CHAPTER - 1
INTRODUCTION

1.0 INTRODUCTION

Science and technology is a flourishing interdisciplinary field that examines the creation, development, and consequences of science and technology in its cultural, historical, and social contexts. This field is of great importance in the world as well as in whole universe. Majority of the countries in this international community are trying continuously to increase their annual budget for science and technology. This development clearly suggests that decision-makers both in government and private sector industry are strongly convinced of the importance of developing science and technology. The contribution of science and technology in national development is of great importance. It is a known fact that no nation can develop without science and technology. Science is the study of knowledge which can be made into a system and which depends on observing and testing facts while technology is the practical application of scientific knowledge. Developed nations of the world like the United States of America, Germany, France etc. boast of several scientific inventions which make them to be rated as the world powers. Science and technology is the pivot of any nation’s development.

One of the major scientific and technological developments in the history of mankind is the invention of computer. Today, computer based communication technologies are influencing all the activities of human life. It is changing the way how people now access and utilize information. Information has become more digital and networked. The popularization of hypertextual structures has added a new degree of freedom to search information. Given the unique features of electronic media and their potential role and impact in access and delivery of information on the network, the emphasis has now shifted from conventional publishing to electronic publishing.

Electronic publishing is a publication process where the manuscripts are submitted in electronic format, edited, printed, and even distributed to readers by employing computers and telecommunication networks. Electronic publishing is about dissemination of information in
electronic media in all its various stages. One of the major products of e-publishing is: electronic journals (e-journals). The term electronic journal or “e-journal” referred to journals and newsletters that are prepared and distributed electronically and they may or may not have a print counterpart. According to the Dictionary for Library and Information Science (243), an e-journal is defined as “a digital version of a print journal, a journal-like electronic publication with no print counterpart, made available via the web, e-mail, or other means of internet access.” A journal which is available in electronic format; a physical version may also be available (Harrods, 245). Electronic journals have altered the way scholarly information is disseminated throughout the world. Scientists were the early adopters of this innovation. Not only have e-journals influenced the way information is distributed and disseminated, but also the ways researchers acquire information from a vast pool of information resources. The revolution in access has changed the information behaviours of scientists (Brown 929). E-journals present an innovation in the way scientific information is communicated to the research community. They are the most important vehicle in the overall dissemination and are the first place where findings are presented as a permanent record to researchers. In the field of science and technology, e-journals hold prominent position as they are an important source of current knowledge. They provide a platform for the communication of ideas, the exchange of experience and the transmission of current information to scientists’ community which is involved in major research and development activities.

E-journals are a vital source of information for the scientific research and development. CSIR News supplement (ii) in 2005 listed around 250000 number of periodicals and out of these, 25000 were scientific, technical and medical (STM) journals, 15000 were referred scholarly periodicals and 12000 were referred scholarly periodicals which were available online. Around 15000 journals were available in S&T areas alone. E-journals are growing three folds every 15 years and their cost, 2.5 times every 10 years. Obviously, no single library can afford to procure all journals even in a single discipline due to financial constraints. Thus, librarians are compelled to work together to overcome economic crisis and to harness technological innovations and form subscription clubs to acquire e-journals; not just clubs but strategic alliances with broad based objectives. Many of the electronic journals are being acquired through purchase or lease by consortia on behalf of a group of libraries. The consortia can be defined as a strategic alliance of
institutions having common interest. The main aim of a consortium is to achieve what the members of the group cannot achieve individually. Some of the consortia at Indian level include: FORSA (Formula for Resource Sharing in Astronomy and Astrophysics, Hyderabad), NKRC (National Knowledge Resource Consortium, New Delhi), INDEST (Indian National Digital Library in Engineering Sciences and Technology, MHRD, New Delhi), UGC – Infonet (University Grants Commission – Information Network) etc. (Sridevi, Satyanarayana and Murthy 320).

Among the major research and development organizations in India, such as Indian Space and Research Organization (ISRO), Defence Research and Development Organization (DRDO), Department of Atomic Energy (DAE), Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR) etc., Council of Scientific and Industrial Research (CSIR) is playing significant role in the field of science and industrial research. The CSIR was constituted in 1942 by resolution of the then central legislative assembly. It is an autonomous body registered under the Societies Registration Act XXI of 1860 having its head quarter at New Delhi. It is one of the largest government funded research and development (R&D) organization in India with a chain of 42 laboratories and several extension centres spread across the country. It has been responsible for undertaking pioneering research in all aspects of scientific and industrial research covering sectors as diverse as aerospace, biotechnology, chemicals, drugs and pharmaceuticals, energy, food and food processing, information dissemination, leather and metal, minerals & manufacturing to name a few. Broadly, CSIR’s R&D portfolio embraces areas as chemical, physical, biological, information, environmental and engineering sciences (CSIR).

Most of the CSIR laboratories have well established libraries or documentation centres. Apart from document sources like books, standards, technical reports, conference proceedings and patents, the scholarly journals are major sources of R&D information. CSIR spends annually about Rs. 25 crore for journal subscription alone. Put together, all the 37 labs of CSIR subscribe to as many as 3,356 foreign research and scholarly journal titles annually at a cost of about Rs. 25 crore. As some of the laboratories are inter disciplinary in nature, some of the titles tend to be subscribed by more than one laboratory. However, the unique number of titles being subscribed by these laboratories is around 2500. These print editions collections create an annual depository of 5,000,000 plus printed articles spread across the labs in stand-alone manner. Most of the
library and information centers of CSIR are well equipped with good IT infrastructure with network facility and high speed internet connectivity (Narayana and Goudar 1).

CSIR has also set up National Knowledge Resource Consortium in year 2009, which is a network of libraries and information centres of 39 CSIR and 24 DST institutes. NKRC's origin goes back to the year 2001, when the CSIR set up the Electronic Journals Consortium to provide access to 1200 odd journals of Elsevier Science to all its users. Over a period of time, the consortium not only grew in terms of the number of resources but also in terms of the number of users as more like-minded institutes evinced interest to join the consortium. Today, NKRC facilitates access to 5,000+ e-journals of all major publishers, patents, standards, citation and bibliographic databases. Apart from licensed resources, NKRC is also a single point entity that provides its users with access to a multitude of open access resources. The consortium envisions emerging as a leader to serve the R&D sector with much needed information to strengthen the research and development system in the country. The National Institute of Science Communication and Information Resources (NISCAIR), New Delhi is responsible for its implementation and management (NKRC).

2.0 STATEMENT OF THE RESEARCH PROBLEM

Understanding the growing importance of e-journals in education and research, modern libraries are stepping ahead to keep pace with the latest advances in IT technologies in e-resource management, user authentication and control, and other access solutions. Besides, libraries have since dramatically expanded their e-journal holdings over the years through consortia based agreements, publisher licenses and aggregator subscriptions. Researchers have welcomed enhanced and easy access to unprecedented numbers of journals. Their reliance on online e-journals for R&D activities, education and research is gradually growing. Realizing the growing significance of e-journals in research, CSIR libraries in main laboratories have also dramatically expanded their e-journals. The e-journals in CSIR libraries are available online via the internet and their usage is gradually going up. But what is still not clear as to how subject and disciplinary differences across CSIR institutions are influencing e-journals usage. It must be recognized that CSIR institutions undertake research studies and programs in several different
disciplines such as physical sciences, biological sciences, chemical sciences, engineering sciences and information sciences. Secondly, there has been very little evidence until recently about the patterns of use of e-journals within the CSIR system by subject and discipline and about their impact on research outcomes. The issue is to understand whether e-journals make any difference to CSIR research pursuits. Thirdly, it is still not clear how this revolution in access has influenced information seeking behavior of researchers. Do high levels of use imply high levels of user satisfaction, high research productivity, or high quality research output? A deeper level insight into issues relating to changes in information seeking behavior of researchers - how do they access and make use of online journals discipline wise, and how the benefits flow from that use - should be useful in developing a more informed perspective on how e-journals should be subscribed and made available to the users in the coming years in the context of cost-effective approach to e-journals management in CSIR libraries. Given the fact that the CSIR has made huge investments in by way of lab infrastructure, set up its own e-journals consortium, it becomes necessary and urgent to make an attempt to assess and verify to what extent are CSIR researchers able to meet their information needs, are they satisfied with the current facilities of NKRC, or do they need additional facilities.

Therefore, the present study is an attempt to study the use of e-journals in different CSIR institutions and the current status of CSIR libraries with regard to their preparedness to manage electronic information services. Several studies evaluating the use of e-resources have been reported in literature. However, CSIR (India) and its laboratories have never been the focus of their study. Therefore to fill the gap this study has been undertaken. The study is titled “Use of E-Journals by Researchers in Science and Technology: A Study of CSIR Libraries.” The context for this study is multidimensional as it deals with the CSIR libraries, CSIR researchers, E-journal consortium and E-journals.

3.0 SCOPE OF THE STUDY
CSIR has a network of 42 main laboratories (See Appendix I) and several extension centres having pan India presence in the country. All the main laboratories have since established excellent local libraries for their use, each holding a wide variety of collections on wide ranging subject areas of interest specific to individual laboratories. All the CSIR libraries are well
computerized, equipped with state of the art information technology facilities, and offering network facility and high speed internet connectivity for online access to information resources.

3.1 CSIR Libraries Covered

The present study is intended to look into the use of electronic journals by researchers in the libraries and information centres of the CSIR (India). The CSIR institutions being mission oriented in nature play a pivotal role in designing and developing the critical technologies for the growth and development of country. In developing critical technologies for the nation, research investigations in basic sciences such as physical sciences, chemical sciences, and biological sciences are of fundamental importance. Therefore, the present study limits the scope of its investigation to CSIR libraries and information centres supporting research programs in the areas of biological sciences, chemical sciences, engineering sciences and physical sciences. In total, 15 main libraries of CSIR were taken as a sample for the purpose of study out of a total 42 CSIR libraries (Appendix III) as they were prominent in research. Furthermore, these 15 libraries were selected on the basis of the subject in which research was conducted in them. Three libraries were taken from each of the subject field, thus including following categories: biological sciences, chemical sciences, engineering sciences and physical sciences. Also, three libraries which dealt with research and development in all fields of science and technology were included. The final list of selected libraries included the following:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Institution</th>
<th>Location</th>
<th>Year of Establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>All fields of Science and Technology</td>
<td>CSIR HQ</td>
<td>New Delhi</td>
<td>1964</td>
</tr>
<tr>
<td></td>
<td>NISCAIR</td>
<td>New Delhi</td>
<td>2002</td>
</tr>
<tr>
<td></td>
<td>NISTADS</td>
<td>New Delhi</td>
<td>1981</td>
</tr>
<tr>
<td>Biological Science</td>
<td>CCMB</td>
<td>Hyderabad</td>
<td>1977</td>
</tr>
<tr>
<td></td>
<td>IGIB</td>
<td>New Delhi</td>
<td>1967</td>
</tr>
<tr>
<td></td>
<td>IHBT</td>
<td>PalamPur</td>
<td>1983</td>
</tr>
<tr>
<td>Chemical Science</td>
<td>CLRI</td>
<td>Chennai</td>
<td>1948</td>
</tr>
<tr>
<td></td>
<td>CSMCRI</td>
<td>Bhavnagar</td>
<td>1954</td>
</tr>
<tr>
<td></td>
<td>IIP</td>
<td>Dehradun</td>
<td>1959</td>
</tr>
<tr>
<td>Engineering Science</td>
<td>CRRI</td>
<td>New Delhi</td>
<td>1950</td>
</tr>
<tr>
<td></td>
<td>NAL</td>
<td>Bangalore</td>
<td>1950</td>
</tr>
<tr>
<td></td>
<td>NEERI</td>
<td>Nagpur</td>
<td>1958</td>
</tr>
<tr>
<td>Physical Science</td>
<td>CEERI</td>
<td>Pilani</td>
<td>1953</td>
</tr>
<tr>
<td></td>
<td>NIO</td>
<td>Goa</td>
<td>1966</td>
</tr>
<tr>
<td></td>
<td>NPL</td>
<td>New Delhi</td>
<td>1950</td>
</tr>
</tbody>
</table>
3.2 User Group

The user group covered in the study included researchers of four categories i.e. research scholars, technicians, technical staff and scientists. All these categories of users are involved in R&D activities; hence the term researcher is used for them in the present study. The following were included in the user group:

- **Scientists**- refer to persons who are directly engaged in R&D work, use scientific knowledge and technological principles to create new knowledge, or are who are engaged in professional work on science and technology (S&T) activities, or high-level personnel who direct the execution of S&T activities.

- **Technicians**- includes trained or skilled staff those who have received technical training in any branch of knowledge or technology and are engaged to look after technical equipments, do practical work in a laboratory, and keep the laboratory function effective.

- **Technical Staff**- includes staff employed in CSIR institutions to carry out sampling, testing, measuring, recording and analyzing of experimental data while performing R&D activities as part of a scientific team.

- **Research Scholars**- includes Junior Research Fellows and Senior Research Fellows involved in R&D activities and doctoral programme of CSIR institutions.

4.0 LIMITATIONS OF THE STUDY

The study is limited only to those users’ groups who are involved in R&D activities in 15 selected CSIR libraries as mentioned above. The administrative staff and post-graduate students were not included in the study as they are not involved in research activities. E-journals subscribed through CSIR e-journal consortium and journals subscribed by libraries outside CSIR e-journal consortium were covered. Open access e-journals were not considered in this study.
5.0 OBJECTIVES OF THE STUDY

The objectives formulated for the study were as follows:

i. To find out the researchers’ awareness about e-journals and National Knowledge Resource consortium (NKRC) in selected CSIR libraries.

ii. To assess the users’ preference pertaining to e-journals vis-à-vis print journals in CSIR libraries under study.

iii. To identify the purpose of using of e-journals and their access in CSIR libraries under study.

iv. To examine the comparative usage pattern of e-journals by the researchers in selected CSIR institutions.

v. To identify users’ preference with regard to different e-journals subscribed through NKRC and e-journals in various fields of science and technology.

vi. To examine the problems faced by the researchers in CSIR libraries while accessing and using e-journals.

6.0 HYPOTHESES OF THE STUDY

The following hypotheses were tested in the study:

i. Most of the researchers are aware about e-journals and NKRC in selected CSIR libraries.

ii. Most of the researchers prefer to use e-journals over print journals in CSIR institutions.

iii. There is significant difference in the purpose of using of e-journals by researchers as well their access by them in CSIR institutions.

iv. There is significant difference pertaining to the usage pattern of e-journals in science and technology by the researchers in selected CSIR institutions.

v. There is variation in users’ opinion and level of satisfaction regarding e-journals in selected CSIR libraries.

vi. There is variation in users’ problems in accessing e-journals in selected CSIR libraries.
7.0 RESEARCH METHODOLOGY

For conducting any research, systematic planning of study is most vital upon which the whole process of research study depends. Methodology describes how one would investigate the topic by specifying the methods of both data collection and data analysis, identify the variables of interest, define them and their relationship (if any), and specify how they would be measured. The means, techniques, and frames of reference by which researcher approach and carry out inquiry is known as methodology (Busha and Harter 11). There are two broad categories of methods in social science research, viz, Qualitative methods and Quantitative methods. Library and information science discipline adheres to both of these methods of research. Within the LIS literature, there is still a strong inclination towards survey method as compared to other methods. In addition, there is more emphasis on investigating user need and in the domain of user studies there is enormous emphasis on quantitative approaches (Wilson 3).

Survey method has been used for the present study. This method plays a significant role in research as can be seen from the statement. “the survey method is one of the most effective and sensitive instruments of research, survey research can produce much needed knowledge” (Kashyap 95). In order to collect the comprehensive and relevant data for the study the following steps were taken

- Literature Survey
- Designing of Questionnaire
- Pilot study
- Collection of Data
- Analysis and Interpretation of data
- Testing of Hypotheses

The methodology adopted for conducting this study is further explained in detail in the third chapter of this thesis entitled Research Methodology.

8.0 ORGANIZATION OF THE STUDY

This study has been organized into following eight chapters:
Chapter 1- Introduction: This chapter deals with the background of the study, statement of the problem, objectives, hypotheses, scope, limitations and operational definition of the term used and organization of the study.

Chapter 2- Review of Literature: This chapter includes an extensive review of available literature and different aspects related to e-journals usage and other related areas.

Chapter 3- Research Methodology: This chapter deals with different methods followed in the study. The study is based on survey, questionnaire and other techniques like interview and observation etc. It also selection of survey population, pilot study, and style used for bibliographical references.

Chapter 4- Electronic Journals- An Overview: This chapter deals with the different aspects of e-journals such as historical development, need, significance and issues related to e-journals.

Chapter 5- Profile of CSIR Institutions and its Libraries: This chapter provides brief description of the selected CSIR libraries covered in the study.

Chapter 6- Data Analysis and Interpretation: This chapter is divided into two parts.
Part A- deals with analysis of the data collected from the Librarians of CSIR Libraries.
Part B- deals with analysis of the data received from researchers.

Chapter 7- Findings, Suggestions and Conclusion: This chapter provides summary of the findings of the study based on analysis on data. Conclusions have been drawn on the basis of data analysis and findings, suggestions have been recommended and areas for further research have also been suggested.

Appendix I: Questionnaire for Librarians
Appendix II: Questionnaire for Researchers
Appendix III: List of CSIR Institutions
Appendix IV (a-e): Rank List of E-Journals

Bibliography
REFERENCES


