Chapter 3
Research Methodology

3.0 Introduction

This chapter discusses the research methodology adopted for collecting and analysing data for the study. It explains the research design, sampling techniques and data collection methods used in the study. It also includes the description of the methods adopted in analysing data for the study.

3.1 Research Design

A research design is “a plan that guides the investigator in the process of collecting, analysing and interpreting observations. It is a logical model of proof that allows the researchers to draw inferences concerning causal relations among the variables under investigation” (Nachmias and Nachmias 97-8). The research design is a logical method that enables the researcher to draw conclusions and linking relations among the variables under study. The main purpose of the plan is to help to avoid the situation in which the evidence does not address the initial research questions. Research design describes sampling techniques, data collections tools, procedures, and techniques used in the study.

This study focuses on the role of CSIR-DST e-Journals Consortium (now National Knowledge Resource Consortium (NKRC) ) in enhancing resource sharing and enriching research output in CSIR laboratories in Delhi.

Research work for this study started with the literature search for retrieving information from the professional and research literature. The first search was conducted with Google and Google Scholar search engines. Databases in the field of library and information science are also searched i.e. Library and Information Science Abstracts (LISA), Library, Information Science and Technology Abstracts (LISTA). Various search terms are used to ensure a comprehensive coverage:
- First, to gain an overview of the subject, broad search terms were used such as library cooperation, partnership, collaborative collection development, interlibrary loan, library networks, etc. in the first stage of information retrieval.
- Then the more specific terms such as e-journals, consortium, consortia purchasing, consortia building, e-journals consortium, were searched.
Survey method is used for data collection from the sample population under study and making statistical inferences from the collected data. Survey method combines several modes of data collection like questionnaire, usage statistics, website, etc. These various methods are used to study the use of e-journals subscribed by the libraries through a consortium. Usage statistics based on the transaction logs provided by the publishers is also used. The purpose of using multiple modes is to collect rich information with high and impressive evidence(s). Questionnaire method is used for collecting data from the sample population in this study.

3.2 Scope and Coverage

The scope of this study is confined to CSIR-DST e-Journals Consortium only. The coverage includes R&D laboratories of CSIR in Delhi.

3.2.1 Time Period Covered

The time period covered for the study is 10 years i.e. 2002-03 to 2011-12. Since the consortium was started in June 2002 and this study was initiated in 2012, therefore it was decided to cover from the inception year of the consortium.

3.2.2 Sample Population Selected for the Study

Out of 38 laboratories of CSIR, a sample of five laboratories i.e. Council of Scientific and Industrial Research- Headquarters (CSIR-HQ), National Physical Laboratory (NPL), Central Road Research Institute (CRRI), Institute of Genomics and Integrative Biology (IGIB) and National Institute of Science Technology and Development Studies (NISTADS) of Delhi are selected for the study. Therefore, questionnaires were sent to a selected sample of five laboratories in Delhi. The selected five laboratories are in the areas of planning, policies framing for national and international science and technology, physics, biology, engineering, history and development of science and society, etc.

Scientific staff (users) of CSIR laboratories are selected for the survey as they are using e-journals subscribed through consortium for their research work. Librarians and professional staff working in the libraries of the laboratories provide technical support to the users and coordinate with the consortium to make the e-journals available for the users. Scientific staff strength of these five laboratories (as provided by the librarians in the questionnaire) is given in Table 3.1.
Table 3.1: Scientific Staff Strength of the Laboratories under Study

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Scientific Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSIR-HQ</td>
<td>30</td>
</tr>
<tr>
<td>NPL</td>
<td>157</td>
</tr>
<tr>
<td>CRRI</td>
<td>88</td>
</tr>
<tr>
<td>IGIB</td>
<td>54</td>
</tr>
<tr>
<td>NISTADS</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>349</td>
</tr>
</tbody>
</table>

The Table 3.1 shows that there were total 349 scientists in five laboratories under study. Out of 349, 30 scientists were in CSIR-HQ, 157 in NPL, 88 in CRRI, 54 in IGIB and 20 scientists in NISTADS. NPL had the highest number of scientific staff and NISTADS had the lowest.

3.3 Questionnaire Method

As per Collins Dictionary questionnaire is “a set of questions on a form, submitted to a number of people in order to collect statistical information” (“Questionnaire,” def. n.pag.). Gray defined “questionnaires are research tools through which people are asked to respond to the same set of questions in a predetermined order” (337). Krishan Kumar defined questionnaire as a “written document, listing a series of questions relevant to the study”(120). A questionnaire is a format containing a list of questions sequentially ordered to obtain information relevant to the objectives of the study. Questions are framed not only to get responses but to get particular kind of data relevant to the objectives of the study. The benefit of using questionnaire is that large amounts of information can be collected from a large number of people in a short period and in a relatively cost effective way. Questionnaire saves the time of researcher as the same set is sent to many respondents. Respondents also can complete it at their convenience. According to Busha and Harter, it is important that the questionnaire must be developed carefully so that it measures the objectives of the research study accurately (61).

3.3.1 Designing of Questionnaire

For this study, two questionnaires were designed; one for librarians- who are providing and coordinating the consortium services and second is for the scientists who are the users of the consortium. Both the questionnaires were preceded by a brief
note explaining the purpose and objective of the survey. It had also been assured that
the identity, opinion and information/ answers collected will be kept confidential and
will be used for the purpose of research only. In users questionnaire, the name of the
respondent was kept optional to encourage freedom of expression of opinion and
ideas from the users. Questions were framed to get qualitative as well as quantitative
information. Open-ended questions which will provide insights into the problem and
give ideas for further research represent qualitative aspect. Close-ended questions
which quantify data and generalise results from a sample of the population of interest
express quantitative information. Questionnaires were designed keeping in view the
objectives and the research questions of this study.

Questionnaire for Librarians consisted of 19 questions in eight sections. The
first section- general information about the library contains questions like name of the
laboratory, library incharge, nodal officer for consortium, staff strength of the institute
and library, infrastructure available in the library in terms of computers, Internet
facility, automation of the library, library budget and expenditure. The section two -
CSIR-DST e-Journals Consortium covers information about consortium membership,
number of print journals subscribed as well as number of e-journals accessed through
consortium, accessibility of publisher subscribed through the consortium. The third
section - revenue savings aimed to collect data on amount of money saved due to the
consortium. The fourth section - research output focused on how availability and
accessibility to more number of journals through consortium has influenced the
research output in terms of research papers of the users. The fifth section - usage
statistics of the resources subscribed under consortium collected information on the
usage of resources so as to know whether readers were using e-journals or not and
which resources were used more. The sixth section- resource sharing aimed to assess
how the consortium helped in sharing resources amongst consortium members. The
seventh section - feedback from the librarians included questions on problems faced
while implementation of the consortium, if any and the impact of consortium on
libraries in terms of communication amongst other libraries, storage space, reduced
manpower, etc. The last section is suggestions of the librarians about the consortium.

Questionnaire for Users consisted of 23 questions in five sections with a
combination of open-ended and closed-ended questions. In multiple-choice questions,
‘Any other’ option was also used at some places to obtain answers that might not have been covered in multiple-choice questions. The first section covered the demographic profile of the users and questions such as gender, age, designation, laboratory’s name, discipline/ area in which they work were asked. To keep the privacy of user’s opinion, the name of the user was kept optional. The second section aimed to know user’s awareness about e-journals, for how long they were using e-journals. User’s awareness about the consortium and how they were made aware of the consortium. Scale questions (Likert response scale) with three and five ratings were used for questions like how important are e-journals over print journals, the purpose of using e-journals subscribed under consortium, sources used for searching information in e-journals, preference of choice for the resources subscribed under consortium, the level of satisfaction, and problems encountered while using consortium. The third section focused on qualitative and quantitative benefits received by the users in terms of total number of publications published by them, number of research papers published in journals which were covered and indexed in Science Citation Index (SCI)/ Social Science Citation Index (SSCI), consultancy and sponsored projects received, in-house projects proposed. The fourth section was on resource sharing in terms of information resources as well as sharing of their expertise within CSIR Laboratories and outside agencies. The fifth section contains questions on feedback and suggestions from users, their personal reaction to the success(es) or failure(s) of e-journal access through consortium at their institutions.

3.3.2 Administration of Questionnaire

A good questionnaire is one which receives maximum response rate. It is, therefore, important to select best ways of administering questionnaires that can help in achieving the highest response. Librarians were contacted personally to discuss the questionnaire and get the accurate and maximum information. Library users were also contacted personally at most of the laboratories explaining the purpose and importance of the survey and convincing them to fill the complete questionnaire. They were also told about the usefulness of the information they will provide and how the results will help in improving the services of consortium. Questionnaires were distributed personally to the library users to get maximum response.
3.3.3 Pre-testing of Questionnaire

Drafts of both the questionnaires were prepared and discussed with my supervisor for clarity and appropriateness of questions. The pre-final version of the user questionnaire was then distributed for a pilot study. It is always considered essential to pre-test the questionnaire to ensure the validity of questions. A pilot study was conducted for user’s questionnaire. The questionnaire was distributed to ten scientists of two laboratories namely Central Road Research Institute (CRRI) and Institute of Genomics and Integrative Biology (IGIB). Users were personally contacted, and questions were discussed in terms of content, language, difficulty in understanding the terms used, and time taken to complete the questionnaire, etc. The questionnaire was finalised with minor modifications as suggested by the users and my observations under the guidance of the supervisor. Since population for librarian’s questionnaire was only five, the questionnaire was discussed personally with the librarian of CRRI and professional staff of National Physical Laboratory (NPL) for any improvement.

3.4 Data Collection

Questionnaires had been used to get vital information from the sample (librarians and users of laboratories libraries) of the study (see Appendix 1 and Appendix 2). Librarians and a sample of scientific staff of Council of Scientific and Industrial Research-Headquarters (CSIR-HQ), National Physical Laboratory (NPL), Central Road Research Institute (CRRI), Institute of Genomics and Integrative Biology (IGIB) and National Institute of Science Technology and Development Studies (NISTADS) were chosen to represent the population for survey. Secondary sources like annual reports of the five laboratories under study, their websites, communications received from Council of Scientific and Industrial Research (CSIR) and National Institute of Science Communication and Information Resources (NISCAIR)-a CSIR laboratory and nodal agency for the consortium and annual report of NISCAIR as well had also been used to collect information.

Scientists of the five laboratories under study were covered for this study. The total size of the scientists in five laboratories is 349. Scientists as defined in Council of Scientific and Industrial Research CSIR Service Rules is as follows:
“Scientific staff” means “R&D scientific staff who are expected to generate new knowledge/ methods/ techniques by research/design/development” (1).

Since scientific staff is the generator of new knowledge/ techniques by research and development, questionnaires were distributed to scientific staff only. As mentioned above, the total population of scientists in five laboratories under study was 349. Out of 349, 41 scientists joined laboratories in 2011 and therefore, not covered by the survey as the period of study is 2002-03 to 2011-12. Questionnaires were distributed to the remaining 308 scientists personally and through e-mail covering junior to senior scientists. The questionnaires were distributed and collected during October 2013 to June 2014.

3.5 Response Rate

The total number of 308 questionnaires were distributed to scientists and five questionnaires to the librarians of the five laboratories, and 229 were received back from the scientists and all five from the librarians. Thus, the response rate for the users was 74.35% and librarians 100%. Now the total sample size for the study for users opinion is 229 and 5 for librarians. Response rate of librarians and scientists is given in Table 3.2.

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Number of Questionnaires Distributed (Library)</th>
<th>Number of Responses Received (Library)</th>
<th>Number of Questionnaires Distributed (Users)</th>
<th>Number of Responses Received (Users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSIR-HQ</td>
<td>1</td>
<td>1</td>
<td>28</td>
<td>23</td>
</tr>
<tr>
<td>NPL</td>
<td>1</td>
<td>1</td>
<td>127</td>
<td>94</td>
</tr>
<tr>
<td>CRRI</td>
<td>1</td>
<td>1</td>
<td>86</td>
<td>62</td>
</tr>
<tr>
<td>IGIB</td>
<td>1</td>
<td>1</td>
<td>49</td>
<td>36</td>
</tr>
<tr>
<td>NISTADS</td>
<td>1</td>
<td>1</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>5 (100%)</td>
<td>308</td>
<td>229 (74.35%)</td>
</tr>
</tbody>
</table>

3.6 Techniques Used in Analysis and Interpretation of Data

The purpose of the data analysis and interpretation is to obtain sensible and useful information. Data analysis according to Dey is a “process of resolving data into its constituent components, to reveal its characteristic elements and structure” (31). The data obtained from various sources was organised and a master file was created by inputting the data into MS-Excel 2007 so that tabulation and analysis of data can be done in any form. The data was analysed using SPSS (Statistical Package...
for the Social Sciences) Version 17.0. Rel. 2008. SPSS is a widely used statistical packages for analysing the data. Data collected is analysed and interpreted to relate it to the objectives of the study. Data is interpreted using tables and charts.

### 3.6.1 Frequency Distribution

Frequency is the number of times a particular event occurs. In other words, the frequency of females in a sample is simply the total number of females in the sample. The frequency distribution is often presented in a table or graphically represented in histograms or bar charts giving the frequencies of values of any given variable. In the words of Croxton and Cowden, “frequency distribution is a statistical table which shows the set of all distinct values of the variable arranged in order of magnitude, either individually or in groups, with their corresponding frequencies side by side (qtd. in Sardana 45).” Thus, a frequency distribution table has two parts- on its right there are a number of times of value and on its left side the magnitude of value. Frequency distribution also shows whether the observations are high or low and also whether they are concentrated in one area or spread out across the entire scale.

The frequency distribution of various questions concerning significant variables was evaluated and presented in the form of tables or in graphical form using histograms, bar charts. For example, in this study data collected from a sample of 229 scientists of five laboratories, could be presented in frequency table displaying the occurrences of scientists of a particular laboratory as follows:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Laboratory</th>
<th>Frequency (Response)</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CSIR-HQ</td>
<td>23</td>
<td>10.04%</td>
</tr>
<tr>
<td>2</td>
<td>NPL</td>
<td>94</td>
<td>41.04%</td>
</tr>
<tr>
<td>3</td>
<td>CRRI</td>
<td>62</td>
<td>27.07%</td>
</tr>
<tr>
<td>4</td>
<td>IGIB</td>
<td>36</td>
<td>15.72%</td>
</tr>
<tr>
<td>5</td>
<td>NISTADS</td>
<td>14</td>
<td>6.11%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>229</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The same data can also be presented in graphical form using histograms and bar charts. Both are visual displays of frequencies using columns plotted on a graph.
Vertical axis or Y-axis generally represents the frequency count and horizontal axis or X-axis generally represents the variable to be measured (scientists in this study).

3.6.2 Percentage
A percentage is a way of expressing proportion. It is equal to the proportion times 100. The percentage of the data was calculated to compare the results and draw inferences. The percentage was evaluated for quantitative questions which have one or more than one response options. The results were presented in graphs and tables.

3.6.3 Weighted Index and Likert Scale
Weighted Index (W.I.) was used to analyse the data of the questions which involved ranking of the options by the respondents. It is applied when all the items in a question are not given equal importance or rank. It is an index where the important items are given more value than less important ones. On a website “eMathZone” W.I. has been explained as weight assigned to each item relative to its importance and index number computed from these weights is called Weighted Index. (n.pag.)

Tull and Hawkins explained that in Likert scale, the respondent is asked to evaluate a statement by giving it a quantitative value on any kind of subjective or objective dimension, with level of agreement/disagreement being the dimension most commonly used (321).

Two questionnaires used in this study contain many questions which used three or five response alternatives such as very important, important, not important or mostly, often, sometimes, rarely, never.

3.7 Bibliographical References
Different types of documents were consulted for this study such as books by single author, joint authors, journal articles, reports, conference proceedings, e-resources, annual report. All the documents referred for the study are duly acknowledged by combination of both in-text citations appended at the end of chapter and a complete list of references arranged in an alphabetical order is also appended in the last as bibliography. MLA (Modern Language Association) Handbook for Writers of Research Papers 7th ed. New Delhi: Affiliated East-West Press, 2009 has been used to compile the bibliography.
Annual Report

Books

Book Chapter

Communications from CSIR

Conference Proceedings


Corporate Author

Dictionary
Dissertation

E-resources

E-mail
Coordinator, e-journal Consortium, NISCAIR.“Re: Subscription of Springer Journals”. Message to Director, CRRI. 3 Feb. 2014. E-mail.

Encyclopaedia

Internal Reports

Journal Articles
References


