Chapter-3

RESEARCH METHODOLOGY

3.1 Introduction

Research is a logical and systematic search for new and useful information on a particular topic. Rajasekar, Philominathan & Chinnathambi (2013) explained research by the well-known nursery rhyme,

Twinkle Twinkle Little Star
How I Wonder What You Are

The use of the words how and what essentially summarizes what research is. It is an investigation of finding solutions to scientific and social problems through objective and systematic analysis. It is a search for knowledge, that is, a discovery of hidden truths. Here knowledge means information about matters. The information might be collected from different sources like experience, human beings, books, journals, nature, etc. A research can lead to new contributions to the existing knowledge. Only through research is it possible to make progress in a field.

Research is indeed civilization and determines the economic, social and political development of a nation. The results of scientific research very often force a change in the philosophical view of problems which extend far beyond the restricted domain of science itself. Research is not confined to science and technology only. There are vast areas of research in other disciplines such as languages, literature, history and sociology. Whatever might be the subject, research has to be an active,

diligent and systematic process of inquiry in order to discover, interpret or revise facts, events, behaviour and theories. Applying the outcome of research for the refinement of knowledge in other subjects, or in enhancing the quality of human life also becomes a kind of research and development. Research is done with the help of study, experiment, observation, analysis, comparison and reasoning (Rajasekar, Philominathan & Chinnathambi, 2013).

Research Methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research. It is necessary for a researcher to design a methodology for the problem chosen. One should note that even if the methods considered in two problems are same the methodology may be different. It is important for the researcher to know not only the research methods necessary for the research under taken but also the methodology.

Quantitative research is based on the measurement of quantity or amount. Here a process is expressed or described in terms of one or more quantities. This chapter provides a description of the quantitative design used in the present study.

The result of this research is essentially a number or a set of numbers. Some of the characteristics of qualitative research/method are:

- It is numerical, non-descriptive, applies statistics or mathematics and uses numbers;
- It is an iterative process whereby evidence is evaluated;
- The results are often presented in tables and graphs;

- ❖ It is conclusive;
- ❖ It investigates the what, where and when of decision making.

Statistics is the most widely used branch of mathematics in quantitative research. It finds applications not only in physical sciences but also in economics, social sciences and biology. Quantitative research using statistical methods often begins with the collection of data based on a theory or hypothesis or experiment followed by the application of descriptive or inferential statistical methods

3.2 Population/ Size and Area of the Study

The present study has made an attempt to understand the usage pattern of e-resources in the university libraries of Assam. The area of the study selected for the research is "Assam" state of Northeast India; with four universities i.e. two central universities and two state universities as mentioned below:

- ➢ Assam University, Silchar (Central University);
- ➢ Gauhati University, Guwahati (State University);
- ➢ Dibrugarh University, Dibrugarh (State University); and
- ➢ Tezpur University, Tezpur (Central University).

The respondents were chosen from the common departments in all four universities of Assam under this study. Broadly, it was further divided into two distant groups which falls under the "Linguistics, Humanity & Social Sciences" (LH&SS) and "Science, Technology and Management" (STM) group. The common department which falls under "Linguistics, Humanity & Social Sciences" (LH&SS) are listed below:

- Department of English;

- Department of Commerce;
- Department of Sociology;
- Department of Education;
- Department of Mass Communication;
- Department of Social Work.

And the departments which come under "Science, Technology and Management" (STM) are shown below:

- Department of Physics;
- Department of Chemistry;
- Department of Mathematics;
- Department of Computer Science;
- Department of Environmental Science;
- Master of Business Administration.

The population of the study further consists of university library users of these universities. The sample of the study was described by using random sampling technique.

3.2.1. Identification the Respondents

On the basis of the nature of research study, the following categories of university library users were taken into consideration which comprises:

- Research scholars; and
- Faculty members.

3.3 Research Methodology and Research Design

For this study, "Survey Method" of research was used to collect data from the library users of central and state universities of Assam; which consists of Assam University, Silchar; Gauhati University, Guwahati; Dibrugarh University, Dibrugarh and Tezpur University, Tezpur. The survey has been conducted from various departments of Science, Technology and Management (STM); Linguistics, Humanity and Social Sciences (LH&SS) for the collection of data by using questionnaire for four universities which has been made for the study.

Thus in total, the study consist of 12 number of departments which are common in all the four universities i.e. Department of English, Department of Commerce, Department of Sociology, Department of Education, Department of Mass Communication, Department of Social Work, Department of Physics, Department of Chemistry, Department of Mathematics, Department of Computer Science, Department of Environmental Science, and Master of Business Administration.

3.4 Sampling Procedure for Survey

"Stratified Random Sampling" technique was used in the case of data collection through questionnaire from the individual scientists in different stages. In order to cover respondents from each university, "survey method" was used and equal numbers of questionnaire have been distributed to them as per sampling procedure, which is shown in Table: 3.1. Altogether, 480 questionnaires were distributed to the library users. Out of 480 respondents, 120 questionnaires were distributed to the respondents of each university. The respondents have been divided

into two categories, viz. research scholars and faculty members and are distributed as per Table: 3.1.

Moreover, "Purposive Sampling" is used to collect data from librarian of those universities to know specifically about the library facilities and services. Thus, 4 (0.7%) questionnaires were also distributed to each librarian of those universities.

Table: 3.1 Sample Design for the Present Study

	Research Scholar		Faculty				
	PhD/ M. Phil	SRF/JRF	Asst. Prof	Asso. Prof	Prof	Librarian	Total
AU	40	20	30	20	10	1	121
GU	40	20	30	20	10	1	121
DU	40	20	30	20	10	1	121
TU	40	20	30	20	10	1	121
Total	160	80	120	80	40	4	484

3.5 Tools for the Collection of Data

To carry out any type of research investigation, data is gathered from which the hypothesis may be tested. The meaningfulness of results of any research work depends not only on method and procedure, data analysis or result interpretations but also on the appropriateness of the tools and measures employed in the study. They should be appropriate, reliable and valid as well as suitable for the kind of sample involved in research work. The problem of research is not solved unless a proper tool is selected and used for data collection. Data required to clarify all the ideas in the mind of the researcher are to be collected by the researcher properly (Bhattacharjee, Bhattacharjee & Sinha, 2013).

The following tools were used for collection of data pertaining to the present study:

- ❖ Questionnaire; which is followed by Interview-schedule; and Observation method

3.5.1. Design and Administration of Questionnaire

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Questionnaires have advantages over some other types of surveys as it do not require as much effort from the researcher as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them properly.

To collect the information pertaining to the usage of e-resources in the university libraries of Assam a "questionnaire" was designed. At last, the final questionnaires were sent to the library users of various universities of Assam along with a request letter and self-addressed stamped envelope. The respondents from whom the questionnaires were not received within one month, to them, a gentle reminder was given and they were pursued for sending their responses at the earliest. The library users within the reach were visited personally and distributed questionnaire to respective respondents and passed on necessary instructions related to the filling up of the questionnaire. It was assured that the information given by them would be used for the research purpose only and would be kept confidential.

3.5.2. Design/ Description of the Questionnaire used

Three different types of questionnaire have been designed for the library users, which comprises of the questionnaire of "research scholars" (Appendix-A),

"faculty members" (Appendix-B) and the librarians (Appendix-C). The questionnaire of "research scholars "and "faculty members "consists of six sections as per details given below:

Section A: Consists of "Personal details" which comprises of eight questions;

Section B: Consists of "Usage Pattern of Electronic Resources by the Research Scholar/ Faculty Members in University Libraries of Assam" which comprises of seven questions;

Section C: Consists of "Status and Usefulness of E-Consortium under University Library" which comprises of three questions;

Section D: Consists of "Details of the Trends of Research Publications" which comprises of four questions; and

Section E: Consists of "Problems and suggestions" which comprises of two questions.

Further, separate questionnaire (Appendix-C) was designed for librarian to elicit information pertaining to the usage pattern of e-resources by the library users of the university libraries of Assam. The questionnaire of the librarian has also been divided by into five sections as enumerated below:

Section A: Consists of "Personal Details" which comprises of six questions;

Section B: Consists of "Status of Technical House Keeping Operation" which comprises of five questions;

Section C: Consists of "Status of Library Automation/ Computerization" which comprises of four questions;

Section D: Consists of "Status of Networking/ Resource Sharing Facility of the Library" which comprises of seven questions;

Section E: Consists of "Provision of User Orientation Program in University Library" which comprises of three questions.

3.5.3. Value of the five point scales

In the questionnaire of "students/ research scholars- questionnaire" and "faculty members- questionnaire" five point scales is used for "Excellent," to "Very Poor"; where 1= Excellent, 2= Good, 3= Satisfactory, 4= Poor, 5= Very Poor

3.5.4 Use of Open Ended Questionnaire

In the questionnaire for "Librarian" few open-ended questionnaires were asked to know the future plan of library, list of e-resources availability, statistic usage by library users, etc.

3.6 Personal Interview

Interviews are particularly useful for getting the story behind a participant's experiences. The interviewer can pursue in-depth information around the topic. It may be useful as follow-up to certain respondents to questionnaires, e.g., to further investigate their responses (McNamara, 1999). Thus to have a face to face dialogue and to collect more reliable data, personal interviews were arranged with pre-intimation to the interviews.

There are three fundamental types of research interviews: structured, semi-structured and unstructured. Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions is asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration (Gill *et al*., 2008). Conversely, unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organization (May, 1991). Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail (Britten, 1999).

In this study, semi-structure questionnaire was designed for taking interview of the scientific community of Assam by approaching to them personally in most of the cases. It has been done in a phased manner through different stages to cover each university. Further, in some cases self-addressed stamped questionnaires were sent personally or via post to the addresses of the interviewer concerned and the duly filled in ones were collected later on through the post. Some of the respondents and librarian have also returned duly filled in questionnaire through e-mail.

3.6.1. Personal Observation

Observational research is a social research technique that involves the direct observation of phenomena in their natural setting. To study the usage pattern of e-resources of the library users of Assam, a personal observation method is also being used. Observation methods are useful to researchers in a variety of ways. They provide researchers with ways to check for nonverbal expression of feelings, determine who interacts with whom, grasp how participants communicate with each

other, and check for how much time is spent on various activities (Schmuck, 1997). Participant observation allows researchers to check definitions of terms that participants use in interviews, observe events that informants may be unable or unwilling to share when doing so would be impolitic, impolite, or insensitive, and observe situations informants have described in interviews, thereby making them aware of distortions or inaccuracies in description provided by those informants (Marshall & Rossman, 1995).

In this study, this method was also used to get actual picture about the facilities for using e-resources available at the university libraries of Assam and to know what strategies usually the library users of "Humanity, Linguistics & Social Sciences" as well as "Science Technology and Management" feel while accessing e-resources available at the university libraries of Assam. Further, personal observation method was also used to study the usage pattern of e-resources by the library users of both the Humanity, Linguistics & Social Sciences" as well as "Science Technology and Management" communities of the university libraries of Assam.

3.7 Stages/ Time Period of Data Collection

The questionnaire were distributed and collected from the library users of "Humanity, Linguistics & Social Sciences" as well as "Science Technology and Management" of the university libraries of Assam in four different stages through different modes during the period from **January, 2014 to September, 2014** in different geographical location; which is stated below.

First Stage: Cachar District (From January, 2014 to March, 2014)

Second Stage: Guwahati City (From April, 2014 to July, 2014)

Third Stage: Tezpur District (From June, 2014 to August, 2014)

Fourth Stage: Dibrugarh District (From July, 2014 to September, 2014)

3.8 Statistics Used for the Analysis of Data

Statistics is concerned with the science of uncertainty and can help the scientist deal with these questions. Many classical methods (regression, hypothesis testing, parameter estimation, confidence intervals, etc.) of statistics developed over the last century are familiar to scientists and are widely used in many disciplines (Efron and Tibshirani, 1991).

The SAGE Dictionary of Statistics (2004) defines Statistics as "a characteristic such as a mean, standard deviation or any other measure which is applied to a sample of data. Applied to a population exactly the same characteristics are described as parameters of the population".

Wegman (1988) defines computational statistics as a collection of techniques that have a strong "focus on the exploitation of computing in the creation of new statistical methodology." The SAGE Dictionary of Statistics (2004) defines statistical package as "an integrated set of computer programs enabling a wide range of statistical analyses of data usually using a single spread sheet for the data. Typical examples include SPSS, Minitab, etc. Most statistical analyses are now conducted using such a package".

3.8.1 Using SPSS software for Data, Coding, Tabulation and Data Analysis

In this study various statistical analysis methods are used for the analysis of data by using SPSS software. SPSS is a computer program used for survey authoring

and deployment, data mining, text analytics, statistical analysis, and collaboration and deployment. Statistics included in the SPSS software are as follows:

- Descriptive statistics: Cross tabulation, Frequencies, Descriptive, Explore, Descriptive Ratio Statistics
- Prediction for numerical outcomes: Linear regression
- Prediction for identifying groups: Factor analysis, cluster analysis and discriminate.

The following statistical techniques were employed for this study to analyze and interpret the data:

- Simple percentage;
- Mean;
- Standard Deviation;
- Chats;
- Cross-Table Analysis;
- Chi-square Test Analysis;
- Rating Scale Analysis;
- Correlation between variable Analysis; and
- Various other relevant statistics.

3.8.2 Simple Percentage Calculation

Percentage analysis is the method to represent raw streams of data as a part in 100 (i.e. percent) for better understanding of collected data. The earliest method used in analysis is percentage methods. We can calculate data is the following way:

$$\text{Percentage} = \frac{(No.of\ respondents\ for\ each\ response)X100}{(Total\ No.of\ respondents)}$$

3.8.3 Mean

Mean is the central tendency of a collection of numbers taken as the sum of the numbers divided by the size of the collection. On the other words, mean of a set of numbers is their average.

Let us consider we have sample space a_i (where $a_i = \{a_1, a_2, a_3 \ldots a_n\}$) and n = total Number of the sample. Then the arithmetic mean A is defined via the equation:

$$A := \frac{1}{n}\sum_{i=1}^{n} a_i.$$

3.8.4 Charts

A chart, also called a graph, is a graphical representation of data, in which "the data is represented by symbols, such as bars in a bar chart, lines in a line chart, or slices in a pie chart". Charts are often used to ease understanding of large quantities of data and the relationships between parts of the data. Charts can usually be read more quickly than the raw data that they are produced from. Chart helps to communicate the data easily to the viewer without consuming much time. It is done with more care and well planned before representing the data in a pictorial form.

A bar chart is a chart with rectangular bars with lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally. In a grouped bar chart, for each categorical group there are two or more bars. These bars

are color-coded to represent a particular grouping. (https://en.wikipedia.org/wiki/Chart)

3.8.5 Cross-Table

Cross-tabulation analysis, also known as contingency table analysis, is most often used to analyze categorical (nominal measurement scale) data. A cross-tabulation is a two (or more) dimensional table that records the number (frequency) of respondents that have the specific characteristics described in the cells of the table. Cross-tabulation tables provide a wealth of information about the relationship between the variables. (www.qualtrics.com/wp-content/uploads/2013/05/Cross-Tabulation-Theory.pdf)

3.8.6 Chi-square Test

The Chi-square test is an important test amongst the several tests of significance developed by statisticians. The Chi-square test was used to compare an observed group of frequencies with an expected group of frequencies. This led to deduce the expected frequencies from the null hypothesis. The level of significance was set at 0.001 or 0.05. The statistical analysis of the data of the present study was done by statistical package. Chi-square, symbolically written as χ^2 is a statistical measure used in the context of sampling analysis for comparing a variance to a theoretical variance.

It involves the simple two-step operation for calculating χ^2 for the general case where there is one dimension of categorization. As we are measuring through this procedure is the degree to which an observed pattern of frequencies differs, overall, from a mean chance expected values pattern.

$$\mathcal{X}^2 = \left\{ \frac{(Observed\ Frequency - Expected\ Frequency)2}{Expected\ Frequency} \right\}$$

$$= (O_f - E_f)^2 / E_f$$

Where, O_f = Observed frequency, E_f = Expected frequency

3.8.7 Rating Scale Analysis

A "Likert scale" is the sum of responses to several Likert items. These items are usually displayed with a visual aid, such as a series of radio buttons or a horizontal bar representing a simple scale. A "Likert item" is a statement that the respondent is asked to evaluate in a survey. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item. The five response categories are often believed to represent an Interval level of measurement. But this can only be the case if the intervals between the scale points correspond to empirical observations in a metric sense (Reips & Funke, 2008).

3.8.8 Correlation

This is used to verify strong or weak relationship between two variables. This means that changes in one variable lead to correlated with changes in the second variable. This also used to verify relationship which may be directly or indirectly i.e. positive or negative between those two variables. Thus, it is essential for a scientific study to process data and analyzes them in accordance with the method laid down for the purpose in order to arrive at the possible result.

3.9 Coding

All researchers collect data for their study, in order to make sense of the data, it must be analyzed. Analysis begins with the labelling of data as to its source, how it was collected, the information it contains, etc. Coded allow the researcher to reduce large quantities of information into a form than can be more easily handled, especially by computer programs (http://web.csulb.edu/~msaintg/ppa696/696codes.htm). Specific codes have been deployed at the time of data generation works to understand classification and grouping of categories of Scientists and their characteristics. These codes are used while making data entry in SPSS software.

3.10 Citation Style

A citation is a reference to a published or unpublished source (not always the original source). More precisely, a citation is an abbreviated alphanumeric expression embedded in the body of an intellectual work that denotes an entry in the bibliographic references section of the work for the purpose of acknowledging the relevance of the works of others to the topic of discussion at the spot where the citation appears. (https://en.wikipedia.org/wiki/Citation). Throughout the course of the study, it is decided to use APA, (6^{th} edition) Style while making text and reference citations.

3.11 Conclusion

Previously many studies had been conducted on the usage pattern of e-resources in the university libraries among various groups and at the same time, different methods and techniques have been used in previous studies while collecting

information from the target users. But, yet there exist a gap in those studies which has been carried out among the the library users of “Humanity & Linguistic” as well as “Science Technology and Management” of the different university libraries by the previous researchers. The methodology adopted in the present study was also found to be accepted in many such studies which are already mentioned in the review of literature of the present study by the researcher. The above discussed approaches were found to be appropriate, feasible, flexible and adaptable for achieving the goal or objectives of the study.