

REFLECTIVE INTERNET SEARCHING: AN ACTION RESEARCH MODEL

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What is the Internet? The Internet is a world wide network of computer networks that enables us to communicate with each other, and to access or provide information on a global basis. Unlike many other information sources it is relatively unstructured, indeed it is often described as 'chaotic'. The Internet, in its earliest form, appeared in the early 1970s within the US Department of Defence. Today many people think of the Internet primarily in terms of two of its key elements, the electronic mail facility and the World Wide Web.

As the Internet becomes more pervasive we are faced with its presence in increasing segments of society and, potentially, our everyday lives. It is being used more in the education sector for teaching and learning, in the commercial sector for marketing and commercial trading, and in government for communication of information to the citizenry. Researchers around the world use the Internet on a daily basis for seeking out the work of others, communicating with colleagues and making their own work available to the community at large. Educational material is made available to students and interactive learning opportunities are presented. In their everyday life people are confronted with growing opportunities to shop, bank, and trade, and to pursue diverse questions that are important to them in areas such as health, the law and the money market. There is a growing awareness amongst people that the sources of information, and other opportunities available via the Internet, are exponentially increasing.

This chapter introduces an approach to Internet searching and use that is based on the action research cycle of planning, acting, recording and reflecting. The model is a conceptual framework for Internet searching that will help people to overcome the challenges of working with an environment that is subject to continuous change, both in the forms of technology used and in the content that is available. We offer this model to the action research community with the expectation that it will be of value to consultants, educators and researchers in their own practice, and for facilitating the development of their clientele.

Information and technology literacy for the 21st Century

In proposing an action research model for searching the Internet, it is our intention to contribute not only to peoples' use of the Internet, but at a broader level to the information and technology literacy of those who use it. Why do we believe that this is important?

While the information technology revolution continues we are simultaneously confronting the inevitable development of the *Digital Divide*. Many communities and peoples are unable to choose whether to use the information sources available as they are not empowered with access to technology, and those that are do not always have the skills required to maximise its use.

While we are unable to provide access to technology we can empower those who have some access through information and technology literacy. Information technology literacy is constituted in the ability to work with the equipment and software at a technical level. Information literacy is constituted in the ability to make effective use of information that is made available through technology and other sources (Bruce 1997, Bruce and Candy 2000). The Global Knowledge Partnership is one organisation that has identified information literacy as a key to empowerment and learning in the knowledge society. Their work is:

‘...rooted in the conviction that access to and effective use of knowledge and information are increasingly important factors in sustainable economic and social development for individuals, communities and nations (Global Knowledge Partnership, 2000)

In the educational sector it has long been recognised that the ability to access, evaluate and use information is a critical factor for successful learning, and a key to the development of self-directed lifelong learners. In Figures One and Two, Denis Ralph, Director of the Centre for Lifelong Learning in Adelaide, graphically portrays the relationship between information literacy and lifelong learning.

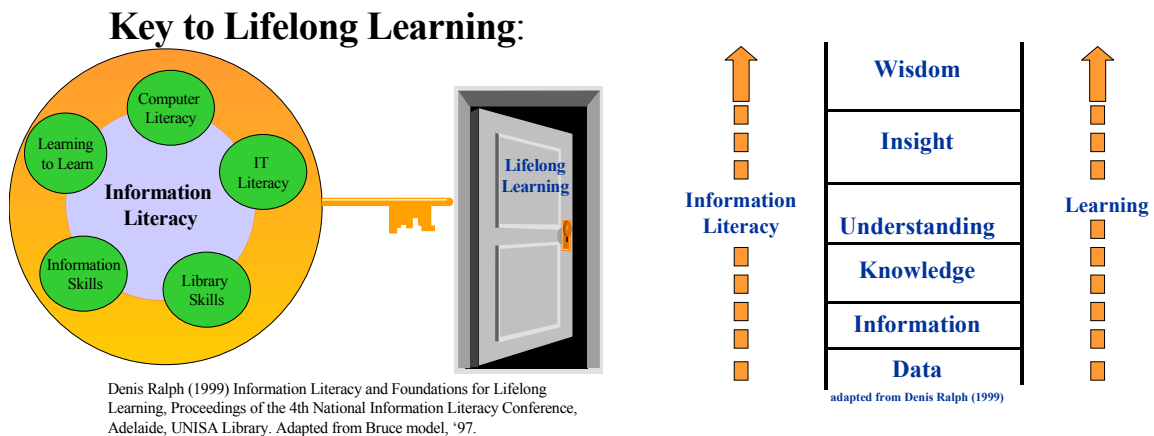


Figure One: The Key to Lifelong Learning

Figure Two: Information Literacy and Learning

At a practical level, much information is available today via the Internet, and pragmatically speaking, being able to use it, independently or via an intermediary is critical for the information literate individual. We must remember, however, that it is not primarily technical skills that make an effective Internet user, but rather the reflective and conceptual capabilities that are part of the character of the information literate.

Developing the action research model

People who have access to the Internet often find that using it is a continual challenge, because it is not a static technology. Learning to search the Internet is a prime example of learning in a changing environment, in this case a changing technological environment. It is particularly important that information users have the opportunity to critically assess the role of the Internet. They need to consider where it may be important to use this technology, and where other information sources may be more appropriate. This need to convey the importance of a critical, reflective approach to Internet use formed the early motivation to seek a new framework for teaching, learning and using the Internet. We needed to create a conceptual model for facilitating its effective use.

In trying to establish an effective strategy to teach Internet searching to action researchers, we confronted a major hurdle. Although Internet instruction is a considerable industry, and much immediate help is available to the savvy user¹, few conceptual frameworks for learning its use are available. Chau's (1997) SIRO (Systematic Information Retrieval/Organisation) Model, for example, suggests a process of conceptualising information flow between organisations. Her model is likely to appeal to the sophisticated information user. We also believe that the skills based approach to teaching and learning the Internet lacks power because of the changing nature of both the technology and Internet content. We needed something that would emphasise reflective competence (Barnett 1994), and the ability to continue to learn in the face of change because critical concepts are understood (Bowden and Marton, 1998), rather than skills-based competence. We needed to be able to provide capabilities that would provide a foundation that would allow people to move forward into an unknown future (Bowden and Marton, 1998). We needed a model that would suit the neophyte as well as the more experienced information and technology user.

This situation suggested the need for developing a construct that would emphasise processes, and ways of thinking about or experiencing the media, rather than specific skills or discipline knowledge which are likely to have a short shelf-life. Such processes would have to be relatively timeless, and would have to closely reflect the natural ways of working that people have. In other words people should be able to relate easily to the model. These criteria pointed us towards adapting an existing literature review model to the Internet context.

Action research models have already proven useful in helping people to come to terms with the world of information and information technology. The 'Reflective Model for Reviewing the Literature' (Bruce, 1996) was created to help postgraduate students interact with their information environment for the specific purpose of working on literature reviews. That model uses the action research process (derived from Kemmis and McTaggart, 1988; Zuber Skeritt, 1991) as a conceptual framework for the literature review experience. We found that, as that earlier model (Bruce, 1996) was embedded in the action research process, and designed to facilitate a reflective

¹ See for example James Glave, Lycos Trails the Search Scene...Or does it? <http://www.wired.com/news/technology/0,1282,1154,00.html>; Ross Tyner, Sink or Swim: Internet Search Tools and Techniques <http://www.lut.ac.uk/info/training/finding/sink.htm>; Danny Sullivan Search Engine Watch <http://www.searchenginewatch.com>; Jian Liu Choosing and Using Internet Search Engines <http://www.indiana.edu/~librcsd/search/>

approach to information and information technology, it was easily adapted to the new context.

The remainder of this chapter proposes and explains the reflective model for Internet searching. The model is not intended to supply all knowledge necessary to become an experienced Internet searcher, but it will provide ways of proceeding that will help the user along the learning path. The experiences gained will be part of the individual's own life context.

The Action Research Model for Reflective Internet Searching

The model below is an adaptation from an existing model of reflective practice when searching for information (Bruce, 1992) which itself was based on reflective practice principles (Schön, 1987) and action learning (Kemmis and McTaggart, 1988). In this section we discuss each element of the model, in brief, to assist those wishing to use it. In the following section each of these steps will be explained in more detail.

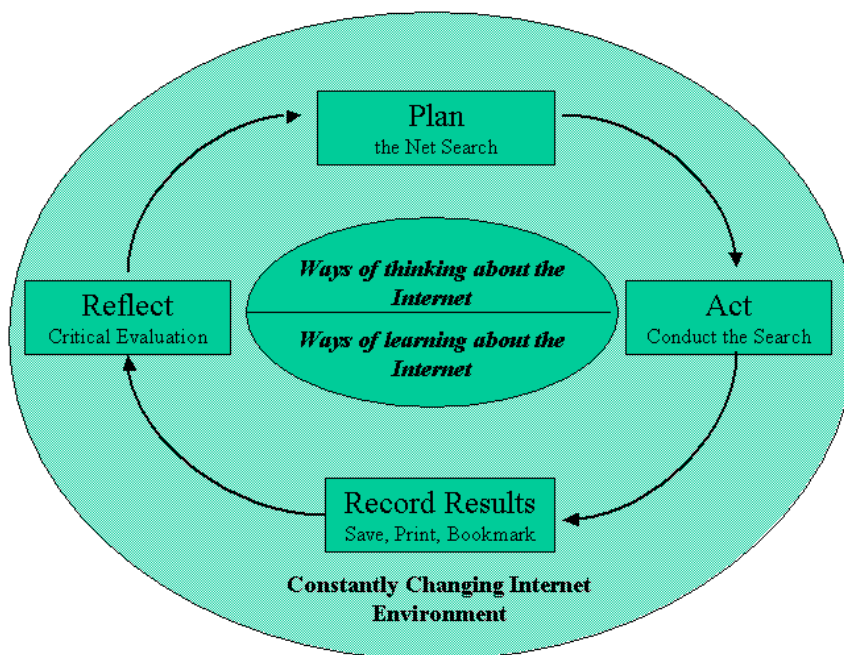


Figure 4: An Action Research Model for Reflective Internet Searching

Planning

It is important to remember that first attempts to search for information on the Internet will usually not be immediately successful. Most first time searchers of the Internet find either too few or too many results to their initial search requests.

With this in mind most people will find it is useful to prepare a search strategy. Just as this is important when searching library databases, the same approach is necessary when searching the Internet. In general, the searcher should carefully plan their search. They should attempt to consider carefully what are the major topics of their

information needs, and then plan how to use each of these topics as steps that might be useful in the search they are about to undertake. We will discuss this stage in more detail later.

Evidence to date suggests that the majority of searchers choose search engines, or search engines combined with subject directories (Yahoo, etc) to undertake their searching. These will be discussed in a later section. Having planned the search and decided on where to search for the information required, the next stage is to act upon the plan.

Act

During this stage of the searching process the Internet Searcher must attempt to remain focussed on the process in hand. That is, it is very easy on the Net to be distracted. The search results often contain irrelevant information as the search yields a high recall of results but a low level of relevancy to the final information needed. This low relevance together with copious links from the net resource to another, allows searchers to be easily distracted from their task.

Record

This is one of the most important elements. Searchers should ensure they record their search process and keep results of their search for later use. Logging the search process when using graphical browsers, like Netscape, needs to be done manually. Searchers may record their search results either by (1) the use of the save features of their Internet browser in order to view from a saved disk file the website results found; (2) printing the results for later reference; or (3) making use of the “bookmark” or “favorites” features of their Internet browser. Bookmark features allow us to permanently store the name and location of the websites.

Reflect

This stage is also a critical phase in the searching process. The final results will be displayed for the searcher to consider. The searcher must decide whether the results genuinely reflect possible solutions to their information needs, or whether the search the acted upon needs further refining. If the results appear to meet their needs, then the search ceases, and an evaluation of results begins. Things to consider here include the date of the resource found, any possible bias in the way the information is reported to the end-user, and whether or not the information appears to be reliable and come from a credible author.

At this point the searcher can cease if their results are reliable and meet their information needs. If not the searcher must go back and refine their search starting again at the planning stage of the cycle. It would be useful here to consider each of these stages or steps in more detail.

Unpacking the Model

We will consider here each step in more detail and outline how the changing environment impacts on this model.

Planning a search strategy

As with any action research planning the search is the most important step. The search plan model below (adapted from Bruce, 1992) suggests ways of approaching the planning stage.



Figure 4: A Dynamic Model for Developing a Reflective Internet Search Plan

This is a dynamic model, in that each step should be considered and continually adjusted while planning.

Step One: The first step in planning is to step back and analyse the problem for which you are seeking information. When it comes to the Internet this stage should include asking yourself questions like:

- Is your topic likely to be found on the Internet?
- Should you consider checking the library for printed resources instead?
- Is the information I require likely to be current or retrospective information?
- Who are the key authors and organisations related to the topic?
- Which geographical regions are most important to your topic?

It is important to consider that most information on the Internet is likely to be recent information, however, often the information may not be updated. Furthermore older materials will be only available on the Internet if their copyright period has expired. For example, to digitise and capture a complete book of older material is a reasonably expensive process, therefore, with the relatively young “age” of the Net, the older materials that may be required when interested in retrospective information are unlikely to be included on the Internet. In the latter case, the traditional library or archive is where the information is most likely to be found. Basically here you are asking whether you should be using the Internet at all.

Step Two: Having decided to attempt to find it on the Net, the next step is to break down your problem or topic into keywords, key authors, or key organisations. Ask yourself the following questions:

- What keywords may be used to describe your topic?
- Who are the key authors writing in this field?
- What are the key organisations related to the topic?
- Which geographical regions are most important to your topic?

That is, consider what are likely to be the main words used to describe your problem. You must remember in this case, that the Internet is a multi-cultural environment, so there may be many ways of expressing your information. Think of synonyms for your keywords and variations in spelling. Try to identify any key authorities, like research centres, or authors in the field, as these also may be useful ways to search the Internet for further information needs. With Internet searching authors and organisations are sometimes of more value than keywords.

Step Three: Now comes the time to combine any keywords, authors, or authorities, into a search strategy. During this process you need to explore ways of combining search terms together into coherent search statements or strings. For the Internet the keywords usually need to be expressed in one string, as there are usually no options to combine terms from one search with another set of terms. Authors and organisations are searched separately.

When searching for keywords the single combined string can be expressed in a mathematical equation using Boolean Logic (see Figure 5). You can combine search terms with the words “and”, “or”, or “not”. If you think about this like a mathematical equation, the “or” is like a plus sign, the “not” is like a minus sign, and the “and” is like the items when two sets are combined and your have results that are common to both sets.

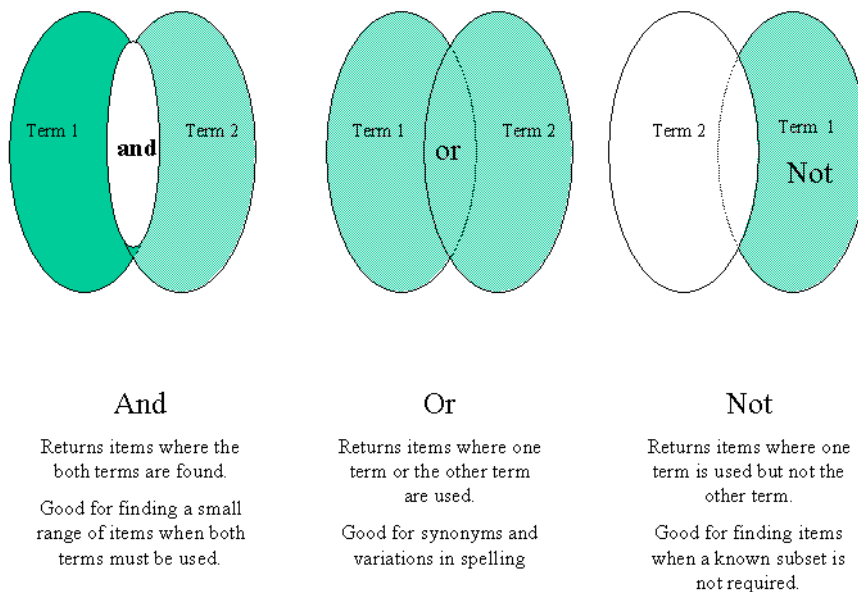


Figure 5: Boolean Logic Searching

Some examples of search strategies would include:

“Sylvia Edwards” and “Queensland University of Technology”
“Action Learning” and “Queensland University of Technology”

(Note that in some search engines to express keywords indicating that the words need to be found together, it is necessary to have the words surrounded by quotation marks.)

Step Four: Identifying where to start. After the construction of the search into a strategy, the next major problem facing the Internet searcher is considering the best place to start the search. Internet searching tools fall into a number of categories. The two main contenders for searching are the Search Engines (Alta Vista, Hotbot, Lycos, etc) and the Subject Directories (Yahoo, WWW Virtual Library, Hotsheet, BUBL Information service, etc), but there are also Local Web servers (Qldweb, Vicnet, city versions of Yahoo, etc), and most importantly the other people on the Net who are available via Chat sessions, email discussion lists, or newsgroups². As a general rule try not to reinvent the wheel! If you know the information you require is very recent then the best place to start your search is probably people on the Internet. That is try Usenet newsgroups, email discussion lists, or using a Chat session to ask others if they know where the item has been stored on the Internet.

If the information is likely to have been available for a few months then try subject directories or Search Engines. A subject directory that specialises in a given subject area is a very useful tool for keeping up to date in that subject area, particularly if it is maintained by some subject experts in the field. Finally you can try the search engines of the Internet, but there are tricks to how these should be used. It is important to remember here is that each search engine gathers and collates resources according to the way they have been designed, and each system is different. This means that for each Internet search engine the same query typed into the system may produce different results.

Search Tips: It really pays to spend some time learning the tricks of how these search tools work. This will help teach you how to improve your overall search strategy, as well as help you learn to translate the strategy into the correct format to fit the tool you plan to use. As search engines are all organised and designed in different ways, a key to planning any search is learning how to achieve the best results by optimising your search to fit different search engines.



Figure 6: Search Techniques

² For help with “People as a Source of Information on the Internet” see Sylvia Edwards, Information Resources NetSites <http://www.fit.qut.edu.au/~sylvia/teaching/resources.html>

To summarise some of the tricks in the planning the search Figure 6 above may be useful.³

Acting on the planned search

Finally you may attempt to close the search strategy and retrieve the information from the search tools in use. At this point you do need to briefly consider whether or not the resources found meet your needs in the first instance. If not further refining of your strategy may be required. You have now moved on to the next stage of the model, that of Acting, or conducting the actual search.

In most cases, an effective search strategy carefully planned and executed using Boolean logic and with a strong familiarity with and use of search engine features, will ensure reasonably satisfactory results.

Recording the Search Plan and Results

Particularly when learning to search it is useful to record the search plan, the process when online, and the results. It is always essential to record results. Keep detailed notes of which resources you used and how you searched them.

Once the information has been retrieved from the Internet there are a number of options available to store the results for further reference. Whichever option is taken will be a personal decision. It may simply be to print the results, or bookmark the results using the Internet browser. If long term storage is considered necessary then the options here include the simple, as in saving to a disk file, to the more complex, the design of an information management systematic approach to the storage of the recorded results for later retrieval and use.

If permanent storage is required, the end user of the system should consider what would help them to retrieve the information easily at a later date. They may therefore need to consider a uniform system of arranging the citations including notes or abstracts about the record, and may include subject headings or keywords useful for text retrieval from the storage system. Tools which may be helpful here include simple card filing systems to more complex electronic bibliographic storage systems, for example, Endnote, Procite, Reference Manager, RefSys, and the like. In both cases a minimum of the author, title or website, subject, URL (or website address), date of when material was produced or last updated, and finally the date the item was retrieved from the Internet (date last accessed) should be included in the details.

Reflection or Critical Evaluation of Results

It is very important to remember that the Internet is very open. It is cheap to use and easy to abuse by everyone who has access to it. That means that the task of critical evaluation of the returned results is more important than ever before for searchers of information.

In particular, if you intend to use the Internet information found, or quote it to others, you need to consider first the quality and usefulness of the information found. The

³ Further information from Ross Tyner, Sink or Swim: Internet Search Tools and Techniques <http://www.lut.ac.uk/info/training/finding/sink.htm>; Jian Liu Choosing and Using Internet Search Engines <http://www.indiana.edu/~librcsd/search/>

information found on the Internet can vary from being pure propaganda, outright lies and other nonsense, to genuinely valuable information resources from authoritative reputable agencies.

In general keep in mind the following questions when considering using Internet information:

- Who put this on the net?
- Is the information a personal opinion? Have they a personal agenda?
- Is the source reliable? Is this person or organisation authoritative in the area?
- Is the information likely to be accurate?
- Is the information up-to-date? How often if the information updated?
- Is this information provided purely advertising in order to sell a product?
- Is the website genuinely trying to provide factual information?
- Are the claims made in the information backed up by references and evidence?

To put it in very simple terms, if you wanted accurate information about the dangers of smoking, would you go to the Smoker's Homepage for that information? Probably not. On the basis of critically thinking about your results you may wish to review your search plan and undertake more searching.

Ways of Thinking About, and Ways of learning about the Internet

Preliminary research is underway to investigate differences in peoples' approaches to and ways of experiencing Internet searching. The following quotes are taken from a research study currently underway (Edwards, in progress). The study aims to uncover variations in peoples' search experiences.

- [I] never seem to get the things right, always need to refine and refine and refine the search strategy before I can finally get what I need.
- By practice and experience, Even reading through ... examples and guides .. it only gives you ideas ... on what to do. I find that search strategy needs [a] great amount of experience so that I can get what I need in a more efficiently in times to come.
- I changed from using *Hotbot/Metacrawler* to *Dogpile*, and rather [than] searching by topics I found it very successful to search Author names of reputable articles that I was already aware of, my results were different, but more useful.
- By using Meta-search engines you quickly learn which smaller engines you prefer or suit your needs, it also gives you the opportunity to compare different search strategies between engines.
- Setting your homepage to a reputable source is also helpful.
- I also [realised] something. Don't always stick to the topic, [rephrasing] the topic is important too.

In each case, the searcher reflects back upon what they have experienced and learnt, and uses these experiences to change and further enhance their planning of a search strategy. They also may choose different tools on the Internet in order to find the resources they require. This suggests that the idiosyncratic experience of individuals

is likely to influence the ways in which they will engage with the elements of the action research Internet searching model.

Constantly Changing Internet Environment

Finally we must consider that while people experience Internet searching in different ways, and learn about the Internet in different ways, they are also constantly affected by the changing nature of the information tool they are choosing to search. The Internet is a constantly changing and dynamically evolutionary environment within the field of Information Technology. Information technology changes at a rapid pace, and the Internet itself grows at a phenomenal rate (Edwards, 1999).

This environment of constant change challenges searchers as they continue to use the Internet. The model allows for this constantly changing technology environment, and encourages the searcher to use action research principles to enlighten their searching, reflecting and learn new techniques as the tools change around them.

Conclusion

Action researchers need to consider the value of the Internet as an information resource. Their personal research and consulting activity can only be enhanced by its use. As action researchers become more comfortable with the net, and make their own resources available to others using this technology, the Internet will become a critical part of the action researchers information.

The model introduced in this chapter we expect will be useful for teaching and learning and using the Internet. We believe it will be valuable to educators, researchers, consultants, and other Internet users to inform their own practice as well as for use in the teaching and learning environment. We offer the model in this spirit and hope that it will empower the action learning, action research and process management (ALARPM) community.

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