Chapter 7

Resource Sharing Technology:
Crossing the Hurdles

1 Introduction

Resource sharing is one of the major methodologies through which librarians are able to bring documents and users closer irrespective of their locations. As both the number of documents and the number of users have been proliferating the world over, the methods of sharing resources have needed automated systems rather than the usual manual systems for execution. The growth of communication networks in the 1980s coupled with advances in computer facilities transformed the scope of resource sharing. Communication facilities can be used well if the librarians are willing to conform to cataloguing standards and interlibrary loan standards, among others. It is the electronic communication which is now facilitating the transfer of documents. If this technology has to be used for resource sharing, librarians must draw a balance between the classic and the modern concepts of networking.[1]

To mark the influence of technology on resource sharing and the birth of library networks, three important factors have guided librarians:

(a) Use of computers for the creation of databases for better services to users;

(b) Use of telecommunication systems to move information in machine readable form from one location to another for users;
(c) The use of standards that enable computers and telecommunication systems to network so that bibliographic, statistical and textual data from various online sources are merged for better use.

In addition to the above factors, the technology interaction with libraries did cover other areas which made an impact on resource sharing.

The photocopying machines have made documents accessible for research and reference thereby making a great contribution to resource sharing. So has the CD-ROM technology, tape service or dial-up access to remote computers done. Pat Molholt observes: "Technology has given libraries choices and made life more complicated. It no longer suffices to ask, "Do we provide a particular service or not?"; if the answer is yes, there are further choices as to how it will be provided. An easy example is found in access to indexing and abstracting information. Initially the question was, could we afford a particular index? "Yes" meant you bought it and shelved it, "no" meant you spent your money on something else. Today a "yes" leads to questions of format with trade-offs between speed and cost. There may be a CD-based product, a tape service, or dial-up access to a remote computer file."[2]

Information technology has also given birth to a number of facilities for information transfer.

The technologies used for document transfer are:

(a) E-mail - One of the most popular ways to communicate, send messages or text.
(b) File Transfer Protocol (FTP) - It helps to transfer files from one computer to another around the globe.

(c) TELNET - This enables users to get hooked to a computer anywhere in the world and access it.

(d) SLIP/PPP (Serial Line Interface Protocol and Point to Point Protocol) - A variant of TCP/IP used on telephone lines.

(e) GIAS - Gateway INTERNET Access Service (GIAS) is offered by Videsh Sanchar Nigam Ltd. (VSNL) which offers:
   (i) Student Accounts
   (ii) Shell Accounts
   (iii) TCP/IP Accounts

(f) Telefax

For document transfer we need the telephone public data network (X.25), (X.28) or INTERNET (TCP/IP).

It may be important to note that in January 1998 VSNL has the following track record:

<table>
<thead>
<tr>
<th>January 98</th>
<th>20 nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75,000 subscribers</td>
</tr>
<tr>
<td></td>
<td>4,000 dial-up centres</td>
</tr>
</tbody>
</table>

With the growth of STD facilities in India, VSNL charges have been coming down:
Table 12

<table>
<thead>
<tr>
<th>Year</th>
<th>VSNL Charges (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1995</td>
<td>Rs. 60/-</td>
</tr>
<tr>
<td>June 1996</td>
<td>Rs. 30/-</td>
</tr>
<tr>
<td>January 1998</td>
<td>Rs. 20/-</td>
</tr>
</tbody>
</table>

The leased lines from VSNL are available at various speeds and the tariff for leased line access includes the line lease charge as well as the INTERNET account charge for a TCP/IP account with INTERNET Protocol (IP) address which are given below:

Table 13

<table>
<thead>
<tr>
<th>SPEED</th>
<th>REGISTRATION FEE (Rs.)</th>
<th>ANNUAL TARIFF</th>
<th>100% EOU</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 KBPS</td>
<td>Rs. 15,000/-</td>
<td>Rs. 1.5 lakhs</td>
<td>Rs. 1.2 lakhs</td>
</tr>
<tr>
<td>9.6 KBPS</td>
<td>Rs. 15,000/-</td>
<td>Rs. 6 lakhs</td>
<td>Rs. 4.8 lakhs</td>
</tr>
<tr>
<td>64 KBPS</td>
<td>Rs. 20,000/-</td>
<td>Rs. 12 lakhs</td>
<td>Rs. 9.6 lakhs</td>
</tr>
<tr>
<td>128 KBPS</td>
<td>Rs. 20,000/-</td>
<td>Rs. 18 lakhs</td>
<td>Rs. 14.4 lakhs</td>
</tr>
<tr>
<td>256 KBPS</td>
<td>Rs. 40,000/-</td>
<td>Rs. 25 lakhs</td>
<td>Rs. 20.0 lakhs</td>
</tr>
<tr>
<td>512 KBPS</td>
<td>Rs. 40,000/-</td>
<td>Rs. 36 lakhs</td>
<td>Rs. 28.8 lakhs</td>
</tr>
<tr>
<td>1 MBPS</td>
<td>Rs. 40,000/-</td>
<td>Rs. 60 lakhs</td>
<td>Rs. 48.0 lakhs</td>
</tr>
<tr>
<td>2 MBPS</td>
<td>Rs. 50,000/-</td>
<td>Rs. 100 lakhs</td>
<td>Rs. 80.0 lakhs</td>
</tr>
</tbody>
</table>

Table 14

<table>
<thead>
<tr>
<th>Year</th>
<th>Charges (per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1995</td>
<td>Rs. 15 lakhs</td>
</tr>
<tr>
<td>March 1998</td>
<td>Rs. 10 lakhs</td>
</tr>
</tbody>
</table>
The use of fax has become universal and does not need any further know-how in this form, unless it is linked with the full text database for the transfer of data through the same type and graphic structures of pages.

Telecommunications have transformed the databases into machines that communicate their resources to users stationed anywhere in the world. They have given birth to networks of libraries that cut across the borders of space. If the advances in technology grow further, these networks will cut across the borders of known time. As a result, the distinctions between what's in a library and what's accessible to library patrons is becoming immaterial. Ownership is becoming a secondary issue as users are more interested in accessing remote databases and full text files. Now, it is possible to develop specialised access tools on the content of a unique collection. [3]

The technology has mostly faced the resource sharing challenges since the 1970s. Its innovations have resulted in the increase of data and the number of databases, and faster transmittal of requests and delivery of documents. But, accessing various electronic networks and databases simultaneously for a particular item of information is not happening. One has to access one database after another and remember different commands for different databases. One of the issues that confronts us is in retro-conversion of records. Today we can download one record after another from a major bibliographic database. This process is time consuming. At present Indian database maintains a standard bibliographical database using MARC.
The use of electronic mail for interlibrary loan began during the 1980s.[4]

1981-Pacific Northwest Bibliographic Centre began using Tymnet for ILL.

1984-ILLNET replaced its TWZ network with ALANET. ALANET, the E-mail of the American Library Association began offering loan and photocopying templates.

Accessing INTERNET and network databases through E-mail has many advantages. One can access the necessary databases and the data, statistical, bibliographical through E-mail, without any charges spent on:

(i) Access time/STD; and
(ii) Delivery of the document

This is the most economical and effective document search and delivery system. You can retrieve files from FTP files. You can explore the INTERNET via Gopher, search for information through Archie, Veronica, or WAIS; access World Wide Web. Also, you can access Usenet newsgroups through E-mail only.

The special feature of this service is that you can get the new addresses for FTP, Gopher and Web mail servers. Also, you can search the databases in 30 languages. To get the details send E-mail to BobRankin@MHV.net with subject:

send list [5]
2 The Softwares

The softwares necessary for resource sharing fall under two categories:

(i) Softwares for data transfer; and
(ii) Softwares for data creation.

2.1 Softwares for Data Transfer

2.1.1 DELSEARCH

DELNET's E-mail access to its databases is remarkable as anyone living in any part of the world who has access to E-mail and is registered with DELNET as a user can retrieve full text or bibliographic data by simply sending a special E-mail query with a subject descriptor. Here, in the case the descriptor could be the name of a person, a subject term of a single or multiple words, a word or words in a title. As such you get the same results which you would have done by online accessing. The data would get transferred. This method of document delivery is very effective and the cheapest ever possible.

While in the DELNET case the queries are sent through E-mail and then they are processed and sent back by the system to the user through E-mail but in the case of Ariel full text documents, especially articles in periodicals are transmitted. [6] Ariel software has to be available on both the ends which also gives access to all titles previously held.
Any user anywhere in the world with the INTERNET E-mail connectivity can use DELSEARCH. Since DELSEARCH is recently developed the access is given to the Union Catalogue of Books. One can access the DELNET Union Catalogue of Books by either title/subject or author enquiry. Instructions to be followed for accessing the Union Catalogue are:

**For Title/Subject Enquiry:**

Step 1  Send an E-mail to: bkt@delnet.ren.nic.in

Step 2  In the subject of the mail enter title/subject query word or words with a single space between each word. Please do not use any punctuation marks in between. Do not send requests for more than one title/subject query per mail, e.g.

mailx bkt@delnet.ren.nic.in
subject: information technology

The query allows the user to retrieve the documents containing the words information technology in the title or in the subject field of the bibliographic data of a book.

Step 3  Do not enter anything in the text of the mail

Step 4  Submit the mail for transmission
For Author Enquiry:

Step 1  Send an e-mail to: bka@delnet.ren.nic.in
Step 2  In the subject of the mail, enter the author’s name
        which can include surname, forename or both in
        any order, e.g.

        mailx  bka@delnet.ren.nic.in
        Subject: Partha Chatterjee

        to retrieve the books written by Partha Chatterjee

        Do not mention two separate authors under one query. You can
        write the names of the joint authors together leaving a space in
        between. e.g

        mailx  bka@delnet.ren.nic.in
        Subject: Partha Chatterjee Tandon

        to retrieve those books which are written by Partha Chatterjee
        and Tandon (the user knows only the surname)

        Step 3  Do not enter anything in the body of the mail
        Step 4  Submit the mail for transmission

        The mail will be received by the DELNET system and the
        query results will be sent back to the user automatically by the
        system through E-mail.
2.1.2 ILL Enhancements

Linda L Thompson and Keiko Cho Horton make the following recommendations for improving ILL facilities while keeping in mind the experiences at Houston Area Research Library Consortium:[7]

1. The handling of ILL requests should be done on the day the request has been received instead of waiting until the next working day;
2. The use of telefacsimile instead of the courier is recommended;
3. Ariel software may be used for document delivery of journal articles besides the use of computer, document scanner, laser printer, INTERNET and documents of bright print quality; and
4. The establishment of telecommunication links between the libraries along with a proper ILL software may help the requests to be processed fast and automatically routed to the next library where the desired document is available;

2.1.3 Ariel Technology

In order to reduce the number of serial subscriptions the Life Sciences Library and the George T. Harrell Library (College of Medicine) of the Pennsylvania State University developed the Ariel software for document transmission over the INTERNET. [8] Ariel provides rapid, efficient and quality transmission of documents at a relatively low cost. The software integrates standard personal computers, scanners, lasers and communications equipment. It has a transmission speed of 1.5
million megabits per second over the INTERNET. A copy of the Ariel Article Request form is given in Appendix VIII.

2.1.4 The Other Softwares

From the North American Interlibrary Loan and Document Delivery (NAILDD) project one can notice that: [9]

(a) An ILL software is being developed to minimize staff costs and multiple proper files required in the paper based process;
(b) OCLC's ILL fee management (IFM) was considered suitable for payment of ILL transaction fees; and
(c) The interconnectivity among all systems used in the ILL/DD process is essential for the NAILDD project. The standard promoted for this purpose includes ISO ILL Protocol (ISO 10160 and 10161), the international standard for communicating ILL requests.

2.2 Softwares for Data Creation

As a large number of softwares are available the world over for data creation, I am referring to only two foreign and two DELNET softwares for data creation in this context.

2.2.1 DOBIS/LIBIS

Another software that has been used in Saudi Arabia is DOBIS/LIBIS for networking of university libraries. DOBIS
(Dortmunder Bibliothekssystem) and LIBIS (Leuven's Integraal Bibliothec System) jointly developed by the University of Dortmund in Germany and the University of Leuven in Belgium is being used by more than 170 libraries in five continents[10].

There are three levels in DOBIS/LIBIS networks:

1. The top level or the union catalogue is shared by all libraries in the network;
2. The local libraries comprise the next level. Each local library is a separate administrative unit with its own files for circulation, acquisitions, periodicals, and holdings; and
3. The branch or department libraries that belong to the local library are at the lowest level.

It is important to mention here that the primary goal of the proposed network is to share production and utilisation of bibliographical data. Once it is achieved, the tremendous benefits of such a network will motivate the participating libraries to broaden the scope of the network to include cooperative acquisition and interlibrary loan, etc.

Among the university in the Kingdom, the KFUPM Library seems in a better position to play a central role in the network for the following reasons:

1. DOBIS/LIBIS has been running successfully for over a decade.
2. Cataloguing practices are standardised.
3. Staff are highly qualified and experienced in creating USMARC compatible records.
4. Strong data processing support is available.

5. General acceptability of the KFUPM Library as a leading DOBIS/LIBIS user library in the region.

The star topology has been used for university libraries in Saudi Arabia in which the KFUPM Library supports a central node controlling all network activities and provide a union catalogue for participating libraries.

2.2.2 NOTIS

A reference may be made to NOTIS, the networking software which was used by Detroit Area Library Network (DALNET) and Upper Peninsula Region of Library Cooperation, Inc. (UPRLC) among others. NOTIS was selected for DALNET in 1985 and installed on dedicated IBM 4381 mainframe. The software supported in the beginning:

(a) Online union catalogue;
(b) Subject authority file;
(c) Cataloguing and authority modules;
(d) Dial access facility;
(e) Circulation modules;
(f) OPAC;
(g) Acquisition module;
(h) Serials module; and
(i) User directory.

The network processing has the following features:
(a) Removing duplicates from a library’s bibliographic records.
(b) AACR II conversion.
(c) Smart barcode creation and label printing.
(d) Authority record generation for name, uniform title, series or subject.

The NOTIS has the following features:

DALNET unified authority database maintains only one record for each unique heading in the main bibliographic database. The Unified Authority records for each set of tapes. The system checks the authority record generated for each DALNET library with “DALNET Unified Authority Database” and only unique headings are maintained by DALNET.

NOTIS software accommodates the following additional features:[11]

1. Bibliographic Record Loading

The software does the following:
(a) Translates MARC field tags
(b) Bibliographic record loaders identify the local call numbers to be used.
(c) Map utility location codes to NOTIS location codes.

The processes of loading involve:
(a) developing specifications for customising loader programmes.
(b) programming the loader
(c) testing/acceptance
(d) record loading

2. Loading Resource Authority Databases

The following four ways have been described to create authority records in the DALNET authority file:
(a) Tape-loading records generated by a vendor
(b) Transferring records from a utility database
(c) Keying records created locally
(d) Using records from a resource authority database loaded in the local NOTIS system

The Library of Congress Subject Headings (LCSH) were also used to create a DALNET resource authority database. It was decided that the Medical Library Subject Headings (MESH) authority records were to be added to the DALNET's resource authority database.

3 The Communication Standards

3.1 TCP/IP Support and the Protocols
The development of INTERNET, the growth of a large number of databases on it and the need to access them have given rise to the use of TCP/IP support in a wide area networking. It has made the transport of documents much easier and faster. TCP/IP support is more compatible with a wide variety of UNIX and MAC systems.

Cynthia J. Durance and Neil McLean observe that “effective electronic resource sharing has been hampered to date by the inability of the existing technology to interconnect, effectively and economically, the many diverse electronic library and information databases which exist worldwide, and thereby provide the mechanisms to reduce the existing fragmentation of information and service delivery.”[12] This is considered to be a major barrier in resource sharing because the number of databases on the INTERNET is growing rapidly.

Barriers to ILL communication have been removed by the National Library of Canada by: [13]

1. The development of an ILL protocol to standardise ILL messages and improve transaction control;
2. An ILL protocol implementation programme to encourage the development of systems based on the protocol;
3. A generic ILL script to facilitate messaging between libraries which use protocol-based systems and those which do not; and
4. A conformance testing system and test suit to ensure that implementations of an ILL protocol conform to the protocol standard.
It is therefore important to see how the ILL protocol works:

In the ILL protocol, the services represent the activities. These services, such as ILL-request (request to borrow); RECEIVED, RETURNED (the receipt and return of the borrowed document); RENEW (the request for renewal); LOST (item requested is lost); and CANCELLED (cancellation of the request). There are optional messages such as SHIPPED, RETURNED, RECEIVED and CHECKED-IN. When the requests are in operation, the messages such as PENDING and IN-PROCESS are used. There are several other services used by the protocol and they are requested by messages such as ILL-ANSWER, FORWARD-NOTIFICATION, etc. The protocol which has to be got approved by the standards organisation of the country besides International Standards Organisation plays an vital role in resource sharing within a country. Such protocols can help in developing ILL strategies towards providing better service to users.

3.2 The ILL generic script

The ILL generic script prepared by the National Library of Canada helps all those libraries which do not have protocol-based systems. [14] It allows a library which has a dumb-terminal and ENVOY 100, the communication network facility of the library to communicate with the other libraries. It initiates an ILL transaction, and structures the data to conform to ILL protocol in machine processable format. It also has manual processing facilities for libraries for messaging purposes.
The National Library of Canada developed a protocol for ILL communications in order to facilitate resource sharing in a networking environment. [15] The protocol was designed:

1. "To encourage software developers and members of the library and the information community to adopt the protocol and incorporate it into ILL systems;
2. "To provide advisory support to implementors on the interpretation and implementation of the protocol;
3. "To acquire essential information on protocol implementation, conformance testing and related issues based on these initial implementations of the protocol."

The protocol will be OSI based and it will be able to communicate with all types of hardware, software or communication facilities used. It can be tailored to the needs of a particular library. There will be no conversion facilities needed and all ILL systems will be compatible. The sequence of messages will be compatible and standard and it will improve ILL facilities. How does an ILL protocol function? It standardises four aspects of ILL communications:

1. "The number and types of messages to be exchanged in an ILL transaction. The protocol identifies and defines the ILL request and subsequent ILL transaction messages that may be exchanged, such as shipped, received and returned. It also identifies messages that are used less frequently, such as renewal requests, renewal responses, overdue notices, recall messages, etc. Some messages are defined as mandatory, others are optional;
2. "The data elements contained within these messages and their values. These elements are defined as either optional or mandatory, fixed or variable in length, and patterned or unpatterned. For example, the shipped date is defined as a mandatory field of 6 characters that has the pattern YYMMDD (year, month, day);

3. "The correct sequence for the communication of protocol messages. The protocol formalises the logical sequence for the exchange of messages so that in an automated environment it will not be possible, for example, to send an answer before a renewal request has been received;

4. "The transfer syntax. As the protocol is intended for computer-to-computer communication, a transfer syntax or an encoding scheme is required so that the various parts of the ILL message can be identified by the receiving library's computer. Just as the MARC format provides tags for all parts of a bibliographic record, the transfer syntax has identifiers for all the elements of an ILL message."

3.3 OSI and ILL

Experimentation in the use of OSI for ILL has been one of the important features of a project approval by the European community.[16] The project was submitted in 1989 by a working group, consisting of representatives of the London and South Eastern Library Region (LASER) (UK), the Direction des Bibliothèques, des Musées et de l'Information Scientifique et Technique (DBMIST) and its host organization Serveur Universitaire National pour l'Information Scientifique et Technique (SUNIST) (France), and the Centre for Library Automation Pica.
(Netherlands). The project is primarily devoted to the use of OSI for interlending between Library Networks in Europe.

The main aim of the project was to:

1. "Demonstrate the capabilities of OSI developments for international interlending services;"
2. "Improve the efficiency of interlending services internationally and nationally;"
3. "Develop a strong community service market for interlending service;"
4. "Achieve interconnectivity between three major networks in Europe -- LASER, Pica, PEB-- and their users for interlending services;"
5. "Apply OSI and other network-standards to library networks for interlending services;"
6. "Achieve a flexible model for international interlending which accommodates the requirements of interlending services in different member states;"
7. "Prepare for the development of changing mechanisms for interlending services which facilitate the availability and supply of literature within the community;"
8. "Assist member states which are less advanced in the development of automated interlending and network services."

The results have not yet been satisfactory. Improvement of interlibrary loan facility through electronic messaging is possible if we use Open Systems interconnection (OSI) Reference Model and improve the telecommunication infrastructures. The system should provide a uniform basis for the coordination of standards development which promote
interconnection between disparate systems and networks, thereby promoting fast ILL facilities and exchanging of records. The Universal Dataflow and Telecommunications (UDT) core programme of IFLA should be effectively developed to promote OSI standards. In order to see to it that OSI becomes an effective tool for removing barriers in information communication and exchange of records, IFLA, in its OSI seminar during 12-14 August, 1987, London made the following recommendations[17]:

1. “Define and specify the service criteria and objectives of its programmes in terms of present and future interworking requirements, taking into account the ever increasing potential of OSI as a facilitator of improved services;

2. “Identify the relevant communications support and capabilities that exist within, and between, the constituent member countries;

3. “Critically examine existing functional profiles/standards being promoted by national and international agencies to assess their suitability in meeting the requirements of the national and international library and information communities;

4. “Contribute wherever possible to the development of application level protocols for library and information needs;

5. “Promote specific initiatives to develop common library applications between two or more countries;

6. “Create appropriate mechanisms to ensure that there is adequate representation to OSI protocol development and promotion agencies;

7. “Consider the mechanisms for involving users, library systems' vendors, national libraries and those offering related services in the formulation of both service objectives and the means of delivering services;
8. "Ensure that there is close liaison between the Universal Dataflow and Telecommunications core programme, which has a specific responsibility for promoting OSI standards, and the other three core IFLA programmes;

9. "Gather and disseminate relevant information on all aspects of OSI affecting the international library and information community."

Further, the Section on Information Technology submitted a resolution which was approved by the IFLA Professional Board in Brighton which reads as follows:

"In order to promote the ability to share resources through electronic means for improved service to library users, in order to facilitate communication for the interchange of information and resources, and in order to reduce the effort and cost of implementing and using computerised library systems, IFLA endorse[s] the further development of ISO and CCITT standards for Open Systems Interconnection and their adoption by the IFLA membership. Further that the Professional Board take the appropriate steps to fulfil these objectives."

IFLA is currently evaluating the ways and means to implement the above resolutions.

3.4 Z39.50 Protocol

In Library networking Z39.50 protocol has assumed greater importance. The protocol[18]:

(a) Provides a mechanism, using client server model, for transmitting and managing queries and result sets;
(b) Is a generalised mechanism and can be used for bibliographic, full text and other types of databases;
(c) Enables the client to perform searches and creates result sets. The records pertaining to the results can be presented to the client or used for creating new result sets with other searches; and
(d) Conforms to one or more common syntaxes and yet it is not necessary that the same syntax is shared in all databases.

The methodology for interaction between a client and a server is as follows:
1. A client sends an INITIALISE request and the server responds with INITIALISE response;
2. As soon as the session is established, the search request can be made by the client; and
3. The server responds with the search results/report;
4. Only one search result is made at one time and is served; and
5. Records are transmitted to the client as soon as the client makes the PRESENT request. If the result set is big, the server may require several PRESENT requests.

There are facilities for deletion, termination of the session etc. and the protocol is used for LISTSERVS, campus information system, WAIS (Wide Area Information Service), etc.

One of the uses of Z39.50 protocol has been in accessing multimedia materials such as museum objects, pictures and descriptive records. It is being successfully done and so in the delivery of articles using ISO-ILL or Z39.50 protocol. [19]
The World Wide Web (WWW/Web) technology has transformed the INTERNET into a user-friendly access facility for a wide range of databases. The WWW incorporates Hypertext Transfer Protocol (HTTP) for facilitating the transfer of hypertext documents and allows its users to act as clients to the services such as Telnet, Gopher or File Transfer Protocol (FTP). The hypertext facility provides hyperlinks to documents that are available on the INTERNET, either on the same Web server or other servers. This enables that the sources be linked and used more effectively.

The Web is major source of information which is shared by INTERNET users all the time. It is estimated that there are more than 50 million Web pages on the INTERNET besides the other major or minor databases available on it. A web page comprising text is generally equivalent to an Hypertext Markup Language (HTML) file and images, sound or movie files are considered supplementary items. Any document on the INTERNET which does not conform to HTTP protocol is not considered a part of WWW.

The following Web tools and techniques are becoming popular in order to facilitate transfer of information:

4.1 Web Servers

Web servers for using web services are necessary. The following are some of the web servers used on different platforms.[20]
<table>
<thead>
<tr>
<th>Platform</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows NT</td>
<td>MS INTERNET Information Server</td>
</tr>
<tr>
<td>UNIX</td>
<td>Apache, CERN HTTPD, NCSA HTTPD</td>
</tr>
<tr>
<td>Intel 16 bit PCs</td>
<td>Windows HTTPD</td>
</tr>
<tr>
<td>Intel 32 bit PCs</td>
<td>OMNI HTTPD, Tiny Web</td>
</tr>
</tbody>
</table>

### 4.2 Web Browsers

The following are the examples of web browsers, plug-ins and helper applications: [21]

- Browsers: Netscape and INTERNET Explorer
- Plug-ins: Adobe Acrobat Reader, Read Audio, etc.
- Helper applications- Web Launchers, etc.

### 4.3 Digital Library Tool Kits, etc. [22]

The digital library tool kits, CGI tools, etc are growing in number and it may not be necessary to go into their functioning and growth of such tools in this work. The purpose has been to refer to some of them in order to highlight the growing number of technology applications that are supporting resource sharing through the WWW. However, reference may be made to Web casting or push technology which allows pre-arranged updating of data on particular addresses on the INTERNET. Reference may be made to DEL-LISTSERVs of DELNET which use the technology for providing latest information to DELNET member-libraries:

(i) IFLA
(ii) Library and Information Science Jobs
DELNET also uses push technology to provide information in the following databases from INTERNET:

(i) Books: New Arrivals From INTERNET
(ii) Book Reviews
(iii) Current Contents

4.4 Uniform Resource Locator (URL)

A URL is the basic Web address for a number of Web pages:
The following is an example:
http://www.mrcemis.ms.nwu.edu/iumrs/index.htm

As we notice the basic URL does not include further segments which denote paths for accessing other Web pages.

4.5 Persistent Uniform Resource Locator (PURL)

PURL is a URL which points to an intermediate resolution service which associates the PURL with the actual URL and returns that URL to the user. This helps the user to access URL faster without waste of time. INTERNET accessing becomes easy. PURLs have been basically created by OCLC. A PURL has three parts:

1. a protocol;
2. a resolver address;
3. a name.
They are interrelated with Uniform Resource Name (URN) standards and are an intermediate step till which time URNs become an integral part of INTERNET. PURLS are classified as follows:

```
http://purl.oclc.org/keith/home
protocol resolver name
```

PURLs can be periodically updated when their associated URLs change. The use of PURL is at present limited to OCLC databases but could grow in future.

5 Summary and Conclusions

Resource sharing technology facilitates the maximum use of resources and supply of the necessary resources to the users. The technology enables the use of computers, and telecommunication and bibliographic standards for online access to resources. The technologies that have helped resource sharing also include photocopying machines, CD-ROM technology, E-mail, ftp protocol, Telnet, SLIP/PPP, telefax, etc. In India VSNL charges for INTERNET/ONLINE accessing has fallen drastically. The use of E-mail for ILL and accessing databases is an important tool which could result in a low-cost access mechanisms. DELSEARCH developed by DELNET is a better application of E-mail based access mechanism. The ILL softwares should be integrated with the networks in India. The softwares for data creation should have union catalogue facilities so that union catalogue preparation becomes smooth. The examples of DOBIS/LIBIS and NOTIS have been given. The barriers to ILL communication can be removed by the use of ILL protocol which
enables transmission of messages to improve. The OSI applications which have far-reaching implications have been discussed. The use of Z39.50 protocol is becoming increasingly useful around the world for transmitting and managing queries and result sets. As it is a generalised mechanism its applications can be worldwide. So are the applications of WWW. Reference has also been made to Web Servers, Web Browsers, URL and PURL as important components of resource sharing technology.

The conclusions are as follows:

1. Technology should make possible access to several databases simultaneously;
2. Communication technology has given birth to networking and the networks will make demands on the communication technology for pin-pointed access to information;
3. Bibliographic databases should be based on MARC format;
4. E-mail based off-line database access mechanism as developed by DELNET needs to be explored for greater use;
5. The use of ILL softwares and protocols should be made by Indian library networks;
6. The use of ILL generic scripts as prepared by the National Library of Canada may be useful in the Indian situation and therefore its applications be explored;
7. The OSI based ILL software be developed so that it can be based on all types of hardware, software and communication facilities;
8. The use of Z39.50 protocol needs to be started by Indian networks;
9. The Web Technology is one of the important technologies for resource sharing. This technology needs to be explored for better hypertext applications for research and reference; and
A Resource Sharing Technology Lab should be established by a network like DELNET for application of new technology and creation of methods for better sharing of resources.

References:
2. Ibid. p. 83.
3. Ibid. p. 84.
5. Bob, Doctor. "Doctor Bob's painless guide to the INTERNET and amazing things you can do with E-mail." http://biz.mhv.net/drbob
8. Dell, and Henry. op. cit.


21 Ibid. p. 8.

22 Ibid. p. 8.