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## LOCATING LITERATURE

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### Introduction

Affordable access to scientific and technological research is critical to support the needs of indigenous education and the research sector. Scientific research is very competitive and it is very critical that the academia, the scientists, researchers, policy makers and funding bodies are kept abreast of the latest scientific breakthroughs in their respective fields. Access to an array of accurate, relevant, most current and comprehensive information sources at the right time and in the right form is thus of paramount importance for creative thinking, productive research and innovations.

Science and Technology information resources are scattered across different physical locations and virtually on web sites in a proliferation of formats. They are available in the form of books, book chapters, journal articles, conference proceedings, technical and research reports, theses and dissertations, databases, data sets, personal communications, wikis, blogs, twitter and on Web 3.0. Print material is being largely replaced by electronic sources, most of which are accessible on the web. The volume of new knowledge added every second to the knowledge base throughout the globe is vast and is more than what any one library can purchase or any information retrieval system can index. To obtain the best information the scientist or researcher is searching for, a five step process is recommended.

- Choose the right place and source
- Develop an effective search strategy
- Conduct the search
- Critically evaluate the results
- Abide by copyright issues and information ethics.

This chapter describes the first step, while the rest are discussed in Chapter 6.

### Choosing the Right, Place and Source

#### Physical library

The first source for a researcher to find information is the library of the parent organization. Browsing the stacks and recent journal arrivals at the library is highly recommended. There is no electronic substitute for a physical book or journal. Often

researchers browsing through journals read articles that catch their eye, which they would never have come across on the web. The bibliography at the end of a book or the citations at the end of a journal article are resources for further information. A trip to the library also facilitates social interaction with colleagues and the library staff, an important source of information for scientists. Libraries also have print indexes that may cover time periods outside the scope of the electronic databases. Asking a colleague can be the fastest way to identify a relevant resource.

### **Local library catalogues**

The next step to find information is the library web page of the institution. Almost all universities and research institutions now maintain their own library web page. The online catalogue and the serials database together form a comprehensive source of in-house information. The on-line catalogue is a quick search tool for finding books as well as for proceedings of conferences, research/technical reports, theses, and sometimes chapters of books and articles appearing in journals. The serials database provides information on the journal holdings in the library. Where a serials database is not available the 'Visual index', a manually handled card system provides this information. The web site may also offer additional databases to search special collections within the library. It is often a gateway to useful information sources both within and outside the library. Library web sites also provide links to other relevant local and global resources. It may also offer special services such as '*Current Awareness Services*' and '*Selective Dissemination of Information Services*' to keep the user community abreast of the new resources acquired by and accessible through the library. Therefore it is of utmost importance to have close contacts with the library staff.

However, no one library can accommodate all resources required to meet the needs of its user community. This is where resource sharing becomes important. Online catalogues of other local libraries play a major role as finding tools of resources within their library collections and mechanisms are available for sharing the identified items among library users. All online library catalogues in the country are given a link from the National Science Foundation (NSF) Library web page<sup>1</sup> and as such the NSF offers a central access point to all library catalogues in the country.

### **Union Catalogues**

Union catalogues are compiled based on the holdings of several large libraries, covering either books or serials. In Sri Lanka, there are several union catalogues which cover books, serials and also items such as journal articles, conference papers, and parts of publications as well as other published and unpublished literature. A few are described below.

- ***The National Union Catalogue (UCAT)***<sup>2</sup>: This is maintained by the National Library of Sri Lanka. It is an integrated database covering the book collections of all major libraries in Sri Lanka updated once in every three months. This provides a good location tool for books in the country and offers a gateway towards resource sharing through the Inter Library Loan (ILL) system operated among member libraries in Sri Lanka. An example of a catalogue with a global coverage is the *Worldcat*<sup>3</sup>, a tool that is used by users the world over to identify locations of books and electronic material for resource sharing. It covers the holdings of 72,000 libraries from 170 countries, with more than 300 million different records pointing to over 2 billion physical and digital assets, as of January 2014.
- ***The Union List of Periodical database (UNILIST)***<sup>4</sup>: This is maintained by the NSF which serves as a finding tool for current and past journal titles and their holdings in over 75 major libraries in Sri Lanka. It covers information on over 7000 journal titles and offers facilities for online ordering of copies of articles. A similar tool in the United Kingdom is the *Serials Union Catalogue*<sup>5</sup>, a free tool to help researchers and librarians locate serials held in the UK.
- ***Union List of Medical Journals***<sup>6</sup>: List of all Medical Journals and their holdings in Sri Lankan Libraries are covered by the Union List of Medical Journals.
- ***Current List of Agriculture Journals***<sup>7</sup>: The AGRINET (Agricultural Information Network) annually prepares the list of journal titles received by all the Agricultural libraries in the country, which supports location of journals for resource sharing.
- ***National Conference Index***<sup>8</sup>: This is a comprehensive online database offered by the National Library and Documentation Services Board of Sri Lanka on conferences and seminars organized in the country. It gives only the meta data (i.e. references). Full text is to be obtained from the relevant libraries or publishers of the proceedings.
- ***Index to Post Graduate Theses***<sup>9</sup>: The National Library and Documentation Services Board of Sri Lanka offers an on-line database of Post Graduate theses of local scientists and social scientists. However, the information provided is still incomplete. For a comprehensive search, supplementary searches need to be carried out in collections of other universities and research institutes. The list of 'Theses collection of Sri Lanka'<sup>10</sup> on the NSF web site points to post graduate theses collections in local libraries. Theses catalogue of the Post Graduate Institute of Medicine, Colombo (PGIM)<sup>12</sup> is a supplementary database on medical theses of local scientists.

## Library Gateways and Subject Web portals

A **Web portal** is a guide to the resources on a specific discipline to be found on the web. Most web portals bring together content from diverse distributed resources using technologies such as 'cross searching' and 'harvesting'. They offer a single point and a common platform to search across several resources. Information may also be presented via other means, for example, alerting services and conference listings or links to e-prints and learning materials. Many large university libraries in the world offer subject portals and these could be used by anybody as guides to useful resources. However, access to the full text will often be restricted. Two examples of university subject portals are the Michael Schwartz Library<sup>13</sup> and University of Wikato<sup>14</sup>. The Resource Discovery Network (RDN) Subject Portals Project<sup>15</sup> is an example which has developed portal functionality for five of the subject hubs of the RDN: BIOME, (the bio-medical sciences hub); EEVL (the engineering, maths and computer sciences hub); HUMBUL (the humanities hub); PSIGate, (the physical sciences hub) and SOSIG, (the social sciences hub).

**Local Library Gateways:** Library gateways bring together a range of resources organized in a systematic order for the convenience of users. The web site of the National Science Library and Resource Centre of the NSF<sup>11</sup> plays a major role in serving as a central local web gateway bringing together a range of local resources that can be searched and browsed in the country. It serves as a central access point to all online local library catalogues and special databases of universities, key research institutions and other science and technology related institutes. It also provides links to national level databases and all integrated library catalogues in the country such as the National Union catalogue, Union List of periodicals, Union Lists of Medical and Agriculture journals etc. It is also a central point to Abstracting and Indexing databases of local origin maintained by institutions and subject networks. It also provides a link to a web portal to search across all local institutional e-repositories with full text documents, full text online journals and many other resources through one interface<sup>16</sup>. Links are also given to all science and technology institutions and professional bodies in the country. The STMIS (Science & Technology Management Information System)<sup>17</sup> is an information source for local scientists, their research areas and scientific institutions of the country.

### Abstracting and Indexing Services

Abstracting and Indexing (A & I) services have the potential to explore resources lying outside the library of the researcher from around the world. A number of A & I services are offered by both local and international organizations. A & I services initially began in the print form and are now delivered over a number of channels. A single A & I source allows users to find metadata (references) to a

relevant and comprehensive set of articles, patents and other grey literature within specific subjects. Many such online search indexes cover a wide range of journals in a particular discipline. The role of the A & I Services has evolved over the years and now leads to the full text of the article, where a subscription to the parent journal is available. Given below are a few A & I databases developed and maintained by local libraries in the country. Many international organizations and reputed journal publishers also offer such A & I services covering global literature.

### **Local Abstracting and Indexing Services**

*The Sri Lanka Science Index (SLSI)*<sup>18</sup>: This database is a comprehensive and unique source which is limited to information on local Science and Technology literature. Apart from books and journals it also covers all types of literature of Sri Lankan origin such as periodical articles (published both in local and foreign periodicals), conference and seminar papers of local scientists, theses, monographs, research and technical reports produced by universities, scientific and research institutions, professional associations, national committees, and others in the country. The database ensures the capture of items that fulfill a distinct function in research but escapes the mainstream of literature that enters the public domain. Apart from serving as a search and location tool, it also plays a major role in creating global visibility and giving national identity to the scholarly research output of the Sri Lankan scientific community. The database is enriched with flexible searching facilities, on a user friendly interface, based on a powerful search engine to increase the precision and recall of the search. The long term goal of the database is to serve as a comprehensive and unique collection, offering free access to all locally generated literature. At present the database offers online free access to the full text of all NSF copyright owned material and twenty two other locally published journals. Articles of almost all locally published journals (over 100) are accessible within the Local Area Network (LAN) of the NSF. Work is underway to provide online access over the internet with copyright permission of the publishers.

*Sri Lanka National Agricultural Bibliography*<sup>19</sup>: This is a database maintained by the AGRINET (Agricultural Information Network) since the 1980s, covering Agriculture literature from local scientists and literature related to Sri Lanka. It gives references to both published material such as books, journals articles etc. and unpublished material such as conference papers, reports, theses, manuscripts etc. Only material available within the country are covered. The location of the material is indicated to support and promote resource sharing. Work is currently underway to provide online access to the database. The database could be consulted at the CARP (Council for Agricultural Research Policy) library. Print copies could be obtained from the CARP library.

*Annotated bibliography of health publications of Sri Lanka*<sup>20</sup>: Provides comprehensive information on health literature of local origin. It is the product of a collaborative work among Sri Lanka health libraries under Health Literature Libraries Information Service (HeLLIS) Network in Sri Lanka. Sri Lanka Medical Index<sup>21</sup>, Theses catalogue of the Post Graduate Institute of Medicine (PGIM)<sup>11</sup>, University of Colombo and several other medical databases covering information during different time periods and different types of material supplement the same. The National Science Library and Resource Centre<sup>10</sup> web site offers a central gateway to all these databases.

*Research Grants database*<sup>22</sup>: of the National Science Foundation maintains a comprehensive database on reports, post graduate theses and research publications resulting from research conducted with NSF funds. It is a useful tool to identify research conducted in the past and to ensure that any future efforts on the same research is avoided. Access to the full text of the final research reports are given online with restrictions to a few specific items. However, information on research carried out based on funds of other funding bodies in the country such as the Council for Agricultural Research Policy (CARP), National Research Council (NRC) and other funding bodies are not covered in the database.

### **International Abstracting & Indexing Services**

There are numerous Abstracting and Indexing (A & I) discovery services covering global literature in different subject disciplines. Web of Science<sup>23</sup> and SCOPUS<sup>24</sup> are the two major abstracting and indexing tools that allows searching across global literature. The NSF library offers searching facilities for researchers on SCOPUS within its premises. These services enable researchers to discover and locate research information. The boundary between resources themselves and discovery services has become permeable and many A & I services have gradually have developed into full text databases. Wiley Online Library<sup>25</sup> and EBSCO<sup>26</sup> databases are examples for such A & I services, which have evolved into full text databases. The American Centre library subscribes to EBSCO and provides membership to other libraries in the country. However, no library in Sri Lanka has access to the full text of Wiley Online Library.

The **AGORA**<sup>27</sup> program, set up by the Food and Agriculture Organization of the UN in collaboration with major publishers, offers access a digital library collection of 1900 journals in the fields of food, agriculture, environmental science and related social sciences to the developing world. AGORA can be accessed at the NSF.

**HINARI<sup>28</sup>** : Programme set up by WHO, together with major publishers, enables developing countries to gain access to one of the world's largest collections of biomedical and health literature. More than 8,000 information resources (in 30 languages) are available through HINARI. The NSF and all medical libraries in Sri Lanka at present have access to HINARI.

**JSTOR<sup>29</sup>**: Is a collection that includes full-text content of more than 1,300 academic journals, as well as thousands of primary sources. The Universities of Colombo, Peradeniya and the American Institute of Sri Lankan Studies subscribe to JSTOR. Scholars could consult the staff of these libraries to access JSTOR resources.

Journal publishers offer similar services to that of A & I services through their journal archives providing an authenticated link to the full text of the article. Searching and access to the abstract is free but access to the full text is subject to the availability of a subscription to the journal. e.g. ScienceDirect database<sup>30</sup> of the Elsevier publishers.

**Sri Lanka Journals On-line (SLOJL)<sup>31</sup>**: Sri Lanka Journals On Line is a database of journals published in Sri Lanka, covering the full range of academic disciplines which complements the Sri Lanka Science Index (SLSI) database. SLJOL offers online publishing facilities for Sri Lankan journals, marking a major landmark in journal publishing industry in Sri Lanka. The database was set up in 2009 by the International Network for the Availability of Scientific Periodicals (INASP) in UK and at present (June 2014) publishes 52 journals. The administrative responsibilities were later transferred to the NSF. SLJOL aims at giving greater visibility and access to the contents of Sri Lankan journals, and also increase worldwide knowledge of indigenous scholarship. All the material on SLJOL is free to view, search and browse. Copyright of all content is retained by the journals or authors. Each journal would need to give permission for any use or re-use of the content that falls outside research and education purposes. Unavailability of the back issues of the journals is one draw back of SLJOL. Plans are currently underway to upload these. Back issues of most of these journals are covered by the Sri Lanka Science Index<sup>18</sup>.

**ScienceDirect database<sup>30</sup>**: This covers all aspects of science and comprises 24 subject modules. The module on Agriculture and Biological Sciences is accessible at the Industrial Technology Institute (ITI) and International Water Management Institute (IWMI) libraries, while the Engineering module is accessible at the University of Moratuwa. The ITI also subscribes to the modules – Chemistry, Pharmacology and Toxicology, and Material Science. The SLINTEC, an institution conducting Nanotechnology research, subscribes to all the modules except the Social Sciences. The Central Bank Library subscribes to Economics, Econometrics and Finance.

## **Standards and Patent Databases**

In an era where the commercialization of research results and innovations is given high prominence for national development, standards and patents are of high importance. The Sri Lanka Standards Institution (SLSI) maintains a database of Sri Lanka standards<sup>32</sup> through its website. Apart from this, many foreign standards and international databases can be accessed at the SLSI for downloading of standards. Standards are not free but are available for sale at the SLSI. Printed and online catalogues on foreign and international standards are also available at the SLSI for consultation. *Samagam Medura*, is the focal point to find information on Sri Lankan patents. Many patent databases of other countries are available for free searching. The SCOPUS<sup>24</sup> database searches across almost all major patent offices in the world and so does the Web of Science<sup>23</sup>. SCOPUS is available at the NSF and offers free searching facilities to scientists. Derwent<sup>33</sup> is another database for patent searching. It covers over 44 million records.

## **Institutional Repositories**

Institutional Repositories (IR) is a new trend the world over as a result of the open access initiative. Open Access (OA) is the practice of providing unrestricted access via the internet to peer reviewed scholarly journal articles. OA is also increasingly being provided to theses, scholarly monographs and book chapters. The concept of 'Open Access' is still evolving. Many organizations have started to demand that research funded by their own organizations or public money should be published in *Open Access* for wider readership. This has resulted in the development of IRs. An Institutional Repository is a digital archive of the intellectual output created by an institution and its community members. It intends to showcase, preserve and provide free access to the research and other products of the institution. These cover journal articles, research/technical reports, theses/dissertations and any other grey literature. Journal articles are deposited in the IR after an embargo period which differs from publisher to publisher. Most of the IR contents are indexed by Google and can be searched through 'Google Scholar'<sup>34</sup>.

## **Local Institutional/Subject repositories**

The National Science Foundation started an electronic Repository of Science and Technology literature in 2009 with the intention to serve as the Central National Repository<sup>35</sup> of Science and Technology of the country. The repository now contains full text of over 3500 scholarly works in all three languages (English, Sinhala and Tamil) of which the NSF holds the copy right ownership. The repository also provides free access to research papers of 22 locally published journals. It plays a supplementary role to the SLSI<sup>18</sup> database and promotes self archiving of local literature. The repository offers a platform and an open invitation to Sri Lankan

scientists to upload their scholarly work. However, it is the responsibility of the scholar that any rules and regulations or agreements made with the parent institutions or journal publishers are not violated when depositing copies. Under the NSF, a network of IRs within the country is promoted and a number of IRs have already been established. Several universities, research institutions and science related institutions are already in the network. The University of Moratuwa, University of Colombo, Open University, Industrial Research Institute, Council for Agricultural Research Policy and the HeLLIS network are some who joined the network early. Although some IRs are still at an infant stage of development there is high potential for a rapid development backed by the 'National Digitization Project' of the NSF. The NSF launched a five year project in 2011 to digitize the locally originated S & T literature housed in all academic and research institutes in the country and to establish IRs in each institution. The aim is to bring into visibility and free accessibility to the total S & T literature output in the country. Under phase one of the project collections in nine libraries have been digitized and uploading of documents in to IRs are currently underway. The Coconut Research Institute, Rubber Research Institute, Hector Kobbekaduwa Training & Research Institute are some of the IRs developed under this project. Access to these is enabled through list of Institutional Repositories<sup>10</sup> on the NSLRC web page. Federated searching facilities have been incorporated through one common search interface<sup>16</sup>. Federated searching offers the facility to search across the whole network bringing comprehensive search results in one search. Items in the digital Library can be searched in Google and other web search engines.

### **Global Institutional/Subject Repositories**

There are many Institutional and Subject Repositories covering global literature. Literature in Subject Repositories are limited to one particular subject but not limited to the works of one particular organization. Majority of these provide free access to the full text of their contents. Authors deposit pre-prints or final versions of their papers in a subject repository. Peer reviewing is often maintained in many repositories to ensure good academic and research standards of the contents. A few such international repositories are described below.

- **PubMed Central<sup>36</sup>**: Is the U.S. National Institutes of Health (NIH) free digital archive of biomedical and life sciences journal literature. PubMed comprises more than 21 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites. Some papers are available for free access.

- **BioMed Central**<sup>37</sup>: Is an independent publishing house committed to providing immediate free open access to peer-reviewed biomedical research. BioMed Central publishes 184 journals. Authors publishing with BioMed Central retain the copyright to their work, licensing it under the Creative Commons Attribution License. This license allows articles to be freely downloaded from the BioMed Central website, and allows articles to be re-used and re-distributed without restriction, as long as the original work is correctly cited. Many BioMed Central journals are citation-tracked (by ISI, Scopus and Google Scholar) and have high Impact Factors.
- **arXiv**<sup>38</sup>: Is an e-print service giving open access to over 682,930 e-prints in the fields of physics, mathematics, non-linear science, computer science, quantitative biology, quantitative finance and statistics owned and maintained by the Cornell University, a private not-for-profit educational institution.

### **Web Directories and Subject Gateways**

A number of both generalised and subject specific web directories leading to global resources are found on the internet. Most of these are subject directories and they serve as efficient web gateways to approach a specific subject the user is looking for. Subject directories are often referred to as subject "trees" because they start with a few main categories and gradually branch out into subcategories at several levels going down to more and more specific topics. A subject directory is a catalogue of sites collected and organized by humans. They cover only a small selective fraction of the web and therefore lead to quality information more quickly. The precision of information retrieved is very high. Many large directories include a keyword search option which usually eliminates the need to work through numerous levels of topics and subtopics. The best subject gateways assess resources for quality before they index them. This can save the time of the scientist and the information found can be more reliable than what is found via a search engine. Using a good quality subject gateway can be an effective alternative to using an internet search engine. The need to appraise resulting web pages for quality is much less. Google and Yahoo are the most popular web directories but there are many directories which are narrow in their scope and thus are much useful for scientists.

The Bath University Bulletin Board Service<sup>39</sup> and Intute<sup>40</sup> are two generalised gateways. *WorldWideScience.org*<sup>41</sup> is a global science gateway supporting scientific discovery in a wide range of national and international scientific databases and portals. It allows searching across many international databases in a single search (federated searching). Strategic Guide<sup>42</sup> to Quality Information in Biology, Chemistry, Computer Science, Mathematics, Medicine, Physics, and Psychology is another popular science gateway.

## **Journal Gateways**

There are also several gateways leading to the full text of scholarly journals. Open Science Directory<sup>43</sup> leads to over 13,000 journal titles while Open J-gate<sup>44</sup> is the world's largest open access English language journal portal with links to full text at publisher sites. Directory of Free Full-Text Journals in Chemistry<sup>45</sup>, Free Medical Journals<sup>46</sup> (leading to 3223 journals) and Socol@r<sup>47</sup> are few more journal gateways. Socol@r is a one stop search for all the open access information worldwide and it covers 11,739 Journals including 1,350,3317 articles. Highwire press<sup>48</sup> is another very important journal gateway. It is a commercial site but offers free access to several thousands of journals from many publishers. Access is usually after an embargo period and this varies from publisher to publisher. The embargo period varies between 6 – 24 months since the date of publication.

## **Free Information Sources**

Due to financial constraints, Sri Lankan libraries have very limited access to commercial databases and therefore it is extremely important that scientists and librarians are aware of the free resources available. Of course, information is not free. However, some of it is available to the public at no charge. Of the total peer reviewed scientific literature, 20% is freely available on the internet. With the increased development of Open access policies for research information, the volume of free literature is also growing. In addition, journal publishers often provide citations and abstracts of their content to database producers because this increases the demand for the articles.

Free resources on the internet are of several types. Literature archives make very important free sources and these are of two major types - Institutional repositories and Subject repositories. Journal repositories and gateways are the other important free resources, described above.

Another type of free resource is the 'Open Access' Journals. Open Access journals give complete access to its contents immediately after publication. They are peer reviewed and many of them have high impact factors. They permit unrestricted use, distribution, and reproduction of the contents in any medium, provided the original work is properly cited. Publication of 'Open Access' journals was initiated by 'non-commercial publishers' but several commercial publishers also have recently joined 'Open Access' publishing.

A list of Institutional and Subject Repositories on journal articles, theses, books and many other library resources, journal gateways, and Open Access publications providing free information and/or free full text, is given in Appendix I.

## Conclusion

Easy access to accurate, relevant, most current and comprehensive information on the latest scientific breakthroughs is considered a challenge to the academia and the scientific community today. Global information explosions, high prices of information sources, limited resources available in libraries, contribute to this problem. However, with the emergence of new information technologies, many libraries in Sri Lanka offer internet based effective search tools and gateways to explore and reach useful resources in their collections. Similarly the internet also offers many tools and techniques to guide the scientists to approach best information sources both free and at cost. Scientists could effectively use these tools to harness the necessary information to conduct productive research leading to national development. However, the value of the manually handled services offered by libraries to its user communities based on print material should never be underestimated.

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