6.0 Introduction

Resource sharing (RS) has become the matter of prime concern in the 21st century academic libraries. No library has ever been or will ever be self sufficient to satisfy its entire users due to various reasons like stringent budgets, escalating costs, publication explosion, diverse user needs, etc. The new modes of RS like e-journal consortia, brought revolutions in the velocity of information access among academics. Advances in digital preservation technologies coupled with the open access movement enhanced the visibility and accessibility of scholarly content over the globe. With the emergence of improved computer and communication technologies along with the introduction of electronic document delivery, RS took a new pace.

As far as engineering college libraries in India are concerned, no library (except national level institutions that receive huge financial support) is in a position to collect and provide adequate information sources to its clientele. In the country, library resource sharing initiatives were confined mainly to the universities and higher education institutions until recently (Now the UGC-INFONET consortium provides e-content to arts and science colleges). Though the INDEST–AICTE consortium was active with the participation of around 1000 engineering and technology institutions, in the year 2012, the consortium stopped its services to state-level and private institutions. In the true sense, at present there are no effective consortia activities at any level for these engineering and technology institutions.
The analysis part of this research brought to light that there is a wide gap between the ECs under the study with respect to their library resources. On the one side there are very rich libraries with established digital libraries, e-learning platforms and a lot of resources whereas on the other side there are libraries that even do not have adequate number of printed books for its users. Resource sharing is the only way to bridge this gap. The present study put forward a model (the Virtual Resource Sharing Centre) for such a resource sharing and the concept of the same was introduced before the respondents at the stage of data collection. The idea was widely accepted by the librarians, faculty members and students. In this chapter a potential model for the same is presented.

6.1 The Virtual Resource Sharing Centre (VRSC)

The model for RS proposed by this study is named as the Virtual Resource Sharing Centre (VRSC). It is envisioned as a virtual library portal that connects a user to the distributed contents over the network of EC libraries. The architecture of the centre is such that the VRSC, which holds three servers for catalogs, digital library and e-learning is connected with similar servers at different college libraries by means of a star-type of network.

6.1.1 Objectives of VRSC

The study revealed the status quo of the different EC libraries and identified the strengths and weaknesses of the study units. Some of the libraries are found to be at par excellence with that of a well established university library where as some others do not even have the basic infrastructure for a college library. In other words, it could be stated that students paying the same amount of annual fees, following
the same syllabus and exams are kept at different extremes with respect to access to information resources. The most viable and practical solution to overcome such a problem is cooperation. Inspite of all the competitions among the institutions, all the managements and authorities should consider this matter positively for upholding social justice. “Explore the possibilities and opportunities” is the motto of the era. The open source movement, open archive initiative, etc have opened new vistas of information access especially for the developing nations. A lot of open scholarly contents are now available on the web and what is needed is to identify, locate and validate the content to create paths for easy information access. It is always the duty of the information and library professionals to harness such information for their clientele. The proposed model of VRSC takes into consideration all these matters and put forward the following objectives:

- To facilitate federated searching of catalogs, DLs/IRs and e-learning portals of member libraries
- To provide a central database of free e-books, e-references and e-courseware on engineering and technology
- To provide validated links to scholarly engineering and technology contents available in open archives and over the web
- To provide virtual reference service
- To act as a platform for interaction between subject experts and students
- To act as a one stop point for access to scholarly engineering content
- To promote open source and open content for the common benefit of the academic community.
6.2 The Proposed Model

Keeping in view the above mentioned objectives the model of the VRSC is discussed in this section. The VRSC is designed as a virtual library portal that links to the digital libraries and OPACs of member libraries, open contents, e-learning portals, etc. The VRSC facilitates virtual reference service as well as provides a platform for communicating with subject experts. The design of the web portal of VRSC is depicted in the figure 6.1.

Fig 6.1 Web Portal of VRSC

6.2.1 Features of VRSC

The features of the VRSC are given in figure 6.2. The main feature of the model is federated searching of distributed member
Virtual Resource Sharing Centre: a Model

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6.2.2 Facilities

The model proposes the following facilities.

❖ Virtual Reference Service

Virtual reference service refers to a method of providing reference service online. The tools used for providing virtual reference include chat, videoconferencing, Voice over IP, co-browsing, e-mail, and
instant messaging. A good number of commercial software that facilitate real-time virtual reference service are now available. Virtual Reference ToolKit, Mosio for Libraries, LibraryH3lp, etc are some of the software common in American and European countries. These software (all proprietary) provide a combined platform for instant messaging, knowledge base and video conferencing. Some of the libraries around the world use a combination of free messenger software and e-mail services along with skype (a free software for audio/video communication via internet) for providing virtual reference service (Lankes et al., 2003). For the proposed model either a proprietary software could be acquired and installed for providing the service or use a combination of the free service mentioned above since there are no efficient open source solutions being available now for this purpose.

**Links to Open Content**

A lot of open scholarly content in the form of e-books, e-journals, courseware, etc are available on the web at distributed locations. It is very difficult for the academic community to identify and harness such resources. The service of qualified and competent library professional(s) would be of great help for identifying, locating and validating such content for use by the academics. Downloading and saving all these content to a central location is not practical. On the other hand, creating and saving metadata (with abstracts) and links would facilitate improved and easy access to open contents and archives.

**Communicate with Experts**

This feature of the VRSC facilitates communication of students with experts in various fields of engineering. For this a panel of subject experts (including retired faculty members) from within and outside
the member institutions on different branches of engineering is to be made and uploaded in the VRSC portal. Creating discussion forums, chat rooms, etc would enhance this type of communication between experts and users/students.

**Federated Searching**

Union cataloging has been a common feature of any RS activity. Catalogs of individual libraries are compiled together to a single entity to form the union catalog of the group. The same is updated periodically to maintain currency. With the advent of online catalogs, this process became a little easier where the members could upload their catalogs periodically on a central database. All these techniques are having a common drawback. They only mention the location of a particular item but do not convey the status of the items. The items may be in circulation, long overdue or so. For an effective RS, prompt delivery of documents is necessary for which information regarding the status of items is important. Keeping in view such requirements, the study proposes a model for federated searching of online catalogs as depicted in figure 6.3.

A query initiated by a user at the VRSC portal will be send simultaneously to the different member catalogs and the retrieved records will be presented to the user. For putting this into action, the following pre-requisites are to be satisfied.

- All the member catalogs must be compatible to some standard (eg: MARC21)
- All the member libraries should make their catalogs online
- Specialised software that facilitates cross domain searching will have to be incorporated in the VRSC.
In addition, federated searching of DLs/IRs and e-learning portals of member libraries is also proposed. For this Open Archive Initiative/Protocol for Metadata Harvesting (OAI/PMH) can be used.

### 6.2.3 Contents

The VRSC would deliver the following contents

- **Open Contents**

  This includes free e-books, e-references, online lectures, learning objects, software, etc. For contents such as open journals, open theses and dissertations, etc, saving their descriptive metadata along with a link to the full-text content is practical.
Catalogs

The VRSC holds the catalog records of its e-books and at the same time provides access to the online catalogs of the member libraries. The OPAC interface of the proposed model is represented in the figure 6.4.

Subscribed E-content

This includes subscribed e-books, databases, e-journals, e-references, etc. Consortial pricing of subscribed content is usually calculated on the basis of the number of participating institutions. The more the number of institutions, the less the unit price for content.
Digital Libraries/Institutional Repositories (DLs/IRs)

The centre maintains a server (DL) for archiving open content. Contents of the DLs/IRs of the member libraries will also be made available through the portal. These include project reports, dissertations, conference proceedings, student and faculty publications, etc. The digital library interface of VRSC is depicted in figure 6.5.

E-learning Courseware

The study revealed that a few number of the colleges have uploaded learning objects in their DLs and one college maintains a separate server for e-learning built on Moodle software. But majority of the libraries are not providing such facility. So it is proposed that the VRSC maintains a central server for archiving and managing learning
objects, video lectures, audio/video resources, online lectures, etc so that all the member libraries get access to such content. Federated searching of e-learning portals of members will also help to locate and access contents at various levels.

**Syllabus and Question Papers**

A considerable number of respondents of the study recommended to include the previous years’ question papers and syllabuses of various courses in the VRSC. Some of the colleges have digitized previous question papers and uploaded in their DLs/IRs. The availability of this content at a central location would be of great help to the entire community.

### 6.3 System Architecture

The figure 6.6 depicts the system architecture of the centre.

![System Architecture Diagram](image)

**Fig. 6.6 System Architecture**

The system architecture comprises of a web portal of the VRSC that is connected to 3 servers for DL, EL and catalog. Open contents,
content creators (subject experts), content managers (librarians), member libraries and users form the core components of the system architecture.

6.4 Network Architecture

The network architecture is based on a star topology with VRSC as the central unit. The catalogs, DLs/IRs, e-learning servers of the member libraries will be connected with the respective servers of the
VRSC. Federated searches can be facilitated through the central point over the network. The network architecture is given in the figure 6.7.

This architecture is based on the status quo of the DLs, IRs and E-learning systems available at different study units. A district wise presentation of the availability of different databases in the study units is depicted in the figure. The catalogs of only six libraries are found to be technically feasible for sharing. So network architecture gives a prospective outcome of the proposed model with respect to sharing of catalogs.

6.5 Workflow

The workflow represents the blueprint of how the system works. The workflow of the proposed centre will start with the identification, location and validation of open contents from the web. Since the centre maintains a database for free e-books, these will be downloaded and saved in the digital library server. At the same time catalog records of the e-books will be uploaded in the system catalog database. For other types of open contents, the links (DOI) will be validated and managed. Metadata for such items will be uploaded in the concerned databases. The e-learning modules and objects created by the authorized faculty members will be uploaded to the e-learning database. The system administrators (content managers) will then create the appropriate metadata, create links to the resources in the system digital library and to open contents and finally store the content in the e-learning database. The services will be provided through the user interface of the VRSC portal. Figure 6.8 represents the proposed workflow of VRSC.
6.6 Technical Infrastructure

The proposed model requires three server machines for installing a digital library, e-learning platform and catalog management. Sufficient number of workstations for the use of library professionals is also necessary. High-end scanners for digitizing content and printers also add to the hardware infrastructure. As far the software requirements are concerned the study recommends installing open source software (OSS) for the different functions. There are well established OSS (which are common in the study units) for establishing all these entities. The study recommends DSPACE, MOODLE and KOHA respectively for digital library, e-learning and library
management. The hardware specification for installing these software are discussed below:

A mid range **DSpace** production system requires 4 GB of Random Access Memory (RAM) and 200 GB of Storage. (DSpace, 2014)

The hardware requirements for **Koha** are Pentium-4, 2.6 GHz or higher processor of RAM 2 GB and HDD 80 GB (Delnet, 2014).

For **Moodle**, the hardware specifications are a 2 x Dual Core AMD Opteron (tm) Processor 265 and 4GB DDR 400 ECC Reg memory and 4GB swap partition (Moodle, 2014).

### 6.7 Organisational Set up

![Organisational Set Up of VRSC](image)

*Fig. 6.9 Organisational Set Up of VRSC*
For any cooperative effort, it is desirable to have an apex body to monitor its functioning. Since the network proposed in this study covers the college libraries under a particular university, the most effective system is to have the university at the apex. It is essential to have a nodal centre with sufficient leadership and manpower to control and maintain the network. The study recommends that the nodal centre shall be maintained at the university campus. The organizational set up of the resource sharing centre is depicted in the figure 6.9.

6.7.1 Administrative Structure

Fig. 6.10 Administrative Structure of VRSC
Since the organizational units are scattered at different geographical locations it is important to have an effective administrative mechanism to interlink the units and ensure a proper coordination. The administrative structure for the VRSC is given in the figure 6.10.

The different units of the administrative structure are discussed below.

**Advisory Committee**

This is the apex committee responsible for framing policies, rules and regulations of the network. This committee may be constituted with the following number of members.

University Professor in the faculty of Engineering - Chairman (1)
Principals of Participating Colleges - Members (6)
Representative of Librarians of Participating Colleges - Member (1)
Head of Nodal Centre - Convener (1)

**Head of Nodal Centre**

As discussed above, the nodal centre is responsible for maintaining the VRSC. The head of the Nodal Centre should be an experienced and eminent personality from the field of Library and Information Science. The study recommends that a Deputy Librarian from the university library system may be given the honorary headship of the centre. Two qualified library professionals may be appointed in the centre for handling the different functions of the centre as mentioned in the figure 6.10. The Reference Librarian may be given the charge for handling the Virtual Reference Desk and Acquisition Librarian may be given charge for handling content acquisition and metadata creation of contents (free, subscribed and e-learning).
Appointing a qualified technical assistant for handling the hardware and software may be helpful in the long run.

6.8 Implementation

The implementation of the VRSC shall be done at multiple phases. The present study could establish only the willingness of the librarians for RS and the acceptance of the proposal for VRSC by the librarians and user communities. The final decision regarding whether to take part in such a cooperative effort and the extent of cooperation depends on the attitude of the managements/authorities of the institutions. So the first step in the implementation of the proposal is establishment of a RS agreement by the colleges regarding the type and extent of cooperation. Discussions at various levels will have to be conducted and the managements/authorities should show an open-minded approach for the common benefit of the community. Once such a consensus is reached the proposal shall be implemented as follows:

6.8.1 Pre-Phase

1) Constitute a governing body comprising of administrators, academicians and librarians for managing and monitoring the VRSC.
2) Depute and appoint competent library professional(s) for managing the centre.
3) Establish the nodal centre at the university campus.
4) Develop the VRSC portal with central databases for handling e-content and e-learning objects.
5) Prepare the policies, terms and conditions on the extent of content sharing among the institutions.
6) Prepare the panel of subject experts on different branches of engineering for developing learning objects.

6.8.2 Phase-I

1) Locate free e-books and e-references and upload them in the central server. Enter the catalog records of the same in the respective server.

2) Identify open content, open archives and open courseware related to engineering and create the metadata and links for them and upload in the central server.

3) Expose the MARC compatible catalogs of the member libraries for facilitating federated searching.

4) Initiate steps to convert the remaining catalogs to MARC compatible format using suitable programmes or shift the library management system to some open source software that supports MARC format (eg. KOHA).

5) Index and upload the e-learning content developed by the panel of experts.

6) Initiate appropriate training programmes for librarians, content developers and users for promoting and optimizing the services of VRSC.

6.8.3 Phase-II

1) Complete the conversion of non compatible catalogs to MARC format.

2) Include all the ECs under the university in the network.

6.9 Expected Outcome of VRSC

✓ Provides an enhanced platform for RS of EC libraries
Chapter 6

- Improves access to scholarly information
- Ensures faster delivery of services
- Interlending and document delivery can be carried out efficiently and quickly
- Access to information results in improved usage which in turn leads to improved productivity of the academics
- Helps to avoid duplication of research

6.10 Probable Challenges

Commitment, tolerance and genuineness are the basic success factors of a RS activity. Open-mindedness to co-operate with competitors is vital to accomplish such an effort. Bringing together competing institutions, and materializing a public–private institution level cooperation involves greater challenge. But an affiliating university can initiate steps to achieve this goal. Discussions at various levels will have to be conducted for reaching consensus in the matter.

It is imperative that all the participating institutions must have a clear understanding of their responsibilities, obligations, benefits and obstacles of the cooperation. Lack of standards in existing systems is the next challenge. Conversion of catalogs into compatible formats or moving on to new platforms for integrated library management requires expertise and policy decisions to be made at unit level. A lot of effort is required to overcome these challenges. The beneficiaries, especially the medium and poor libraries should understand the importance and benefits of cooperation and work dedicatedly and ambitiously to accomplish the task. For this, cooperation from political circles, government agencies, non-governmental funding agencies, voluntary agencies, etc should be sought.
When almost all these challenges are tackled, a formal agreement (Memorandum of Understanding) should be drafted stating the responsibilities of the participants, the rules for content sharing, inter library lending, etc.

6.11 Conclusion

It is a matter of fact that academic libraries can not function effectively on its own without any cooperation or collaboration. With the escalating costs of publications, variety of contents and diverse user demands libraries find it difficult to satisfy all its clientele. The present study also revealed that most of the users are either partially satisfied or dissatisfied with their library facilities. The only solution to overcome this situation is cooperation. Exploring the possibilities of sharing open contents is another viable solution. The RS model put forward by the study covers both these aspects. It is also essential to satisfy the required technical infrastructure including high speed internet connectivity and sufficient number of terminals by all the institutions for the successful functioning of the system.

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