

INTERNET INFORMATION SEARCH, RETRIEVAL TOOLS: IMPLICATIONS FOR LEARNING, RESEARCH AND TEACHING

Joseph E. Longshak

University Library

University of Jos

and

Gupiyem G. Gupiyem

University Library

University of Jos

Introduction

The internet has revolutionized virtually all sectors of human endeavour affecting the way we work, play, learn, shop and undertake recreation and leisure. The mass of information embedded in the nooks and crannies of this phenomenon is now becoming a nightmare in relation to information search and retrieval. This section describes the Internet information search and retrieval (search engines, meta-search engines, subject directories, invisible web (specialised database) browsers URL links). The problems of these tools are also highlighted and some solutions are suggested. Even though there is proliferation of these tools, they are not able to guarantee precision of information retrieval. Apart from that, these tools can not keep track of the colossal size of information on the Web making it imperative for the development of strategies for effective search. It is also necessary to utilize other technologies like electronic learning (variously referred to as Virtual Learning environment [VLE], Web-Based Learning, Online Training, Distance Training and Computer Based Training [CBT]) to reap the benefits. This shall not only enhance Information technology literacy in the educational sector, it will maximize the use of resources.

THE INTERNET

Ten years ago, the Internets' existence was merely

what one gleans from western publications. Then, it seemed just another

Big media hype touted by the western media as that held the key to cultural dominance. There were just a few hundred thousand databases linked to the network. Its phenomenal growth reached an unprecedented level with the coming of the World Wide Web (WWW). In 1990 it was merely a text-mainly information network. When Tim Berner Lee came out with his hypertext transfer protocol (HTTP), Hypertext mark up language (HTML) and Universal Resource locator (URL) in, 1992 the internet was revolutionized from a text-mainly network to a hypermedia (text, graphics, audio and video) information resource repository that was gradually spreading its tentacle globally.

As it was with any new innovation that appears to be beneficial for sustainable development, the virtue of the Internet has been and is still being extolled because of its many contributions in several human endeavours namely; education, Health Care, Democratic process, publishing, Agriculture, research, communication, Mass Media, Trade/ commerce (Afolabi, 2001,p. 72; and (Longshak, 2004,p. 7).

The growth of the internet brought information closer to the end user. In Nigeria, cyber cafes (internet centres) are springing up in major cities and environs. Relevant and up-to-date information is available to anyone with knowledge of internet use. However, the "you-can-get-any-information - under -the-sun" image of the Internet is far from the reality. There is far more information overload, explosion over the Internet than ever (Pedley, 1998 and Perry, 1999). This overload, explosion and chaotic organisation of the Internet is due to the fact that the number of people "publishing" information on the network is greater than people who publish through conventional print format, and they do so with greater ease. While the rigours of peer-review, vetting, editing that is usually associated with conventional publishing is negligible (only for scholarly or scientific publication), it is a different story with Internet (on-line) publishing. Any one with the knowledge, technical know-how and financial wherewithal can publish or "post" information on the Internet.

First, the information overload/chaos that characterise the internet makes it impossible for even the most brilliant Internet guru to search through the network. Secondly, the fact that organisation of information (except for its chaotic nature) is similar to that of the library (the use of indexing and cross-referencing (hyper-links)). It is possible to exploit these factors to our advantage as Williams (1998, p.85) rightly observed,

"the internet is an incredibly powerful tool for transmitting information, it is certainly not such an effective tool when it comes to searching for, collecting, filtering or prioritising information"

The bottom line of this is that, there is a greater need for effective utilization of the right information search and retrieval tools and the adoption of cautious and appropriate search strategies.

The internet and its services

The Internet is not entirely a new concept. However a brief mention of the service provided by the global information network is made below.

E-mail: This service allows for the exchange of electronic messages between the end user, or group of individuals as long as they are also linked to the intranet/internet. It also provides access to discussion groups (Newsgroups).

Telnet/remote login: This permits computers and computer users to log onto other computers (in a remote location) and access it as if they are physically using it.

File Transfer Protocol: This allows for the downloading or uploading of documents or files at different locations. In other words, it makes it possible for your computer to rapidly retrieve complex files intact from close or distant locations.

Gopher: This is a text -only method of presenting information on the Internet. Gopher was developed in 1991 to present information stored on servers in a logical structure through menus and items according to the collection of information.

Usenet/ discussion group: These are forums where

Internet users hold online discussions about diverse topics. Usenet group is like a huge online bulletin board where anybody can read or post their ideas, opinions about or on a topic (Anderson, 1997, P. 64).

The world wide web: This is a library of resources available to computer users through the global Internet. It enables users to view a wide variety of information, including magazine archives, library resources, and current world and business news. Also called "The 'web", it is the most popular and dominant aspect of the Internet. It is a vast collection of multimedia computer files or documents. It is on this resource that this section is devoted to.

The World Wide Web link spans the Internet forming a global scale multimedia knowledge resource. Smaller-scale implementations known as "intranets" host private data and applications and can be protected from public access through a device known as a "firewall". These can be found in schools, Banks and other corporate, big businesses the world over. The great impact that the World Wide Web is making on all human endeavour is on the basis of the fact that it is the largest repository of information resources globally. The positive value or otherwise of these resources is a subject of ongoing debate as to its relevance to human development.

These information resources are either in hypertext or hypermedia forms. Hypertext documents contain textual information while Hypermedia document refers to documents which integrate textual, graphical, audio and video information. These information resources are linked together in an associative system of information storage and retrieval. The links are a form of cross reference that automatically connects and allow user's to navigate or 'Surf' from one document/web site/page to another. The hyperlinks are words, phrases, symbols, images within a web page, which are highlighted (change Colour) when the mouse pointer is directed at them. Clicking on them takes users to another document seeking to give additional or

related information on the first document. The audio and video capability of the WWW now makes it possible to provide live broadcast of TV/Radio programmes.

The evolution of the World Wide Web can be traced to the early 1990's when Tim Berner-Lee (regarded as the founder of the (WWW) a member of the European particle physics Laboratory), CERN, Geneva first wrote Hypertext Markup Language (HTML) establishing links between documents in a computer system or computer networks. HTML is the standard text forming language containing tags which determine the way words, text, graphics, and video information can be arranged on a web page. He then developed an addressing system that gave each particular web document, site or page a unique location called uniform Resource Locator (URL). He devised a set of rules called Hypertext Transfer protocol (HTTP) for transferring information across the internet (Cahlin, 1997, p. 15 and Hamid, 2001, p.20).

His aspiration was to create an electronic information space where people can publish and exchange information with minimal or no cost, thereby giving room for pooling of knowledge and information resource which can be accessible globally. With the help of these programmes which he developed and made available free, the growth of the Internet became faster. While it took the radio 50 years and the Television 20 years to hit the 50 million user mark, it took the internet, indeed the www only 4 years to hit that mark.

Accessing the World Wide Web

To access the World Wide Web a computer must be connected to the Internet. The said computer has to be connected to Internet via small scale network (like the university of Jos intranet) which must have a browser to enable users access

the Web.

Browser: A browser is a program that enables a computer to locate, download, and display documents containing text, sound, video, graphics, animation, and photographs located on computer networks. Browsers allow users to access Web information by locating documents on remote computers that function as Web servers. It also enables you to navigate and view other internet resources (File Transfer protocols (FTP), Usenet Newsgroup, Gophers). A browser downloads information over phone lines to a user's computer through the user's modem, or other form of Web connection, and then displays the information on the computer.

Retrieving information involves launching the browser icon on the desktop, or from the start up menu. This is possible even if you do not remember the addresses and file names (URL'S). It also makes it possible to link an information source to another information source. There are several types of Browsers but the most popular Browsers are Netscapes Navigator and Microsoft's Internet Explorer. In Nigeria most of the computer systems using Microsoft's Windows operating system Microsoft windows '95, win 98, 2000,XP come with Internet Explorer. Linux based computers Operating systems like Red Hat, Fedora, Mandrake, Ubuntu uses Mozzarella, Mozilla Firefox, Konqueror. Type the address/URL of the site into the slot or location/ address box after which you press ENTER. The browser the automatically link you to the site of the URL you typed. Typical URL'S include: -

Websites/www sites = <http://www.nytimes.edu> - URL of New York Times.

Gopher Sites = <gopher://groundhog.spy.umich.edu>

Telnet sites = Telnet: [// Fedlworld.gov](telnet://Fedlworld.gov).

(Anderson, 1999, p. 62 and Barker, 2006).

Use of hyperlinks: click and you will find!

The second major function of browsers is to enable users to navigate hyperlinks that take them from one page/ document/site to another. A Hyperlink is a URL within a Web site is. When the user clicks on a

hyperlink, the browser moves to this next server and downloads and displays the document targeted by the link. Using this method, browsers can rapidly take users back and forth between different sites. This saves the time and effort of the searcher. As explained earlier Text links are usually underlined and are in different colour (e.g. blue, or red) or green) once the mouse pointer is directed at a link it changes into the shape of a pointing hand. The status bar immediately shows the address (URL) of the hyper link. Clicking on the link automatically takes user to the page, site or document, (Storey, 2006, p.2)

Internet information search and retrieval tools

It has been observed earlier that the Internet is where diverse and current information is obtainable and that it is characterised by chaos in manner information is organised (or not organised) over the global network. There is need for searchers (students, academics, researchers) to develop some basics methods to facilitate easy information retrieval.

1. Search Engines
2. Meta-Search engine
3. Subject Directories
4. 'The invisible web"/ "Deep Web" Specialised database.

1 Search Engines

A search engine is software which keep up-to-date database of web sites on the World Wide Web (www) indexing millions of pages. It compiles a list of documents on the web and the contents of these documents. Search engine respond to users query by searching lists displaying a list of documents (sites on the web it has indexed that match the search query. Each one searches a database of the full text of web pages selected from the billions of web pages out there residing on servers. A search engine returns

keyword search result based on matches and relevance of content (Mcbride, 1998, p. 16).

Moody, (1996, P. 37) outlined the specific roles of search Engines to include;

- (a) Access the web site addresses their creators know. This they do by sending programmes called spiders/robots/crawlers to scan and catalogue the www automatically by indexing the links between documents.
- (b) From this site, they find links to other pages via embedded addresses.
- (c) They compile the pages collected by the spider, passes it on to be indexed in keywords by indexing software and stores in a database which can be accessed by the public/users.
- (d) Once in a while, at regular intervals, the spiders are sent out on foraging missions to find new sites and update existing ones.

Search Engines are very powerful tools for interactive search and retrieval. To understand how relevant search engines are it is necessary to reflect back to the growth of the World Wide Web. In 1995 the web had approximately 50m pages, in 1997 there were 150 millions pages while in 2003, more then 3 billion documents (not pages) found on the internet.

In 1997, a breakdown of the size of database indexed by search engines shows; Excite (55 million) Hotbot (54 million) Alta vista (30 million) Infoseek (20-50 million) Lycos (20-25 Billion), while in 2003, to keep up with the pace of the growth of the internet, Google (believed to be the most powerful search engine now) Claims to index 3 billion full-text web documents, All the web 2 billion, Alta Vista 1 billion and Teoma 1 billion (Brake 1997, p.13) and (Barker, 2006). To further illustrate how awesome the internet is, 5.20pm 7/07/2006, a query put to Google search engine, for the word 'library' retrieved a result of the 3, 307, 998, 701 pages searched for the word with a result of 149, 000,000 hits (that is sites found containing

the word Libraries). The search took only 0.16 seconds!

2 Meta Search Engines

These are information retrieval software that automatically submit keyword search/queries to several other search tools (search engines in rare cases some searchable databases) and the retrieved results from their database. They are regarded as time savers and search more than search engines and/or subject directories after which they compile the result based (supposedly) on relevance. They are tools for serious searches for researchers to use for in depth probing of a topic. Results are interpreted; duplicates are eliminated and use intelligent ranking or clustering by subject.

Examples of Meta Search Engines are: - Surf wax, Corpenic Agent, visimo and Ixquick -

1. Surf wax searches (AllTheWeb, Alta vista, AOL, MSN)
2. Corpernic Agent searches (Altavista, AOL, Goegle and Lycos, MSN).
3. Visimo searches (Google, MSN, AllTheWeb, MSN)
4. Ixquick searches (AllTheWeb, Ask JeeVees, Direct Hit, MSN, and Open Directory).

3 Subject Directories

Subject directories are a collection of directories (set) pages sites) organised into broad and general categories pages are reviewed based on subjects. They are compiled by experts with a lot of time searching the web and assembling guides to a field of subject disciplines which are of great value to academic researchers. They are less specific than search engines because users are not matching words, rather subject category, description and location is the focus. Subject directories include Librarians Index, Infomine, Google Directory, Yahoo and academic Info.

4 **The Invisible Web/Deep Web**

These are web pages, Documents that are not indexed by Search engines and are not always found in subject directories. They are accessed through box in a web page (of Library catalogues statistical databases). Search terms sent to the specialised database are returned to you in another Web page that is dynamically generated for searchers answer and it is not retained anywhere after the search. Search engines cannot retrieve such dynamically generated pages because their spiders can only find them by visiting all the hyperlinks in the web pages they have indexed. As such, unless there is a link some where, the scope of the database is beyond them. Apart from this, there are web pages/documents requiring passwords before they are accessed. These characteristics make this information source to be referred to as the "Invisible Web" or "Deep Web" Since it is not just possible with search engines to locate them directly.

Weaknesses of information search tools

The search and retrieval tool, discussed above are not without their drawback which searchers should be conscious of while surfing the internet for information some of these drawbacks include;

1. Just like a good library is only as good as the index (catalogue) that lists its materials, the internet is only as useful as the other search tools that service it (Burke, 1997, p. 12.). Agreeing with this Moody (1996, p. 37), asserted that "the web is growing in an erratic way and at the rate that is certain to down any attempt to catalogue it using conventional procedure".

This is a clear indication that the Growth of the internet and the size of information content have overwhelmed all the search tools capabilities to search and retrieve and index it. The solution to this problem lies in the fact that the growth of the global IT industry is phenomenal that a month is like a decade (in

other fields of human endeavour). New innovations/inventions are possible within a short period. Nine years ago, Google (now arguably the most powerful search engines around) was not even in the market but it has now overtaken the more established search engines (Alta vista, Infoseek, Lycos, Excite). With this pace, surely newer and more powerful information search and retrieval tools should be developed. This fact and the great competition between internet software developers in the global information and communication technology sector is sure to engage themselves in the race against time to develop smarter and more intuitive information search tools. It will not be out of place to suggest that information professionals should team up with software developers to come out with more reliable, comprehensive and efficient information search and retrieval tools.

2. Another problem associated with the large size of the Internet is the fact search results are always large and sometimes lack focus. For instance, a search for a concept using a search engine may produce 10,000,000 hits or even more. That is fine for any user but the pressing task facing the searcher is the fact that a "shape" or focus is not given to the retrieved concepts since the search engines retrieved pages/documents with the search terms. Personal experience has shown that one gets easily frustrated before getting to the 10th page of the indexed pages/documents. They are not arranged according to any meaningful basis (relevance, context) and the irony is that, the page, documents or site that may suit users need may be burrowed behind the first hundred indexed and retrieved pages documents/sites. Apart from this, the answers to users query could be found in Websites, databases that have not been indexed by any search engine. The mere task of opening and perusing 100 Web pages not to talk of 100,000 (which is not up to half of what is retrieved) is no doubt daunting even to the most hardened searcher.

Search engines should be developed to intuit (more analytical in matching search queries with relevant results). This and the combination of search in context,

form of relevance ranking (as Google claims to do) and Boolean connectors according to user's need. This again calls for in depth researches for ways in which the organisation of knowledge and information search and retrieval skills of academics, researchers and information Professionals can help in resolving this problem.

3. The Nets volatility based on the discussion about using specialised database's (invisible web) it is evident that many web pages are created in response to users request and exists only transiently. These dynamically generated pages are there only for as long as the search and retrieval process. Apart from this, most pages/sites are updated at intervals (hourly, daily, weekly, forth nightly monthly, yearly) some pages eventually disappear or are replaced and cease to exist posing another far reaching problem (since they may still reflect their existence in their database). Burke 1997, P. 37). The presence of projects like the Internet archive (<http://www.archive.org> help in archiving sites. A habit of searching through the internet archive project is one sure way of searching for information of "Archival" value.
4. Some documents retrieved from the Internet cannot be read with an ordinary web browser (Navigator or Internet Explorer). They are stored in Portable Document Format (PDF) a file format that encapsulate information (text, graphical sound audio) video in a form that cannot be distorted while being moved from different devices (Macintosh, PC) browsers (Moody 1996 p, 37).The use or installation of Adobe's Acrobat reader on the system solves this problem. The Acrobat Reeder interprets PDF documents and converts them into human-readable form for the user.
5. Some sites are protected and cannot be indexed or accessed without a fee, though there is nothing wrong with this, it is important that

- information on education, social welfare, Health should not be protected. (Burke, 1997, P.12)
6. Other problems include the inability of meta-search engines to search all the databases for the search engines they retrieve only few of search result from the search engines visited. (Barker, 2006). Specialised search should be done using Meta search engine as opposed to generalised search in cases where the focus is specialised -information,
 7. Subject Directories according to Barker (2006) never contain full text of the web pages they link. This limits its utility. The Experts compiling these directories should make them more responsive to users needs.

RECOMMENDED SEARCH STRATEGIES

For effective searching it is necessary to devise steps to reduce the possibility of retrieval of irrelevant result as well as wastage of time and effort as has been emphasized earlier.

- Use concept mapping to create a visual representation of the main themes, sub themes of the overall search process.
- Identify appropriate keywords, concepts and phrases that best describe the required information resource.
- Select the most suitable tool (search engine, meta search engine, subject directory or searchable database)
- Use similar tools to compare notes

Useful tips for using search engines (Google, AlltheWEb, Teoma, Alta Vista). Remember, search engines have different features, Google ranks result according to relevance of site, Visimo clusters result according to categories selected from words and phrases contained

in the search result. AskJeeve allows you to ask appropriately phrased questions.

- Use "phrase searching" whenever possible.
- Add more words to focus results.
- Try a title search for subject focus.
- Limit to .edu or .gov to exclude most ecommerce sites.
- Use link search to find who links to a specific page.
- Use the advanced search forms, or at least look to see what it offers. They often include ability to limit search to title, a specific domain, or do a link search. These also allow you to restrict retrieved resource by file format, time, language and other irrelevant. Google's Advance Search is a very good example. Be sure to use it whenever basic search results are cumbersome.
- Use, "define:biology" for definitions.
- Use Wildcats which is also known as truncation to expand search by cutting off words to allow search of plurals, variations or alternate spellings of a word. Example: Searching for "Lib*" retrieves Library, Librarian, Libyan, Liberation, Libraries. Wild cat truncation symbols include (1, #, \$, *,?) depending on the online system.
- Use Boolean operators AND, OR NOT to refine information search and retrieval.
 - AND means two concepts. Search term/keyword must match to produce a hit (be selected and retrieved from the search engines database) example.
 - Library AND Information - means search engine will retrieve all pages/Documents contain the two words.
 - OR, Retrieves document/page with either words, e.g. Farming
 - OR Agriculture (search engine retrieves pages/documents containing either farming or Agriculture
 - AND NOT, exclude or

ignore the subsequent words example Libraries AND NOT Information centres (search engine will select and retrieve only pages containing libraries and ignore the ones containing information centres).

Summary of Search tools and the relevant use.

1	Keywords	Google, MSN or Yahoo
2	Factual Answers	AskJeeves, Brain Host, Factbites, Answers.com, MS Encarta
3	Compare result from different search engines	Dogpile, TurboScout
4	Overview of a subject	Yahoo Directory, Google Directory, The Open Directory Project
5	Suggested categories to narrow search	Clusty (suggest new topic to search under), Teoma(Suggests collection by experts), Wisenut
6	Comprehensive Search	Ez2Find
7	Across search engine	Ixquick, Fazzle
8	Re-rank/re-order results	MSN Search Builder, Google Personalize Search
9	Images/video	Video.search.yahoo.com, video.google.com

Electronic Learning as a tool for effective utilization of the Internet/Intranet

Definition: E-lectronic Learning (e-learning) can be seen as the process of delivery of a learning, training or education program by electronic means. It involves the use of a computer or electronic device to provide training, educational or learning material.

Equally the Wikipedia Encyclopaedia (2006) describes e-learning as an approach to facilitate and enhance learning through the use of devices based on computer and communications technology. Such devices would include personal computers, CDROMs, Digital Television, P.D.A.s and Mobile Phones. Communications technology enables the use of the Internet, email, discussion forums, and collaborative software.

There are various appellations that e-learning in its short history has earned. Some of these are Virtual Learning environment [VLE], Web-Based Learning, Online Training, Distance Training and Computer Based Training (CBT) also known Computer Aided Instruction (CAI). The differences in the names reflect the slight variations in their meanings. However as this is not the focus of this discussion no mention is going to be made on that. However, for more information on these differences check <http://en.wikipedia.org/wiki/Elearning>.

Features of e-learning

- 1 it is basically learner-centric in its approach,
- 2 content of learning material is available all the time,
- 3 delivery of learning is depended on technologies,
- 4 Online administration (student assessment),

E-learning can be asynchronous (real-time) training delivered through audio, video-conferencing or even TV/Satellite broadcasting.

Asynchronous which involves the learner accesses learning materials when convenient through self-paced Computer Based Training.

Components of an e-learning system

- Networked (this could be LAN, WAN Intranets or Internet) or Stand alone Computers for Computer Based Training software on CD-ROM or any external storage device.
- The e-learning Software suite/System some which include Blackboard, Moodle, ATutor, ILIAS, WEbCT, KEWL, Internet Teaching Assistant.
- Web Server Software (Microsoft's' Internet Information Services, Apache, Xitami). This software makes it possible the e-learning software to be hosted and for course materials, discussions, assessments, messages, e-mails, exam

and assessments scores to be accessed by many people from one computer (server) the
After Installation Course Lectures/teachers can then upload the courses, administer courses, initiate discussion forums, set test/quiz questions, mark same and publish result using the same medium. Students on the other hand access their lecture/course materials, read/learn, write test/quiz, ask questions, and participate in discussion forums in the same manner.

Why e-learning.

There are several reasons why e-learning is becoming more relevant in the teaching learning process. These include.

- Cost Effectiveness in the sense that it can reach out to as many students as possible as long as the student is connected via appropriate technologies. There is less paper work involved as the course materials are delivered in electronic or digital format, assessments and examinations are also conducted via the same medium. For distant students, e-Learning reduce travelling expenses
- Standardize Course Materials,
- Flexibility in time and pace. Students learn according to their pace. This enables the teacher to take care of the individual differences of the students.

Challenges and Limitations

There are several challenges and limitations of e-learning namely;

- Cost of implementation and maintenance of the learning system.
- Institutional constraints like government restrictions on importation of software or internet connectivity.
- Computer illiteracy among prospective resources persons and students.
- Attitudes to Technology.
- Opposition from staff who fear losing their jobs.
- High initial setup cost.

Opportunities

An Institution stands to gain a lot from e--learning because;

- Computer literacy is likely to increase.
- There will be maximum human capacity development.

As mentioned earlier this is an innovation that is gradually becoming popular as professional educators and Education experts seek for ways of enhancing the effectiveness of the overall pedagogic process. In Africa and indeed Nigeria this is gradually becoming a reality. Knowledge Environment for Web-based Learning (KEWL) is an advance learning management system developed at the University of Western Cape, South Africa is an example of learning software that is beginning to enjoy immense popularity in this sector. It is an Open Source software (That is it is free to download and install) whose source codes are open and can be modified so long as such modification are made open. It is now part of the African Virtual Open Initiative and Resources (AVOIR), a collaborative project with developers drawn from across Africa. University of Jos is ably represented as the Nigerian Coordinator as well as two developers who help to shape the Learning software (KEWL).

Conclusion

It is true the Internet is a Technology fraught with dangers ranging from crime (cyber crime), Terrorism, dominance of western culture, invasion of privacy, unauthorised access (hacking) unwholesome information (pornography, nuclear weapons secrets, Germ warfare secrets. (Longshak, 2003, p.13) But it is also true that the Internet is a technology we can not do without for academic research.

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