WEB TECHNOLOGIES FOR USER EDUCATION

Anjana Bhatnagar   Vijaya Deshmukh

Abstract

Web technology is used to provide access to information both within and beyond the institution. In the future there will be greater emphasis on the delivery of information to support learning wherever curriculum programs are being taught, and wherever students are learning at institute or at home. The role of the library resource centre as a service facility will grow. Institutions have a crucial responsibility towards students to develop their aptitude in using the information potential of these information technologies critically and wisely. The paper is aimed at presenting the use of web technology in education. The problem is with organizing educational resources whereby individual learners will be able to access material according to their own leaner profile and needs. The Data for this paper is based on conceptual study including personal observation and interaction with students, library research referring to the important journals, periodicals, publications and research volumes and making use of the web. The authors in this paper have highlighted the various types of web technology useful for learners and educators. In Recommendations and Conclusions, the authors throw light on the need for a resource database for learners. Further research will entail the feasibility of the implementation of a resource-base using a data warehouse and data mining as the driving forces with the Internet/Web technology as the delivery mode.

Keywords: E-Information Literacy, Web Technology, Web Services, Portals, Search Engines

1.   Introduction

Education today faces many challenges, including use of technology and e-information and literacy. Learners need to be allowed to access educational resources, which will allow the learners to help themselves. This implies that an educator should find appropriate educational resources for each of the courses that he or she presents. A number of educators are turning to E-Learning as a source for educational resources. Electronic-Learning is an umbrella term for providing computer instruction courseware online over the public Internet, private distance learning networks or in-house via an intranet. E-learning most often means an approach to facilitate and enhance learning through the use of devices based on computer and communications technology like personal computers, CDROMs, Digital Television, P.D.A.s and Mobile Phones. The electronic resources might include notes, PowerPoint presentations, video clips or Internet sites.

Communications technology enables the use of the Internet, email, discussion forums, and collaborative software. E-learning may also be used to support distance learning through the use of WANs (Wide area networks), and may also be considered to be a form of flexible learning where just-in-time learning is possible. Courses can be tailored to specific needs and asynchronous learning is possible. Some view e-learning as a means to effective or efficient learning, due to its ease of access and as the pace is determined by the learner.

Power over information technology ultimately resides in power over the information itself. The skills to use particular technologies change as rapidly as the technologies themselves, whereas the skills needed

to think with information and to use it with imagination and compassion are relatively constant. Information literacy is the fuel of all learning, whether it is technologically rich or poor, and whether educators themselves are experienced or learner drivers of the technologies. The web-based user education provides a high degree of interactivity and flexibility to the users.

What is Web Technology?

Web technology is software, hardware and network architectures that use standards and technologies developed for the Internet and the World Wide Web (WWW). WWW is a major service on the Internet. The World Wide Web is made up of "Web servers" that store and disseminate "Web pages," which are "rich" documents that contain text, graphics, animations and videos to anyone with an Internet connection. The heart of the Web technology is the hyperlink (the "URL"), which connects each document to each other, whether locally or around the world by clicking a link. "Click here" caused the Web to explode in the mid 1990s. The Web turned the Internet into the largest online information source in the world.
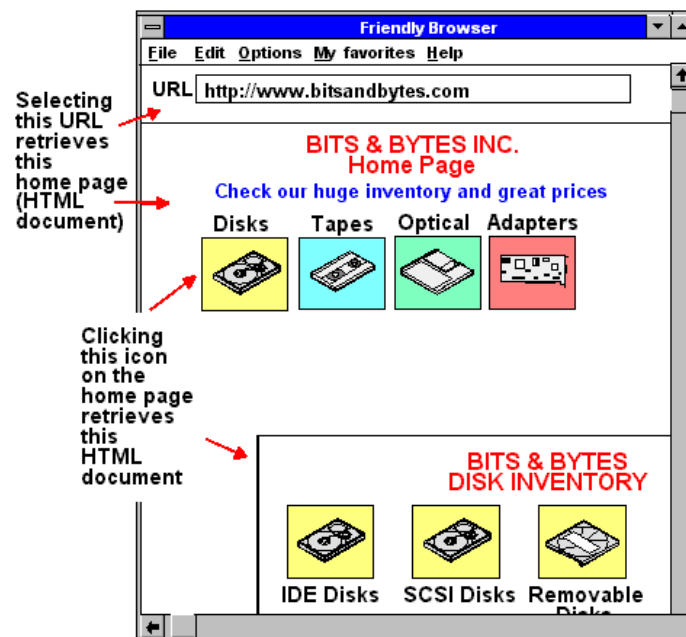

Figure1: Web Linking

Accessing a Web document requires typing in the URL (Uniform Resource Locator) address of the home page in the Web browser. The home page contains links to other documents that can be stored on the same server or on a server anywhere in the world as shown in Figure 1.

2. Methodology

The paper is aimed at presenting the use of web technology in education. The effective use of information resources in the learning program is facilitated by access to information provided by systems and services managed through the library resource centre. These systems enable:

- the organisation, storage and circulating of information resources;

- students and teachers to locate appropriate resources

- the identification of appropriate sources and information resources outside

The problem is with organizing educational resources whereby individual learners will be able to access material according to their own leaner profile and needs.

The Data for this paper is based on conceptual study including personal observation and interaction with students and library research referring to the important journals, periodicals, publications and research volumes and making use of the web to build up first hand information for future analysis. Data display involves organizing and assembling reduced data into diagrammatic or visual display.

3. Scope of Web Technology

Efficient systems, effective use of technology and the availability of staff with the appropriate expertise contribute to a user's ability to gain access to information. Educators, with their specialised knowledge of information access systems, turn the potential for use provided by the systems into effective use. Effective applications of information technology enhance the information access opportunities. Training and assistance for information retrieval can be achieved in the following ways:

- Students receive guidance and have access to programs which integrate information skills development into the curriculum.

- Educators, who have specialist expertise in information access, work cooperatively with classroom teachers to facilitate access to information for both learning and teaching.

- All library resource centre staff are skilled in using the systems and technologies, and able to assist teachers and student users.

- In addition to curriculum related professional development, educators are given the opportunities for continuing professional development relating to developments in information retrieval, information technology, information management systems and librarianship.

- To remain up-to-date with relevant technological developments, the resource centre's ancillary staff is given appropriate initial and ongoing training.

4. Need of Web Technology

Web technologies as a prospective solution include the flexibility of the technology, the ability to create different types of interaction and the plethora of educational resources currently available from both non-profit organisations and commercial concerns.

The ability of the technology to create flexibility in learning can aid learners in managing their own learning. The learner can decide when to learn as well as what to learn and in which order to learn the

material [1,2]. To give the learner the power to decide when to learn also alleviates the strain on the available resources such as computer facilities and multimedia tools. Flexibility in computer technology also means that one multimedia or hypertext document or resource can suffice for many different learning styles. Multimedia technology can emulate a rich learning environment necessary for the stimulation and motivation of learners. Learners affected mostly by visual representation can benefit from a multimedia package, but simultaneously, learners who utilise a mostly auditory learning style, also benefit. The learner can choose which facet of the package to focus on, an option which is not available in media such as the printed media, e.g. books[3,1].

A multitude of interactions can be realized by using computer technology. The interactions include inter-learner and learner-educator interaction, which can be facilitated via tools such as e-mail and chat systems. The interaction that is most relevant to this study, however, is the learner-computer interaction. Multimedia and the emerging Internet technologies such as Dynamic Hypertext Mark-up Language (DHTML) and Java are allowing learners to interact with simulated environments, allowing greater learning to take place. Multimedia and web pages can support learning by their very nature and structure. Their structure offers learners a framework in which they can organise the knowledge being presented. This electronic organisation is more akin to the human cognitive organisation of knowledge than any other media currently available [3,2,4] educator needs an educational resource vast enough to meet the requirements of different cultures, learning styles and backgrounds. The Web is rich with resources that can be used in the educational environment [3,5,6].

5.   Types of Web Technology

- Internet (Public access pages)

- Intranet (Internal web pages)

- Extranet (Secure access to Intranet)

- Web pages

- Web servers

- Portals/Gateways/ Routers

- Search engines

- Email

- Distribution lists

- Internet Forums

- Instant Messaging

- Peer to Peer communications

Because all of the above technologies were built using international standards, they all enjoy the benefits of having a world wide scope and being fully digital. Furthermore, much off-the-shelf software exists to make them all co-exist and communicate. A web application would be a software whose front-end (what is visible by the user) is a website (web pages). These web pages, ultimately, will serve as the central repository of all documents, via Internet (Public access pages).

5.1   Internet

The Internet website is a reflection of the existent internal information management. Current, updated pages reflect an organisation's commitment to good communication to the external world. If the organisation has good internal systems and processes then the information to place on the website (news, pictures, updates, etc.) should all come from internal sources: the Intranet, Internal emails, and Internal newsgroups. A little training and the right software eliminate what many Web Agencies charge a lot of money for updating and maintenance.

The Internet is a vast resource; there are very few topics that one cannot find on the Internet. It's vastness, however, is also its greatest problem when it comes to finding appropriate educational resources. One has to approach resources with caution, since there are quite a few Web pages that contain errors. A resource might also not be appropriate for the level of learner. Educators can invest a lot of time and effort into finding or creating appropriate educational resources. It therefore stands to reason that once a resource has been found or made, that the educator would like a quick and easy way of reusing that resource.

Some of the challenges of modern education such as a lack of library books and increasingly large classes can be defrayed by the intervention of Internet technologies. The technology of the Internet allows educators to locate, create and distribute educational resources on a platform independent system.

5.2   Intranet

The public Web spawned the private "intranet," an in-house website for employees. Protected via a firewall that lets employees access the Internet, it restricts uninvited users from coming in and viewing internal information. As this is a closed network, it is possible to control the level of access of various documents based on individual user IDs and passwords. Each level can be tailored to its users, and each member can contribute easily.

5.3   Extranet

An extranet is when specific persons or organisations access specific areas of your intranet through secure connections over the Internet. They allow access from people separated geographically and/or by time zones. Users can download as well as upload documents. Needless to say that the cost linked to courier / postage is massively reduced.

5.4   Web pages

A document on the World Wide Web, consisting of an HTML file and any related files for scripts and graphics, and often hyperlinked to other documents on the Web. A Web page is a "page" of the World Wide Web, usually in HTML/XHTML format (the file extensions are typically htm or html) and with hypertext links to enable navigation from one page or section to another. Web pages often use associated graphics files to provide illustration, and these too can be clickable links. A web page is displayed using a web browser, and can be designed to make use of applets (subprograms than run inside the page) which often provide motion graphics, interaction, and sound. A collection of web pages stored in a single folder or within related subfolders of a web server is known as a website. A website generally includes a FrontPage named index.htm or index.html. A difficulty in designing and testing web pages is that they should be suitable for many browsers and browser settings and different screen resolutions.

5.5   Web Servers

A web server is a computer that delivers Web pages to browsers and other files to applications via the HTTP protocol. It includes the hardware, operating system, Web server software, TCP/IP protocols and site content (Web pages and other files). If the Web server is used internally and not by the public, it may be called an "intranet server." Web server may refer to just the software and not the entire computer system. In such cases, it refers to the Hyper Text Transfer Protocol (HTTP) server (Internet Information Server, Apache, etc.) that manages requests from the browser and delivers Hyper Text Markup Language (HTML) documents and files in response. It also executes server-side scripts (Common Gateway Interface(CGI) Scripts, Java Server Pages(JSPs), Application Service Providers (ASPs,) etc.)that provide functions such as database searching and e-commerce.

A single computer system that provides all the Internet services for a department or an organization would include the HTTP server (Web pages and files), FTP server (file downloads), Network News Transfer Protocol (NNTP) server (newsgroups) and Simple Mail Transfer Protocol (SMTP) server (mail service). This system with all its services could be called a Web server. Web servers are not only used to deliver Web pages. Web server software is built into numerous hardware devices and functions as the control panel for displaying and editing internal settings. Any network device, such as a router, access point or print server may have an internal Web server (HTTP server), which is accessed by its IP address just like a Web site.
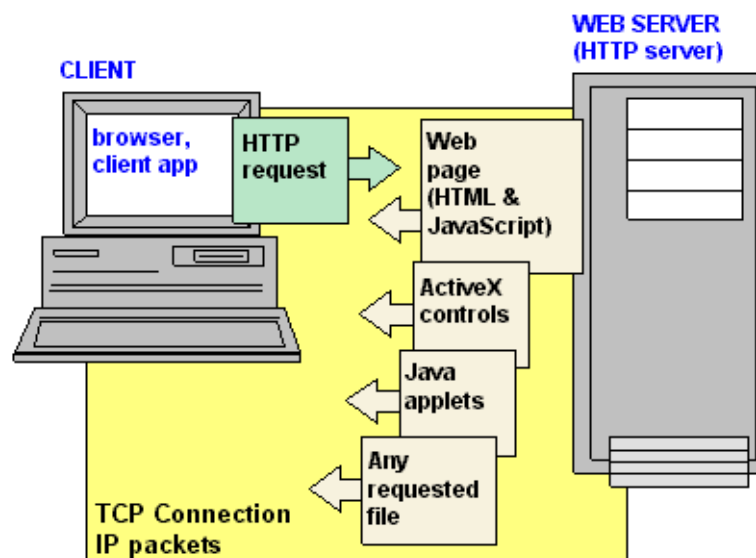

Figure 2: Web Server Fundamentals

Figure 2 shows all the server-side processes that can take place in a Web server and application server. There is overlap between a Web server and an application server, as both can perform similar tasks. The Web server and application server can be in the same machine or in separate computers.

5.6   Portals/Gateways/Routers

A web portal is a web site that provides a starting point, a gateway, or portal, to other resources on the Internet or an intranet. It enables Web searching, news, white and yellow pages directories, free e-mail, discussion groups, and links to other sites. The major general-purpose Web portals are Yahoo!, MSN and AOL and are the Web equivalent of the original, pre-Web online services such as CompuServe and AOL. Portals typically provide personalized capabilities to their users. Many of the portals started initially as either Internet directories (notably Yahoo!) and/or search engines (Excite, Lycos, Altavista, infoseek, and Hotbot among the old ones). The expansion of service provision occurred as a strategy to secure the user-base and lengthen the time a user stays on the portal.

A number of libraries in Europe are involved in the development of internet subject gateways services that aim to help users find high quality resources of internet. They offer an alternative to the Internet search engines and Web directories. The definition of subject gateways says in some sense they are the Internet equivalent of an academic or special library. Subject gateways are Internet based services designed to help users locate high quality information that is available on the Internet. They are typically databases of detailed metadata records, which describes Internet resources and offer a hyperlink to the resources. User can chose to either search the database by keywords or to browse the resources under subject heading. A very popular Subject Gateway is "PINAKES" (http://www.hw.ac.uk/libWWW/irn/pinakes/pinakes.html). It gives link of 45 various subjects' gateways. It provides 10 the Multi-Subject Gateways for example INFOMINE (http://infomine.ucr.edu/Main.html), DutchESS (http://www.konbib.nl/dutchess/) and BUBLLink (http://bubl.ac.uk/link/). A link BUBL (http://bubl.ac.uk/) is a famous LIS subject gateway gives BUBL Journals, Abstracts, full text, over 200 titles with other various links. BUBL LINK / 5:15 Catalogue 150 Internet Resources link for Library and Information Science.

Some sites which gives access to gateways are:

- Subject Gateways, Electronic Journals and Search tools: http://www.ull.ac.uk./ull/webres.html

- Trinity College Library WWW Resources for Library User: http://www.tcd.ie/Library/gateways.htm

- Galaxy-The professional's guide to a world of information: http://galaxy.einet.net/galaxy.html

- Australian Libraries Gateway: http://enzo.nla.gov.au/products/alg/

  • Subject based Information Gateways: http://www.lub.lu.se/desire/sbigs.html

- PINAKES: http://www.hw.ac.uk/libWWW/irn/pinakes/pinakes.html.

- INFOMINE: http://infomine.ucr.edu/Main.html

Current Awareness Services(CAS) according to Luhn is an essential function of management to make the members of its organization aware promptly of such new information which will most likely contributes to performing their individual task with the highest possible degree of competence. Modern procedures and techniques of CAS have included individual notification of published information directed to individual professional scientist's engineers and others. A library can provide this service through e-mail, which is easiest and common procedure. Otherwise a library can refer or link directly to some location to their WebPages. Some important Internet site providing information service are Current cites—This is a monthly bibliography of some selected titles of books and electronic documents on information technology.

URL: http://sunsite.berkeley.edu/currentcites/and a library can link http://www3.oup.co.uk/jnls/tocmail/ to his WebPages for giving Oxford Journals' Table of Content Service to their users. It guides to content of current journals published by Oxford University Press. And Scholarly Article Research Alerting—Provides table of contents of any of its 200 academic journals http://www.carfax.co.uk/sara.htm

Router is a device in a network that handles message transfer between computers. It is a network device that forwards packets from one network to another. Based on internal routing tables, routers read each incoming packet and decide how to forward it. To which interface on the router outgoing packets are sent may be determined by any combination of source and destination address as well as current traffic conditions (load, line costs, bad lines, etc.).

5.7 Search Engines

Search engines are software programs that searches a database and gathers and reports information that contains or is related to specified terms. A website's primary function is providing a search engine for gathering and reporting information available on the Internet or a portion of the Internet. Some of the search engines used widely for educational purpose are Google, Altavista, Yahoo, Satyam etc. The success of the Google search engine is mainly due to its easy-to-use interface. Educational Search Engines are Web Sites are collections of educational topics that have built-in search features to help educators find sites by keyword search. Using these search engines before trying general search engines is a great time saver.

- Education Planet - The Education Web Guide

  http://www.educationplanet.com/
  This is a searchable collection of educational web sites. Uncheck the boxes except for web sites and maybe maps.

- Education World

  http://db.education-world.com/
  Large web site of educational links and a search engine feature to search these links.

- Awesome Library - Education Search Engine

  http://www.neat-schoolhouse.org/searche.html
  Database of 110,000+ sites related to educational topics.

- Blue Web'n Refined Search

  http://www.kn.pacbell.com/wired/bluewebn/search.html
  Search engine of good educational sites, with ratings and grade levels. However, this is a fairly small database, so use one or two keywords only.

- StudyWeb

  http://www.studyweb.com/
  Doesn't give descriptions with first search results and some terms were hard to guess at the relevance. But the next level gives good descriptions of sites with ratings and approximate grade level provided.

- The WWW Virtual Library

  http://www.vlib.org/

Educational Web Sites

- Carroll County Public Schools Web Watcher

  http://www.carr.org/ccps/students/help/ Suggested Web sites are organized by grade level and annotated by teachers to correspond with The Essential Curriculum of Carroll County Public Schools in Maryland. See Also: Carroll County Web Watcher: Teacher resources.
  http://www.carr.org/ccps/programs/media/teacher_resources/index.htm

- Baltimore County Public Library - Elementary Curriculum Connections

  http://www.bcpl.lib.md.us/centers/education/LibraryWeb/elem/Elem_level.html List of links by topics related to the elementary essential curriculum for Baltimore County.

- ED's Oasis Treasure Zone

  http://www.EDsOasis.org/Treasure/Treasure.html
  Selected educational sites by curriculum topic

- The Internet Public Library Youth Division

  http://www.ipl.org/youth/
  Collection of online resources for children

- Classroom Connect – GRADES

  http://www.connectedteacher.com/library/search.asp
  This is a great site for curriculum links with a built-in search engine for those links

5.8   Email

Electronic-MAIL is a system for sending and receiving messages electronically over a computer network, as between personal computers. Mail is sent to a simulated mailbox in the network mail server or host computer until it is examined and deleted.

5.9   Distribution lists

A distribution list, also known as a mailing list, is a collection of email addresses. One can use distribution lists to send an email message to several people at one time. The list can contain a few addresses, or many. For example, LISTSERV is a system-independent distribution list management system available to all email systems.

5.10   Internet forums

An Internet forum is a web application which provides for discussion, often in conjunction with online communities. Older forums date back to around 1996, following the newsgroups and bulletin board systems which were widespread in the 1980s and 1990s. Popular discussion topics include technology, computer games, and politics, but forums are available for any number of different topics.

Internet forums are also commonly referred to as web forums, message boards, discussion boards, discussion groups, or simply, forums.

One significant difference between forums and electronic mailing lists is that mailing lists automatically deliver new messages to the subscriber, while forums require the member to visit the website, and

check for new posts. Due to the possibility of members missing replies to threads they are interested in, many modern forums offer an "email notification" feature, where an email is automatically sent to all users who have chosen to be notified of new replies, informing them that a new post has been made.

A bulletin board is an electronic communications forum that hosts posted messages and articles connected to a common subject or theme or interest. It allows users to call in and either leaves or retrieves messages. The messages may be directed to all users of the bulletin board or only to particular users. But all messages can be read by all users. Several libraries are using bulletin boards to help, promote and evolve web-based library services. The bulletin board system is also used as an interactive interface to invite suggestions on activities and services of a library. It can also be used as an interface to distribute library services.

Electronic Clipping Services: On the lines of SDI, many database vendors have electronic clipping services to provide professional news both in real-time and with periodic updates. Users can set up profiles on most major databases to monitor customized and customer-directed news including current events, company industry news, evolving issues and other topics of interest. These include Alert Service of Dialog (Knight-Ridder) CLIP service of Dow Jones/retrieval, News Flash of News Net, Eclipse of Nexis, etc

5.11 Instant Messaging

Exchanging messages in realtime between two or more people. Unlike a dial-up system such as the telephone, instant messaging (IM) requires that both parties be logged onto their IM service at the same time. Also known as a "chatting," IM has become very popular for both business and personal use. IM is often used as a way to avoid telephone tag, whether the communication continues as text messages or winds up as a traditional phone call.

E-mail and instant messaging are often used in a similar manner, but e-mail is not realtime, and there can be delays of several minutes. Like e-mail attachments, IM systems generally allow for file transfers. Also like e-mail, some systems let one send messages even if the recipient is not currently online. IM is expected to promote IP telephony by allowing users the option of switching from typing to speaking (from text chat to voice chat) if they have a headset attached to their computers.

A Library may provide variety of reference services by using instant messaging to learners.

- Real Time Library Chat Room

- Ask-A-Librarian

- Virtual Reference Desk

- Selective Dissemination of Information(SDI)

- Rich Site Services(RSS)

5.11.1 Real Time Services: Library Chat Rooms

A new and exciting method of digital reference service that libraries are attempting to provide more and more now is live reference. These are real-time, interactive reference services in which the users can talk to a real, live reference librarian at any time, from anywhere in the world. User and librarian can interact using chat technologies, and unlike with email reference the librarian can perform a reference interview of sorts by asking the users to elaborate or clarify if needed before proceeding to answer the question.

The librarian can perform Internet searches and push websites onto the user's browser, and can receive immediate feedback from the users as to whether their question have been answered to satisfaction. Most libraries currently involved in real time reference service are part of collaborative network so that they can share staffing and work around the clock to truly provide reference service any time. Library of Congress Collaborative digital reference service (http://www.loc.gov/digref/cdrshome.html) is one of such service. Cornell university, Internet public library, Michigan State University, Carolina University are offering web chat based services using software like Lineperson, AOL Instant Messenger, Conference Room and Netscape Chat. The librarian have observed that their relatively new chat based service logged significantly more questions in relatively short time than did their well established e-mail digital reference service.

5.11.2 Ask-A-Librarian

Digital reference service, also called Ask-An-Expert" or "Ask-A-Librarian" services are Internet-based question and answer service that connects users with individuals who possess specialized subject knowledge and skill in conducting precision searches(Davis S, 2000). Most "Ask-a-Librarian" services have a web-based question submission form or an e-mail address or both. Users are invited to submit their queries by using web forms or through e-mail. Once a query is read by a service, it is assigned to an individual expert for answering. An expert responds to the query with factual information and or a list of information resources. The response is either sent to the user's e-mail account or is posted on the web so that the user can access it after a certain period of time. Many services have informative web sites that include archives of questions and answers and a set of FAQs. Users are usually encouraged to browse archives and FAQs before submitting a question in case sufficient information already exists.

5.11.3 Virtual Reference Desk

http://www.vrd.orgI provides resources and links to experts that offer digital reference services. The site hosts searchable database of high quality 'ASK –A' service along with alphabetical and subject wise listing. Virtual reference desk also hosts a listserv called "Dig-Ref" to promote and explore the growing area of digital reference services.

5.11.4 Selective Dissemination of Information (SDI)

Most of the R&D and academic institute because of the tight teaching and research schedule, it was found that scientists and faculty members of the institute were hard-pressed to personally visit the library. Here an electronic SDI service was formulated to deliver current information of interest to faculty members on their desktop. Through this service the Research Interest Profiles (RIPs) of users are searched in a batch mode on the latest updates of EDB's on a monthly basis and the result are e-mailed to respective faculty members. Thus this service not only function as a Current Awareness Tool, but also influenced the acquisition of information sources as well as usage of other library services like document delivery, resource sharing and acquiring reprints.

5.11.5 Rich Site Services (RSS)

RSS is a categorized registry of library services that are delivered or provided through RSS/XML, Atom, or other types of Web feeds. RSS is an initial for RDF Site Summary / Rich Site Summary / Really Simple Syndication. In general, for each entry, the home institution library is listed, as is a hot linked entry for the item. When available, a link to the RSS feed, or an associated information page, is provided. RSS is compiled and maintained by Gerry McKiernan, Science and Technology Librarian and Bibliographer, Science and Technology Department, Iowa State University Library. Ames, IA 50011.

5.12 Peer to Peer communications

Communications in which both sides have equal responsibility for initiating, maintaining and terminating the session is peer communication. Contrast with "master-slave communications," in which the host determines which users can initiate which sessions. If the host were programmed to allow all users to initiate all sessions, it would look like a peer-to-peer system to the user. See peer-to-peer network and peer-to-peer computing.

6. Challenges of Web technology

Unfortunately, the Web is also a source that is not regulated. No single organisation or person owns the Internet. This means that every web page has to be scrutinized for validity and truthfulness before being used in any educational institution. Even a site that has been put up by an academic institution may not be suitable for certain education environment for two reasons. The first reason is that inexperienced learners often cannot read emotional undertones of written material, such as humour or sarcasm. The second reason is the integrity of the contents of a web page.

An educator either has to train learners to discern resources for themselves or an educator has to look for the resources on behalf of the learner [4]. Unfortunately for the educator, truthfulness and undertone are not the only characteristics than need to be scrutinized when choosing educational resources. There are an inordinate amount of pedagogical criteria that need to be met. Some of the criteria for resources include: diversity, appropriateness, engagement, learner performance and reusability. The criterion of diversity considers the learning styles, gender, cultural backgrounds, and so forth, within the classroom. This suggests that the educator might have several different resources for each topic being taught to cater for the diversity within the classroom [5,7].

The criterion of appropriateness suggests that the educator should scrutinize the contents of a resource for aspects such as level of engagement. In other words, at what level of learner is the resource aimed (beginner, intermediate or expert). Other aspects of appropriateness are whether or not the content of the resource covers the topics of the curriculum and how well the topic(s) is covered.

The criterion of engagement looks at the manner in which resources present their content. Questions that an educator would ask under this banner would be: Does it capture the learner's attention? Is it interesting? Is it easy to follow? Is it easy to navigate? Under the criterion of learner performance, an educator would ask slightly different questions. These would include: what will the learner learn? Will the learner's skills improve? What skills will improve?

Reusability is one of the most important criteria. It asks what can the resource be used for and if the resource can be used under different circumstances. Reusability has several repercussions. A resource that can be used in several different courses is far more valuable than a resource that can only be used in one course. One of the reasons being is that it would take up less storage space. Another reason is that additional students would use the resource and it would probably be used more frequently [7].

Web Technology is very good at storing, transferring, processing, filtering and protecting data. Most of this data is unstructured (documents, emails, ideas, requests, results etc…) as opposed to structured (databases). IT allows users to maximize the potential of this data by better organization and access. But IT will only be at its maximum potential if the business processes are designed to interact with the system, and staff are trained and comfortable with new working methods.At the end of the day, these are only tools that depend on the users and system designers for its design, implementation, use and monitoring.

Others point out that that e-learning software developers tend to limit their focus on course delivery and content, while online education institutions require a much wider range of educational services. E-learning systems such as Moodle, an open source course management system, work towards a student-centred learning solution, building upon a social-constructivist pedagogy, whereby learners construct their knowledge through discussion, thereby enhancing their thinking skills. One important point is to help teachers organize their pedagogical perspective. Some institutes for Higher education are devoted to this mission (training, counselling, funding, development, etc.).More recent approaches focus on dialogue, interaction and collaborative activities - courses still contain content but it is of secondary importance or is generated by the students.

The abovementioned criteria are just a few of the requirements put forward by educators to ensure the quality of educational resources. The need for so many standards implies that there are numerous resources on the Internet that are not suitable for educational environments. Thus finding a resource that is suitable for the level of learner and meets the pedagogical criteria could be compared to finding a diamond in a huge pile of dust [8,9]. It stands to reason that an educator could spend an enormous amount of time looking for appropriate educational resources. Once a resource has been found, it is thus advantageous to keep track of it.

7.   Recommendations

The organisations should have the infrastructure for providing the service to their users.

The organisations should take one more step further instead of just providing access to the internet. They should take the responsibility of evaluating the web resources for effectiveness. They should have in-depth knowledge about the web resources and the search engine, which will give the real power to answer the queries. The librarian should create a web directory of the inter resources so that it can be used or referred to by a user whenever it is needed for providing the services. The users should be given a proper training and explanation about internet and the search option. Educators should reorient themselves and adopt web technology to generate better services and resources where their skills of structuring and organizing resources are put to its best use.

One of the most widely used formal devices for organizing knowledge of information retrieval is by indexing. Indexing systems have been originated with early collections of systems and their function is essentially to indicate the content and related features of a document with the double purpose of: identifying documents on specific subjects and identifying documents on related subjects.

7.1   Resource Database

Keeping a record of educational resources maximises the value of the resource and minimises the efforts of the educator. Once a resource has been found, the user is able to retrieve the resource when necessary. This saves the time it takes to continually search for resources (Barker, 1999).

A database can be used as an electronic method of keeping record of the educational resources. The latest databases are able to store a number of different file types. The file types can range from entire programs to hyperlinks and Universal Resource Locators (URLs). Hyperlinks and URLs are particularly useful when organising educational resources. Firstly, they reduce the size of the database. Instead of storing entire web pages or programs, the database will just store the link to the relevant resource. Secondly, it effectively combats the issue of copyrights. Instead of undergoing the lengthy, and often expensive, copyright permission procedure, one can just store the hyperlink to the pages and point the learners to the resource. Storing a hyperlink may be construed as reasonable use[10]. One problem that

would need creative management is the problem of changing sites or sites that disappear or move. Just storing the hyperlink may make it easier to retrieve a resource, however, the resources also need to be organised. The data can be accessed via a number of routes which include title, author, subject, keywords or even by a misconception. Envisaged Resource-Base is a database that stores resources not only has to store the information about the resources, but also needs to store information about learners and the course curricula.

7.2   Resources

Each resource could have a number of uses within a number of diverse courses. Since each course has a curriculum with associated objectives, one method of accessing the resources is via the curriculum or objectives route. Thus, each resource can have a number of links to several course objectives (or sub-objectives). For each objective, one could also have a number of misconceptions that could hinder learners from truly grasping the concepts being taught in class. These misconceptions could have resources associated with them so that educators and learners can find the resources via a misconception. A learner entering the learning web site should also be shown the resources which are appropriate to him or her. These resources should be chosen according to the syllabus model (for resources given to all learners attending the course) and comparing the syllabus model to the learner model (for individual feedback and guidance).

7.2.1   Learner Model

Along with the resources shared in the system, one would also need to store information about the learners using the system. This would allow the learners to be able to get the resources specific to their needs[11]. The repercussions of individualising web pages leads to each learner needing a record within the database. This record needs to include, not only the learner's name and the courses for which he or she is registered but also the data that will aid the database in creating the personalised learning environment. The data that needs to be stored includes the learner's ability to solve problems, the learner's knowledge about the subject being taught and the misconceptions that the learner has inadvertently adopted along the way. All of these aspects will help deliver individualised learning[12].

These learner characteristics, however, have to be updated continuously, since as the learner becomes skilled in particular areas, the system has to adapt to these changes. In this way, the learner is continually being offered new challenges. This in turn, fortifies the learner's confidence, stretches the learner's abilities and hopefully motivates the learner to continue studying [2,12]. Learners should also have the rights to make certain additions to the resource-base. Giving learners this right makes it easier for them to take ownership of their own learning.

7.2.2   Curriculum Model

In order to deliver the necessary educational resources to the learner, the database also needs some sort of model with which to compare the learner's progress. This model could contain the curriculum and learning objectives for the courses being offered. Having a curriculum model available has a number of advantages. Firstly, it provides educators with a structure on which to build their lessons. Secondly, a curriculum model can be used to give learners feedback on their learning. By comparing a learner model to the curriculum model, an educator can determine where the strengths and weaknesses of the learner are situated. Once the problem areas are known, individualised feedback and guidance can be given. Feedback and guidance can include offering the learner alternative educational resources, which can be used to explain certain errors, correct misconceptions and offer suggested solutions to specific problems.

7.3   Accessing the Resources

Appropriate resources for learning and remedial purposes are supplied to learners by means of the curriculum and learner models. To facilitate the access to the learning materials, a suitable database model for storage and organisation of the resources should be found. Data warehousing, along with its close associate, data mining, hold some interesting prospects for the organisation, storage and retrieval of educational resources.

Data warehousing is a method of storing and organising an enormous amount of data for the purposes of analysis, pattern matching and trend finding. The characteristics of a data warehouse include its ability to store detailed as well as summarized data. Integrated data provides easy access to what would normally be stored in separate tables. Metadata is an important facet of data warehousing. The data warehouse could also store the learner records and curriculum models, which will determine what resources the learners receive. Data mining is a method of extracting data from a data warehouse. An educator (or learner) could "discover" an educational resource by identifying relevant attributes. Even if a resource has not been categorized, the mining procedure should have the ability to scan the contents for anything significant. The educator could thus be given a selection of unusual resources from which to choose.   Details of resources that were used for a course in previous years could be stored in the data warehouse as summarized data. Thus to access appropriate resources, data mining would use the summarized data, along with the data scan, to produce a list of potentially helpful resources. Analysing the access to the resources could also determine which resources are more effective for particular learners or misconceptions. This, in turn, would facilitate in individualising learning.

8.   Conclusions

Locating, creating and modifying resources take an enormous amount of time. Educators have to scrutinize each resource to ensure that it is appropriate for the learners and the course being taught. Appropriate resources, thus, must be organised and stored in such a way as to facilitate easy access, distribution and relocation. A database model can be utilized to store the education resources. A data warehouse is not only used to store large amounts of data, but also to store summarized and detailed data along with metadata. Thus, a data warehouse can store the learner records and the curriculum models as well as the educational resources. Data is extracted from a data warehouse by data mining techniques. However, data mining does more than extract data, it can also be used to analyse data and create information. In the resource-base, data mining should be able to help locate stored resources, match resources to learner needs and produce information that can help make teaching more effective. The resource-base is, at the present, still a concept. Further research will entail the feasibility of the implementation of a resource-base using a data warehouse and data mining as the driving forces with the Internet/Web technology as the delivery mode.

A technique for storing and organizing resources for educators needs to have several qualities. Access should be easy and transparent. Access should also be available in a number of avenues; educators should be able to search for resources using key words, by topic, by learning objectives and even by possible misconceptions that learners might develop. Since the resources are not only for the educator, the learners for whom the resources are intended should also have easy access. This can be done either by allowing the educator to prescribe the resources to the learners or by allowing the learners to find their own resources within the resource-base or both.It would be interesting if learners can individualize their need for resources. In prescribing or suggesting remedial resources to individual learners' portfolios, an educator can "point out" a problem and suggest solutions. The learner can then digest the material in his or her own time.

9. References

1. Göschka, K. M. & Reidling, E. (1998). Web Access to Interactive Database Training: New Approaches to Distance Laboratory Work at the Vienna University of Technology. Teleteaching '98: Distance Learning, Training and Education. Proceedings of the XV IFIP World Computer Congress. Part I. pp 349 –360.

2. Nah, F. F., Guru, A. & Hain, P. M. (2000). The Use of Hypertext and Animation for Online Learning. Proceedings of the 15th Annual Conference of the International Academy for Information Management. pp. 342 – 347.

3. Passerini, K. & Granger, M. J. (2000). The Learning Effectiveness of Instructional Technologies: Results from Pilot Studies. Proceedings of the 15th Annual Conference of the International Academy of Information Management. pp 49- 59.

4. Smith-Gratto, K. (2000). Strengthening Learning on the Web: Programmed Instruction and Constructivism. Instructional and Cognitive Impacts of Web-based Education. London:Idea Group Publishing.

5. Slay, J. (2000). Implementing Modern Approaches to Teaching Computer Science: a Life Long Learning Perspective. Proceedings of the 15th Annual Conference of the International Academy of Information Management. pp. 177- 180.

6. Gillham, M., Buckner, K. & Butt, R. (1999). The Cautious Student – A User-Centred Evaluation of Web-supported Learning. Innovations in Education and Training International. 36(4). pp 327-333.

7. Retalis, S. & Skordalakis, E. (1998). Building Quality Web Based Tele-learning Systems. Teleteaching '98: Distance Learning, Training and Education. Proceedings of the XV IFIP World Computer Congress. Part II. pp 835-844.

8. Astleitner, H. & Sams, J. (1998). Ways of Supporting Teachers in Web-based Instruction. Teleteaching '98: Distance Learning, Training and Education. Proceedings of the XV IFIP World Computer Congress. Part I. pp 85-94.

9. Small, R.V., Sutton, S., Miwa, M., Urfels, C. & Eisenberg, M. (1998). Information Seekingfor Instructional Planning: An Exploratory Study. Journal of Research on Computing in Education. 31(2). Manhattan: International Society for Technology in Education. pp 204-219.

10. O'Hara, M. J. & Peak, D.A. (2000). Quandary for Information Technology: Who Controls the Content of Distance Education? Journal of Information Systems Education. 11(1&2). pp 34 – 40.

11. Shaofeng, W. & Kehong, W. (2000). TH-CMI: A Standardised Courseware Based Distance Education Management System. Proceedings of the 16th Word Computer Congress 2000: Educational Uses of Information and Communication Technologies. pp 401 – 404.

12. Rosas, R., Nussbaum, M., Strasser, K. & Csaszar, F. (1997). Computer Assisted Mediation for Blind Children. Computer Education. 28(4). pp. 229-235.

Accessed between Nov. 22, 2005 and Nov.28. 2005

- http://www.hw.ac.uk/libWWW/irn/pinakes/pinakes.html

- http://infomine.ucr.edu/Main.html

- http://www.konbib.nl/dutchess/

- http://bubl.ac.uk/link/

- http://bubl.ac.uk/)
- http://www.actlab.utexas.edu/gateways.html
- http://www.ull.ac.uk./ull/webres.html
- http://www.tcd.ie/Library/gateways.htm
- http://galaxy.einet.net/galaxy.html
- http://enzo.nla.gov.au/products/alg/
- http://www.lub.lu.se/desire/sbigs.html
- http://www.hw.ac.uk/libWWW/irn/pinakes/pinakes.html.
- http://infomine.ucr.edu/Main.html
- (http://www.vrd.orgI
- http://www.loc.gov/digref/cdrshome.html
- http://sunsite.berkeley.edu/currentcites/
- http://www3.oup.co.uk/jnls/tocmail/
- http://www.carfax.co.uk/sara.htm

About Authros

Dr. Anjana Bhatnagar is working in PK Kelkar Library at Indian Institute of Technology Kanpur since 1983. She has wide experience in library automation and has contributed a lot in Computer Aided Reference Services in her institution. She has published various papers and also coauthored a book. She is Life Member of different Library Associations.
Email : anjana@iitk.ac.in

Dr.Vijaya Deshmukh is working in IIT Kanpur as Assistant Registrar. She has 15 years experience in various facets of Administration and Management. She has conducted research on Information Technology and its use as a tool to enhance efficiency. She has worked in industry and educational institutes of repute and is involved in academic administration
Email : vdd@iitk.ac.in