions and universities, is assigned to the INFLIBNET Centre. INFLIBNET is one of the autonomous inter-university centres of the UGC, initiated in 1991 for the development of library and information studies in the country, including providing the high-speed data network (UGC-Infonet), the promotion of scholarly communication among academicians and researchers and the development of the UGC-Infonet Digital Library Consortium (Chand and Arora, 2008).

The Shodhganga became operational on 20 May 2010. The project fulfils the UGC's national scheme for digitization of older theses from all universities and a part of an international movement on ETDs led by the National Digital Library of Theses and Dissertations (NDLTD), a worldwide collaborative consortium for developing and managing ETDs using one standardized method and OA initiatives. The main objectives of the Shodhganga project are to provide financial assistance for:

(1) providing access to Indian theses and dissertations in OA to worldwide academic community;

(2) setting-up of ETDs lab in eligible universities;

(3) extending access to anti-plagiarism software package in member universities; and

(4) funds for digitization of older theses available in universities (Shodhganga, 2012).

All universities that conduct PhD or MPhil programmes are eligible to join Shodhganga. They can formally join the Shodhganga project by modifying the PhD Ordinance, signing a memorandum of understanding with the INFLIBNET Centre and appointing a University Coordinator. However, financial assistance is limited to universities covered under Sections 2(f) and 12(B) of UGC Act. The repository Shodhganga can be accessed at: http://shodhganga.inflibnet.ac.in/.

The repository is set-up using DSpace, an open source digital repository software developed by Massachusetts Institute of Technology (MIT) in partnership with Hewlett-Packard. The DSpace supports the Open Archives Initiative's Protocol for Metadata Harvesting (OAI-PMH) and uses a qualified version of the Dublin Core schema, which includes three additional elements (Audience, Provenance and Rights Holder), as well as a group of element refinements or qualifiers than simple Dublin Core. DSpace's decentralized nature provides a platform for research students to deposit their PhD theses and make it available to the entire scholarly community in OA. The repository has the ability to capture, index, store, disseminate and preserve theses submitted by the researchers. INFLIBNET Centre, besides maintaining Shodhganga, would also deploy a central server to harvest the metadata from all such repositories distributed across universities with an aim of providing unified access to theses and dissertations.

Shodhganga obtains theses in two ways: INFLIBNET enters into an agreement with a university to obtain any digital theses that have already been archived there; or theses are submitted by individual scholars. A research scholar or supervisor, or a representative of the university under the university's mandate, can submit a digital thesis directly to Shodhganga with permission from INFLIBNET. Individual researchers are encouraged to submit their theses and dissertations either online or off-line on voluntary basis till their respective universities adopt and implement UGC Notification, 2009.

Shodhganga's contents are organized in a community-subcommunity structure. Universities exist at the community level while schools, departments, labs, and research centres are at the subcommunity level. The holdings represent languages and scripts such as Sanskrit, Hindi, Gujarati, Marathi, French and English. As of 19 June 2012, Shodhganga holds 3,350 theses from 52 universities.

The project has been well received by the Indian academic community: 62 universities have signed a memorandum of understanding, while 52 universities have started contributing the project. Table I shows the number of universities participating in the project.

There are different search strategies integrated in the repository. Theses can be browsed by title, keyword, issue date, name of researcher/author, and name of the research guide, and also by university.

| S. no. | Year | No. universities | | Total |
		Covered under Section 12 (B) of UGC Act	Not covered under Section 12 (B) of UGC Act	
1	2010	10	0	10
2	2011	25	13	38
3	2012	8	6	14
	Total	43	19	62

Table I.
Year wise data on universities signed MOU with INFLIBNET

The universities should agree to abide by copyright laws and intellectual property rights for their theses, and should make all attempts to deter plagiarism in theses submitted to their universities. During the process of submission, the researcher (submitter) is also asked to grant non-exclusive rights to the INFLIBNET Centre to host his/her theses in the Shodhganga.

At the time of the study, Shodhganga Indian ETD Repository comprised 3,350 theses from 52 universities. Though this is only a small portion of the total PhD theses produced in the country, it has been established as a permanent, systematic and durable system for the control and management of the flow of research knowledge. The system will support OA to Indian theses; it will help to identify the finished research and avoid duplication; it will support further studies in more areas.

Discussion

Managing the knowledge created through research at universities is a difficult task in a diverse nation like India. But the application of ICTs and the advent of open source software have made immense impact on the KM field of India. The establishment of Shodhganga as a central repository for collecting, archiving and disseminating Indian theses is an important achievement for the nation. Though Vidyanidhi was a project aimed at collecting Indian theses under one platform, it could not achieve the task for several reasons. Numerous universities tried to establish systems at their own expense and expertise to digitize their theses. But majority of Indian universities were neither implementing nor participating in ETD projects. The Shodhganga project shows a steady growth in the content creation and archiving of theses. Compared to Vidyanidhi, the major plus point of Shodhganga is the UGC Regulation regarding the mandatory submission of an electronic version of every thesis submitted to an Indian university, while financial assistance to digitize the back volume of theses and the creation of an ETD lab in the universities are added advantages. The project received e-INDIA Jury Choice award for the year 2011 under Digital Learning category for its performance. The majority of the universities are on the way to modifying their PhD regulations to facilitate storing their theses online.

Conclusion

The Shodhganga project is a major attempt to control the flow of research knowledge in India. It provides OA to all Indian theses, and increases the visibility and worldwide access to Indian research knowledge. The online availability of theses in a single platform offers vast source of data on the diverse economic, social, educational and cultural aspects of the different states of India. This knowledge base can be used for policy making, planning, organizing and establishing various systems for national development. It will help India to avoid duplication in research. The system will also support India to control the flow of research output.

A project for capturing all theses produced in India was essential due to several reasons. There was lack of co-ordination and control over the flow of research knowledge in the country. The number of ETD projects established at individual universities was small compared to the total number of universities in India. Although the Vidyanidhi project was not successful, the Shodhganga project has become a major repository that can cover all universities in India in a systematic manner. Apart from being a central storage of Indian theses, the project provides financial assistance

and training to establish ETD repositories at university level. The growth rate of Shodhganga is progressing steadily.

The Shodhganga project is actually performing the task of KM of Indian PhD theses. Online availability of e-theses through centrally managed digital repositories ensures easy access and archiving of Indian theses. It sustains OA to publicly funded research. Since the project covers all universities in the country, it shall be a great achievement for India to control the flow of knowledge generated through research.

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