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Development of Institutional Repository at Agasti Knowledge Resource Centre by using DSpace: Case Study

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Abstract: Institutional Repositories are playing vital role in preservation of knowledge generated at academic institutions. It preserves and disseminates knowledge generated at the institutional level. It includes e-content generated by faculty members, syllabus, old question papers, video recordings of college festivals and events, photographs, college magazines, rare books and other reading material. DSpace is the open-source digital library software popular among the academic libraries to fulfil the needs for establishing institutional repository at college libraries. This article discusses case study of establishing IR@Agastilibrary by using DSpace 6.4 and hosting it on physical server of college. It also focuses on reading materials chosen for preservation including e-content developed by college faculties, college magazines, photographs, old syllabus, old question papers and newspaper clippings.

Keywords: DSpace; Digital Library; Agasti Library; Institutional Repository;

Introduction:

Agasti Arts, Commerce and Dadasaheb Rupwate Science College Akole established on July 1974 as Arts and Commerce college. College hosts fourteen undergraduate level programmes and seven post graduate level programmes as well as it also hosts research centre in geography. Student strength of college is around five thousand and more than two hundred employees are working to run this college. College has set up of central library hosting more than seventy thousand collections of reading material and access to N-LIST e-resource and DELENT e-resources. Library regularly practicing preserving newspaper clippings, event photographs, current and old syllabus, old question papers and college magazine in the physical form.

College has started publishing award winning College Magazine ‘Agastya’ to publish articles, poetry, annual reports, event reports, students’ and teachers’ achievements every year. Due to advancements in ICT and demanding nature of use of ICT in teaching methods, college faculties have generated large number of e-content including notes, videos, YouTube channels, quiz, presentations etc. This arises needs to establishing institutional repository at Agasti library.

DSpace is an open-source digital library management software useful and popular among academic libraries to develop digital library and institutional repository at colleges. DSpace used to develop big repositories such as NIScPR, Shodhganga, Shodhgangotri at national level by INFLIBNET, Gandhinagar. It is proven technology in the field of digital libraries.

Literature Review:

Literature review is conducted to study, identify and analyse use of procedures, preservation strategies and technologies to establish institutional repositories. It also focuses on findings of earlier studies conducted. (Bansode & Pujar, 2008) written review paper on scholarly digital library initiatives, this article taken overview of digital library projects undertaken at national and international level. This article discusses about types of digital libraries, genesis of digital libraries and national and international scenario of digital library initiatives. It finds out that digital library initiatives in India are still in nascent stage of development. It also suggests that to develop digital library must make careful planning and undertake feasibility study is required as digital library projects requires careful selection of hardware, software, materials and standards to be used in their preservation.

(Tyagi, Dhanwantari, Raghuraman, & Kalbhor, 2009) implemented information retrieval standard SRU (Search and Retrieve via URL) in the digital library developed using DSpace at DIAT to integrate resources preserved in digital library searchable through single search form. The client is developed and tested to support single search form.

(Kamble, Hans, & Sangeeta, 2012) in their article discusses definition and features of open-source software useful in the library management, paper describes the features of OSS and also highlights the initiatives taken in India to make use of open-source software for developing digital libraries. According to article DSpace is helpful for long term preservation of digital material stored in the repository. DSpace accepts all manner of digital formats.

(Shewale, 2012) established digital library using DSpace in GIPE's library, identified large number of rare books, copyright free books GIPE publications (Artha Vijnana) Maps, annual reports, unpublished material and miscellaneous documents for digitization. DSpace is chosen to establish digital library, LibLiveCD developed by Prof. ARD Prasad and Dr. Sunita Barve is used to install DSpace. Vendor is identified to digitization of identified material. DC XML metadata is prepared to bulk upload on DSpace Server.

Most of libraries found that DSpace is feature rich, most compatible, popular among libraries to establish digital libraries.

Objectives:

Institutional Repository is developed in keeping in mind the following objectives

1. To establish online digital repository at Agasti Knowledge Resource centre
2. To establish online digital repository using Open-Source Digital Library Software DSpace
3. To digitise college magazine and preserve it along with other reading resources generated at the college level.
4. To form a policy and procedure for digitization in Agasti Knowledge Resource Centre.

Hardware and Software requirements of DSpace:

(Kamble, Hans, & Sangeeta, 2012) DSpace was developed by Massachusetts Institute of Technology (MIT) libraries and Hewlett-Packard (HP) as an opensource application. DSpace supports long-term preservation of library material. DSpace accepts digital formats such as articles, preprints, working papers, technical reports, conference papers, books, thesis, data sets, computer programmes, visualizations, simulations, and other multimedia publications etc.

DSpace is supported by Windows Based operating systems as well as Linux based operating systems. (DSpace6.4 Documentation, 2022) DSpace can be installed and run on any modern personal computer. Supporting software includes JAVA, Java Built Tool like Apache Maven, Apache Ant, Relational Database like PostgreSQL or Oracle, Servlet Engine like Apache Tomcat, Git and Text Editor are supporting software needed to make DSpace work for establishing digital library.

Agasti Library hosts multiple rack servers in its server room used for automation of college library. One of them is chosen for hosting institutional repository by using DSpace. Configuration of rack server includes 64GB RAM, RAID1 configured 1TB HDD and Intel Xeon E5 processor much powerful hardware for running medium sized library automation needs.

Methodology:

Planning of establishing Digital Repository starts with need for digitization of knowledge generated by the college stack holders including faculty members and students from various disciplines. College magazines was digitally born but at that time there was no such policy defined by the college magazine to preserve it in the form of PDF or any other electronic form. Due to advancements in teaching methodologies using ICT, faculty members of the college started preparing presentations, videos and other lecture notes in the digital form but due to lack of policy at institutional level these valued resources are only available with the faculty members, hence need arise to centralize the storage which can hold and distributes these resources among students seamlessly. Event photographs are the most important memories of the alumnus as well as for college management board members, which are stored in physical form of albums and later it was difficult to identify and relate the events correctly as there is no metadata or description of events and peoples in the photos.

Metadata and description of events are playing key role in identifying the track of development of college. Same is the case with old question papers and syllabus, students are always demanding old question papers but due to limited printed copies available with library, it is difficult to distribute it among students. This all arise strong need of establishing digital repository to serve the purpose.

Selection of Software:

College has adopted open-source policy and always promotes use of open-source software for office automation, library automation purpose. For management of house-keeping activities of library AKRC adopted Koha as an open-source integrated library management software, for library portal AKRC adopted content management software WordPress as a software to maintain library website. For all servers AKRC adopted open-source operating systems including Ubuntu and Debian as host operating systems for running the college servers. This open-source environment and college policy lead AKRC to adopt and utilize open-source digital library software for establishing digital repository. DSpace is popular and easy to use, feature rich open-source digital library software is adopted for establishing digital repository at AKRC.

Hardware Infrastructure:

College has invested large amount on procurement of server level hardware, networking and established server room equipped with all the necessary hardware and facilities including 24X7 power backup, mirroring of storage available on servers using RAID1 technology, air conditioning environment and three Internet Service Providers along with Static Ips and Firewall security. Therefore, AKRC server is used to host VPS of DSpace along with its operating system. Sixteen Gigabyte of RAM, 300 GB of Storage, 2 Core of processors are used to create Virtual Private Server. VPS created by using open-source virtualization tool Oracle VM VirtualBox.

Installation and configuration:

Physical Server Configuration:

Physical server is having 16 core of Processor (Intel Xeon E5) and 64GB RAM and 2 TB Hot Swapable HDD. Its host operating system is Ubuntu 22.04 LTS. Oracle VM VirtualBox is open-source software allows to create virtual environment to host different operating systems and run applications on it independently. It is also beneficial in case hardware change is needed. Or user can increase or decrease hardware demands as per requirement.

Oracle VM VirtualBox is free and open-source virtualization tools available to download on its official website https://www.virtualbox.org/. It can be installed on many hosts operating systems including Windows, Linux, MacOS etc. The .deb package (6.1) and extension pack was downloaded from official website and installed on Ubuntu 22.05 LTS by using package manager on physical server and VPS is created as per needs of DSpace6.4 digital library software. DSpace 6.4 requires Ubuntu 16.04 LTS as host operating system hence

image of Ubuntu 16.04 LTS server edition is downloaded from its official website under old releases. Installation of Operating system on VPS is done and its was running smoothly and ready to install DSpace6.4 code. To ease the installation process and without disturbing server room, ssh ports are opened for accessing VPS in network. Open-ssh package is installed on VPS operating system which supports Putty, Termius like clients and gives access to terminal remotely with full control over VPS.

Installation of DSpace:

DSpace installation procedure is available on its wiki page. Though it is self-explanatory but challenging for non-technical users. There are large number of blogs, YouTube videos available over internet to understand the installation of DSpace on different operating systems. Even non-technical person can follow the instruction and apply commands in installation of DSpace for establishing the digital repository. (Kumar, 2019) The broad steps of installation given on popular blog are as follows:

Step 1. Update and Upgrade Ubuntu

Step 2. Installation of OpenJDK and Ant Maven

Step 3. Installation of RDBMS – PostgreSQL

Step 4. Create User and Database in PostgreSQL

Step 5. Create Extension pgcrypto

Step 6. Editing configuration file of PostgreSQL

Step 7. Restart PostgreSQL

Step 8. Create DSpace User in Ubuntu

Step 9. Create a directory to build DSpace

Step 10. Downloading DSpace Code and Installation of DSpace

Step 11. Installation of Tomcat

Step 12. Setup environment variables

Step 13. Copying DSpace Web Apps to Tomcat

Step 14. Writing script to run tomcat automatically

Step 15. Create DSpace Administrator Account

Step 16. Create E-Person into DSpace

Configuration of DSpace:

DSpace comes with JSPUI and XMLUI interface, both the interfaces are installed on DSpace server along with oai webapp. JSPUI is configured to utilize as landing page of IR@Agastilibrary repository. Custom header is generated and configured to use as banner on JSPUI page. To send automated emails Exim4 is used to setup Gmail account for DSpace.

Top level community is created and sub-communities are added under the top-level community. For organization of resources needs to be hosted on repository communities and collections created. Following Table Shows Organization of Communities and Collections created in the DSpace repository.

Top Level Community	Community	Collection
Agasti Library	E-Agastya (College Magazine)	Academic year wise collections created (From 2002-03 to 2024-25)
	Syllabus	Year wise collections created
	Old Question Papers	Year wise collections created
	E-Content	Course wise collections created
	Photographs	Year wise collections created
	Annual Reports	Year wise collections created
	Faculty Publications	Faculty wise collections created
	College Publications	Conference Proceedings collection created

To handle workflow of metadata and uploading digital formats of resources, e-persons with appropriate rights to community and collections are created and allocated.

To access repository from Internet, Static IP provided by ISP is configured and required ports are opened in to the Firewall. This allowed search engines to index complete repository.

Digitization Workflow:

Most of the collections of this repository is digitally born and therefore only metadata is created and bitstreams uploaded into repository. But college magazines are only available in hard copies. Though they were digitally born but at that time there was no such policy defined by college to collect digital copies of each published college magazine, committee suggested to scan each page of large collection of college magazines available in the library stack.

For scanning of magazine committee has taken decision to dismantle each page from paperback binding, it is necessary step for clear scanning of page. For scanning AKRC adopted all in one device manufactured by Brother Inc. The model of All-in-One device is MFC-J430W. It has both systems useful for scanning i.e. ADF as well as flatbed system. Limitation is that it only scans up to letter size page and every time manual feeding is required. To cope up this limitation and speed of scanning AKRC procured new hardware Canon Image Formula DR-C225 II to save time spent on scanning but again it has limitations that it does not have flatbed system to scan material without dismantling binding. It supports scanning whole dismantled book in one go with great control over clearing, editing, cropping, enhancing images captured, adding missing pages in between scanned batch these features come with free available package comes with purchasing hardware.

Total 15 issued scanned using flatbed scanners and it has taken more than a month time to prepare PDF files of each issue with considering size for uploading and downloading from DSpace. Very Descriptive Metadata is prepared for each issue of college magazine according to Dublin Core metadata standard used in DSpace. Decision was taken by AKRC not to upload whole magazine in single PDF rather than it was split into sections like cover and preliminary pages including index, various sections of magazine, articles written by students, articles written by teachers, reports, staff directory list, event reports etc. and uploaded into DSpace. Mr. Sadgir was intern from YCMOU centre, Loni who handled this entire process of scanning and creating metadata under the guidance of librarian.

Other than college magazine, repository objects such as videos, presentations, pdf of syllabus, pdf of old question papers, newspaper clippings are uploaded into the digital repository in to their respective collections.

Findings:

DSpace is most appropriate solution to start digital library at early stage. It has large community support; very descriptive documentation is available on DSpace. Large number of libraries is using DSpace to establish digital library and preserve resources in it.

IR@AgastiLibrary hosts more than 171 full-text resources and it is continuously growing as large number of e-content generated at the institutional level. To handle it effectively policy is formed and team of faculty members and library staff is working on it to improve the policy and promote use of digital library to disseminate knowledge generated at institute level. New policy includes keeping all the backup of digitally born college magazines in future and host it on digital repository.

Library staff is trained thoroughly to handle workflow of DSpace and able to complete tasks in less time. Rare books are identified and they need to be digitized and therefore planning started to digitize rare and special collection into digital repository.

Expertise and skills achieved in establishing digital repository using DSpace helped a lot to library staff. Surrounding colleges and educational institutes got help from AKRC staff to establish digital libraries at their institutions including installation of DSpace on Linux, selecting hardware for digital repository, identifying documents needs to be digitised and hosted on repository etc.

Challenges faced:

There are lot of challenges faced to complete this digital library project in AKRC. Identification of material needs to be achieved involves copyright issues, feasibility of scanning using low end scanning hardware, budget and trained manpower are the major issues faced by the AKRC. Other than these challenges, technical supports might be needed at the time of upgrading server, upgrading the version of DSpace, backup and restore needed much technical knowledge in case required to restore database on another instance.

There should be clear and concise policy needs to be defined at institute level to identify material needs to be digitized, appropriate budget to procure hardware, allot trained manpower, support from technical service providers needs to be considered.

Future Plans:

Current version of DSpace used in establishing repository is DSpace 6.4 which needs to be upgraded to latest version of DSpace. It will take more time and technical knowledge to complete migration and upgrading it to latest version of DSpace.

DSpace supports OAI technology so AKRC planning to harvest freely available resources by using OAI and start new collections such as Ph.D. Thesis written by faculty members, free e-books available, free e-journals, articles pre-prints, and scan rare books and host it in the digital repository.

There is strong need of library user that there should be discovery service which can provide single window search from both ILMS and DSpace so AKRC is planning to host VuFind, open-source discovery platform to be integrated with DSpace and Koha.

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Appendices:

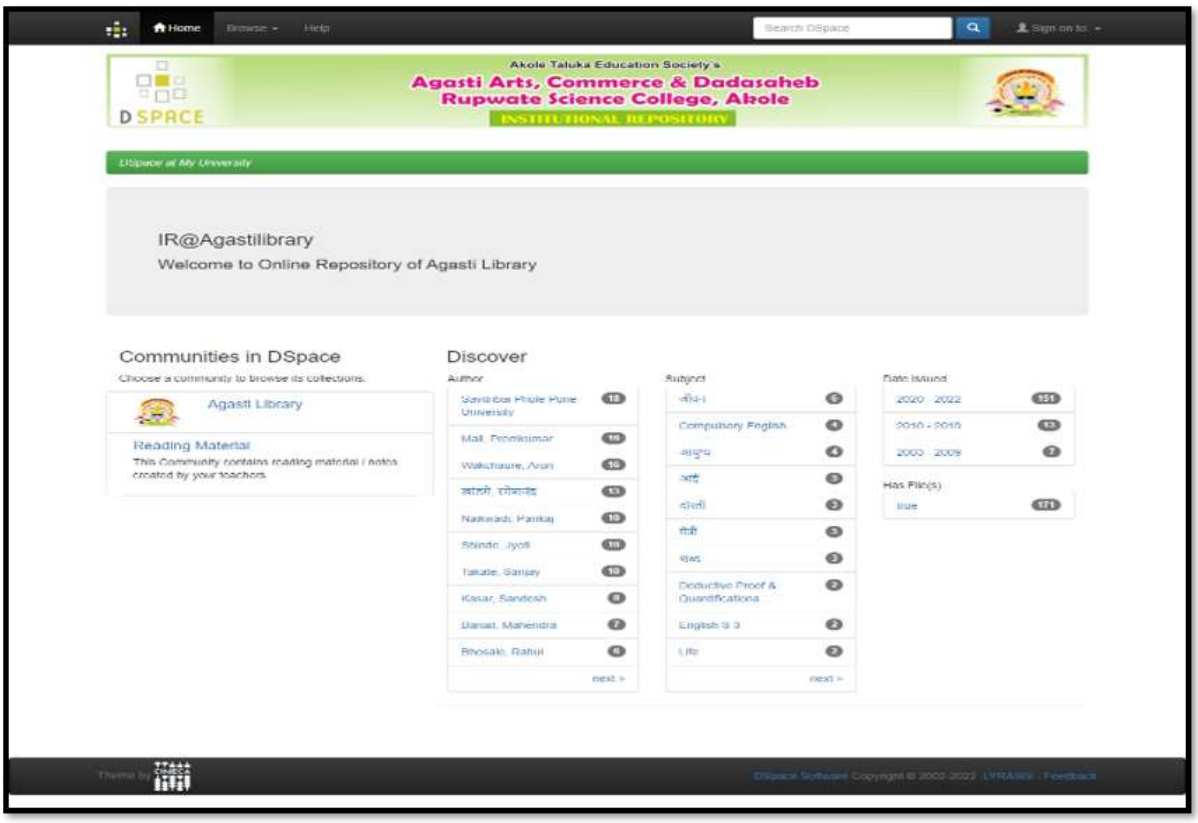

Figure 1: Screenshot of IR@Agastilibrary

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