CHAPTER – 1
INTRODUCTION

The objective of the present chapter is to highlight need and importance of the study, objectives, hypotheses, sample, and methodology of the study.

1.1 Preamble

The primary aim of the Research is to extend the boundaries of knowledge. It is search for knowledge. Research, through objectives and a systematic method tends a solution to a problem. Wise, JE et…al. (1970) and others quotes research as “a more systematic activity directed towards discovery and development of an organized body of knowledge. It is based on critical analysis of hypothetical propositions for the purpose of establishing cause effect relationship which must be tested against objective reality”

In Universities and similar institution research is carried out in science as well as in social science disciplines, pure research develops theories by discovering broad generalizations or Principles for further understanding of a phenomenon. It is aimed at expansion of knowledge the researchers in science discipline use scientific information. Scientific information has certain properties. It is universal especially in the case of discipline like Social science. It become absolute in fast developing scientific discipline. Explosion of Information and the tremendous growth in scientific publication causes difficulty in their accessibility and availability. So in order to carry out research right Information should be provided to researcher at right time. Researchers need specialized information to keep them updated with the latest trends in their subject fields. To encourage and promote the research activities it is necessary to provide effective information by institution and libraries, so that duplication in research could be minimized and research could be made more effective. Research can be carried out only when necessary information is provided to scholars as a when they are needed but it becomes difficult to satisfy the information need of research scholars in social science discipline due to the factors exponential growth of literature, scattering of literature, in various forms and its complexity.
1.2 Relevance of the Study

North Maharashtra University was established in 1990 at Jalgaon in the Khandesh region of Maharashtra. It plays a significant role in the Pure Sciences educational, social and cultural development of people of Khandesh.

Building up comprehensive collection is one of the arts of modern librarianship. Moreover number of the librarians of the University in India have pointed out that the condition of most of Indian University libraries is far from satisfactory. Especially opinions of Deshpande and Rajyalakshmi (1997), Tejomurty (1984) are the opinion that the Indian university libraries located in back ward areas suffer from inadequate stock of reading material, poor service and insufficient facilities. Against such back ground large number of Bibliometric studies in the form of citation analysis has been conducted in India.

1.3 Definitional analysis

The definition of the study of the used terms in the present study are as under:

1.3.1 Citation Analysis

Paul and Roy (1983) defined citation analysis as, “Citation analysis is one branch of bibliometrics where the unit of analysis is a document, that is a document, that is being cited as a bibliographic reference or as a foot note in a citing document”. Martyn (1976) has rightly defined citation analysis as, “The analysis of citations or references or both which form part of the scholarly apparatus of primary communications. The technique is used for putting items of references in some kind of rank or order whether they are journals of authors cited”.

1.3.2 Thesis (Ph.D.)

Sengupta (1991) defined thesis as, “A thesis is a statement of investigations of research presenting the authors findings and any conclusions reached, submitted by the author in support of his candidate for a Ph.D. degree in science”. In the present study term thesis is confined for which North Maharashtra University, Jalgaon awarded Ph.D. in Pure sciences. Anne’s Encyclopedia Dictionary of Library and Information Science defined thesis as, “Often refers to the treatise written by
candidate for the degree as distinct from doctoral dissertation”. He also defined thesis as, “A proposition advanced and defended in a formal disputation, especially by a candidate in particular fulfillment of university requirements for a master’s degree. Master’s theses are indexed annually by discipline, subject and author” (Ali, 2006).

1.3.3 North Maharashtra University, Jalgaon

The North Maharashtra University, Jalgaon, established on 15th August, 1990 under the Maharashtra Universities Act, XXIX of 1989, started its academic and administrative functioning from the academic year 1991-92. Within the span of 3 years, the University is recognized under section 2 (f) in 1991 and 12 (B) in 1994 under the University Grants Commission (UGC) Act, 1956. The jurisdiction of the University is extended over three districts i.e. Jalgaon, Dhule and Nandurbar, a predominantly tribal and rural area of Khandesh region. The University has opened it’s doors of higher education to mostly “first generation learners” of this area. Access, equity and academic excellence are the thrust areas of the University’s educational endeavor. The University has successfully adopted the ‘School Concept’ with academic flexibility for the optimal use of infrastructure and resources. There are 13 Schools and 01 Institute imparting education in 11-UG, 62-PG and 37-Ph.D. Programmes (North Maharashtra University Official website, 2015).

1.3.4 Pure Sciences

Fundamental science is basic science. The term fundamental science attributes to a scientific specialty a causal or conceptual priority by either of two, differing distinctions. Within philosophy of science, the many empirical sciences are often posed such that fundamental physics is the foundation underlying all others, which thereby are the special sciences that rest upon and in principle are derivable from, or conversely are reducible to, the objects and laws of the fundamental science.

In science's planning and practice, fundamental science is an infrequent synonym of basic science, also termed pure science, which yields theories and predictions—principally in natural sciences such as physics, chemistry, and biology, yet even in other empirical sciences, too, such as cognitive sciences and behavioral sciences—not the technology and techniques developed in applied science (Wikimedia, 2014).
In the context of the present study the term Pure science includes the subjects comprised as Environment Science, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics, Statistics, Botany and Zoology.

1.3.5 Bibliometrics

Bibliometrics is the most active field of “Library and Information Science”. Citation analysis study is the major portion of it. Bibliometric is a sub subject in the information science field, it is first known to have been applied by F.G. Cole’ and ‘N.B.Eales’ in 1917. They analysed comparative anatomy paper by counting the number of publication by country. A subsequent study was conducted by ‘Hulme’ in 1923. Both of this studies designate it as the statistical bibliography and defined it as the application of quantitative techniques to library, and bibliographical work. ‘Alan Pritchard’ in 1969 have coined the term bibliometrics. For this term ‘Dr.S.R.Ranganathan’ used another term ‘Librametry’ in 1948 (Kabir, 1997).

According to Alan Pritchard (1969) bibliometrics, “The application of mathematics and statistical method to books and other media of communication”. Fairthorne (1969) defined bibliometrics as, “Quantitative treatment of properties of recorded discourse and behavior appertaining to it. Bibliometrics is also named as quantitative analysis of bibliographic features of a body of literature”. Nicholas and Ritche (1978) defined, “Bibliometrics is the statistical or quantitative description of a literature”. According to Sengupta (1990) bibliometrics is the “organization, classification and quantitative evaluation of publication of pattern of all macro and micro communications along with their authorship by mathematical and statistical calculation. The importance of bibliometrics can be judged from the fact that it is not merely a theoretical discipline as many think. It has practical applications in library management or in measuring the quality of journals. Extensive research and studies are however, needed in bibliometric, owing to its immense importance not only in library documentation and information centres, but also application in science policy research (Kabir, 1997). Above definition shows bibliometrics aims at the examination of the statistical distribution of the processes related to –
• The Utilization of document
• Library staff and library users.
• Library users.

It helps to evaluate information and to handle the information in libraries and information centers by the quantitatively analyzed information.

1.3.6 Scientometrics

Scientometrics is a newly emerging field that investigates quantitative aspects of science, it is the quantitative arm of the science of science, scientific communication studies, and science policy studies, the term ‘scientometrics’ is very recent term. It is often used with the same meaning as the bibliometrics to mean the application of quantitative methods to the history of science, but is now generally used as a generic term for a variety of research approaches with in the study of science. That quantifiable aspect of science can be utilized to access the characteristics of science (Davis, 2001). It is a formed structural part of science of science methodology including, the complex of mathematical and statistical method, used to analyse the quantitative characteristics of science as an enterprise (Voverience and Trumpiene, 1994). According to Nalimov and Mulchenk (1969) “Scientometrics is the investigation of science as development of information process”.

1.3.7 Informetrics

Informetrics is a term synomymous and analogous to bibliometrics. It is a concept introduced and practiced by “International Federation of Documentation” (IFD) considered information a very important commodity which is the basic component for the growth and development of the socioeconomic structure of a country. The term “informetrics” was suggested by German scientists Blackert and Stegel in 1979 as a newly formed branch of science, using mathematical and statistical methods to investigate scientific and technical information on theoretical level and practical information activities (Voverience and Trumpiene ,1994). In 1980 the term was proposed for research, while bibliometrics and scientometrics refer to all quantitative aspect and modes of printed media and services, informetrics is not limited to media or scientific communication. Neither is it restricted to scientific research. Informetrics is, thus an emerging sub-field in information science, which is
based on the combination of advance of information retrieval and quantitative studies of information flow. The scope of informetrics is –

- Definition and measurement of information.
- Time and characteristics of retrieved performance measure

1.3.8 Webometrics

Webometrics is a new research field in Library and Information Science applying quantitative bibliometric methodology such as publication analysis, citation, cluster analysis to the 3Ds that is distributed, diverse and dynamical information space of the web, including webpage content, links structures, search engine and user searching and browsing behavior. Webometrics is quantitative and quantitative study of web related phenomena, originated in the realization that method originally designed for bibliometrics analysis of scientific journal articles. Citation pattern could be applied to web with commercial search engines, providing the raw data. The web impact factor (WIF) was developed by Ingwerson to measure the impact of a web area by the number of links it receives. WIF calculations were found to be a crude instrument for webometric studies webometric research want search engines and an academic web crawler have been used. The both have advantages and disadvantages. Some times it is ore appropriate to use a search engine at other times it is more suitable to use a personal web crawler (Li, 2003). Cybermetrics is a generic term for the study of quantitative aspect of the construction and use of information resources, structures and technology on the whole internet, drawing on bibliometrics and informetric approaches cybermetrics thus can compass statistical studies of discussion grouping mailing list and other computer communication on internet including www webometrics and cybermetrics are currently the two widely adopted terms used as synonymous (Kretschmometer, 1999; Wormell, 1998).

1.3.9 Three laws of Bibliometrics

The three fundamental laws which leads to the formation of bibliometrics.

1.3.9.1 Lotka’s Law

This law provide fundamental theoretical base for bibliometrics study involving authorship. Scientific productivity is frequently measured in terms of the publish output, mostly because the data on the number of publication by authors can be easily collected and are quite reliable. In other words the law correlates the number

1.3.9.2 Bradford’s law

Bradford’s law provide the fundamental history of bibliometrics. Bradford’s law made in 1934, described the scattering pattern of journal in the area of applied geophysics lubrication. Law of scattering describe the distribution of documents usually journal in the discipline or problem area. Bradford’s law begins with a regularity which is observed in the retrieval or use of published information (Drott, 1981; Singh, 2007; Bandyopadhyay, 1999; Afolabi, 1983).

1.3.9.3 Zipf’s law

“Describing word frequency ranking”, it develop an external or empirical law, governing a relation between the ranks of the word and frequency occurrence in a long text. The word are arranged in their decreasing order of frequency then the rank of any word of the text will inversely proportional to the frequency of occurrence of the words. One commentator the statistician Gustav Hwerdan, has put it : “Mathematicians believe in (Zipf’s law) because they think that linguists have established it to be linguistic law, and linguists believe in it because they, on their part, think that mathematicians have established it to be a mathematical law” (Gustav, 1966; Wyllys, 1981).

1.3.10 Other Empirical laws

K.P.Vijayakumar (1997) in his article ‘Applications of bibliometrics in Library and Information Centres’ says that much of the later bibliometric studies were made either to substantiate, modify, extend, link or challenge these three empirical laws:

1.3.10.1 Price’s square root law of scientific productivity

This law states that “half of the scientific paper are contributed by the square root of the total number of scientific authors.

1.3.10.2 Garfield law of concentration

Garfield talked about the number of journals involved in publishing the literature of a single field.
1.3.10.3 Sengupta’s law of bibliometrics

This is basically an extension of the Bradford’s law. It states that “during phases of rapid growth of knowledge in a scientific discipline, articles of interest to that discipline appear in increasing number of periodicals distant from the field (Mahapatra and Kaul, 1992).

1.4 Objectives of the study

The main objective of the present study is –

1. To analyze the citation of Ph.D. theses on Pure Sciences awarded by the North Maharashtra University, Jalgaon.
2. To find out (form-wise) the types of cited documents.
3. To find out the chronological distribution of the cited documents.
4. To find out the authorship pattern of cited document
5. To rank the cited journal.
6. To rank the cited books.
7. To find out the language-wise distribution of cited documents.
8. To find out the geographical distribution of cited documents.
9. To find out the Indian and Foreign distribution of citations.
10. To rank the cited web-resources.
11. To rank the cited authors.
12. To rank of the publisher.

1.5 Hypotheses

The following hypotheses are formulated in the study.

1. Male researchers are dominant than female researchers in their subject area.
2. Journals are the major documents cited in maximum.
3. Multiple authors are pre-dominant than single author.
4. English language is a pre-dominant language.
5. Researchers mostly prefer Foreign Publications.

1.6 Scope and Limitation

The study is based on citations given at the end of the theses of which the researcher has used for the preparation of theses. The present study is based on 45517 citations appended at the end of 225 Ph.D. theses in Pure Sciences, awarded by North
Maharashtra University, Jalgaon. The span of 16 years was taken into consideration that is from 1995 to 2010.

1.7 Population sample

Pure Science includes Environment Science, Geology, Applied, Geography, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics, Statistics, Botany and Zoology.

Out of the above subjects only 11 subjects were taken for the study, viz. Environment Science, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics/Statistics, Botany and Zoology. The arrangement of the subjects is done as per the School concept appear on the Official Web site of the North Maharashtra University, Jalgaon and also represented in Table 3.1.1. The subject wise distribution of theses covered under study is given in table no. 1.1.

Table No. 1.1 : Number of theses

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Departments</th>
<th>Total Theses</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environment Science</td>
<td>10</td>
<td>1505</td>
</tr>
<tr>
<td>2</td>
<td>Microbiology</td>
<td>15</td>
<td>3415</td>
</tr>
<tr>
<td>3</td>
<td>Biochemistry</td>
<td>05</td>
<td>958</td>
</tr>
<tr>
<td>4</td>
<td>Biotechnology</td>
<td>16</td>
<td>2867</td>
</tr>
<tr>
<td>5</td>
<td>Chemistry</td>
<td>60</td>
<td>12078</td>
</tr>
<tr>
<td>6</td>
<td>Physics</td>
<td>37</td>
<td>8791</td>
</tr>
<tr>
<td>7</td>
<td>Electronics</td>
<td>10</td>
<td>1452</td>
</tr>
<tr>
<td>8</td>
<td>Computer Science</td>
<td>04</td>
<td>368</td>
</tr>
<tr>
<td>9</td>
<td>Mathematics</td>
<td>09</td>
<td>790</td>
</tr>
<tr>
<td>10</td>
<td>Botany</td>
<td>38</td>
<td>8692</td>
</tr>
<tr>
<td>11</td>
<td>Zoology</td>
<td>21</td>
<td>4601</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>225</strong></td>
<td><strong>45517</strong></td>
</tr>
</tbody>
</table>

1.8 Research Methodology

Research is common parlance refers to a search for knowledge. Redman and Mory in 1923 defined research as, “Systematized effort to gain new knowledge” (Kothari, 1990). Research methodology is a way to systematically solving the
research problem. It may be understood as a science of studying how research is done scientifically. According to P.V. Young (1960), “Research methodology, is the systematic method of discovering new facts and verifying old facts, their sequence, inter-relationships, casual explanations and natural laws which govern them” (Kothari, 1990).

There are various types of research method as follows:

- Descriptive and Analytical research.
- Applied and Fundamental research.
- Quantitative and Qualitative research.
- Conceptual and Empirical research.
- Field and Table research.
- One time and longitudinal research
- Survey research method.
- Sampling research method.
- Historical research method
- Scientific research method etc.

The present study adopted sampling method. The method is very old and popularly known in all human societies. Present day it is widely used. A sample means, a smaller representation of large whole (Kothari, 1990; Panneerselvam, 2004). The present study entitled, “Citation analysis of the Ph.D. theses in Pure Sciences awarded by North Maharashtra University, Jalgaon during 1995 to 2010. For this study 225 Ph.D. theses of Pure Sciences were chosen as a sample from the year 1995 to 2010, there are 45517 citations appended in 225 theses. The data was collected from the bibliographical entries listed at the end of the theses, which was used by the researcher for completing the theses. The citations were photocopied and the data was collected. The analysis was done by using various parameters.

1.8.1 Data collection

The bibliographical entries listed at the end of the 225 Ph.D. theses of Pure Sciences awarded by North Maharashtra University, Jalgaon were photocopied for further Analysis.
1.8.2 Data Analysis

Analysis of 45517 citations appended at the end of the 225 Ph.D. theses was done by using various parameters like to identify the core journals, to rank the cited author, to rank the cited journal, to find out chronological distribution of citation, to find out the geographical distribution of citations, to find out the types of cited document.

1.9 Summary of major conclusions

The analysis of data on the basis of the different variables considered helped in reaching some important conclusions.

1. The Present Study cover the theses submitted during 1995 to 2010. Over all 236 theses were awarded to the university from Pure sciences of the subjects undertaken in the study. Only 225 (95.34 %) theses were available for the study, remaining 11 (4.66 %) theses were not available. Hence, 225 theses were considered for the present study.

2. Out of the total 236 theses awarded to the university, maximum are awarded in 1995-2000 (15.25%), 2001-2005 (36.44%), and 2006-2010 (48.31 %). A steady growth can be seen in research of Pure Science.

3. Amongst the total theses 236 awarded, 200 (84.75%) are male researchers while, 36 (15.25 %) are females. This indicates that, “Male researchers are dominant than female researchers in their subject area” (hypothesis no.1) is valid. This scenario is observed in overall the subjects in Pure sciences.

4. The average citation per thesis for Environment Science, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics/Statistics, Botany and Zoology is 0.66; 0.44; 0.52; 0.56; 0.50; 0.42; 0.69; 1.09; 1.14; 0.44 and 0.46 respectively. The overall average citation per thesis for 225 theses is 0.49.

5. Of the total 45517 citations the highest percentage i.e. 81.02% of citations were Journals, followed by 13.26% citations were from Books, 6% from reports, 2.54% from Conference proceedings , 1.90% from Thesis and remaining 1.28% citations from Reports, Patents and Web, etc. This indicates that, “Journals are major documents cited in maximum” (hypothesis no. 2) is valid.
6. During the years 1991 to 2010 (20 years) time period the citations are 20203 (44.39%), followed by 9486 (20.84%) during the year 1981-1990 and 13859 (30.45%) citations during 1798 to 1980 (182 years) time period and 1969 (4.33%) citations do not have any year of publication.

7. Out of total number of 45517 citations 12760 (28.03%) are by single author, followed by 28188 (61.93%) citations by multiple authors and 4569 (10.04%) citations have no authors. This indicates that, “Multiple authors are predominant than Single author” (hypothesis no. 3) is valid. This has been observed in all the subjects.


9. Out of 45517 citations, all 45517 (100%) are cited in English language, only. This indicates that, “English language is a predominant language” (hypothesis no. 4) is valid.

10. Out of 45517 citations, 7796 (17.13%) citations are Indian, 33272 (73.10%) are foreign citations while 4449 (9.77%) geographical area could not be traced out. This indicates that, “Researchers mostly prefer Foreign publications” (hypothesis no. 5) is valid. This hypothesis is valid in all subjects.

11. In overall citations amongst Countries, USA tops the position having maximum citations, followed by UK, India, Netherlands, Canada and Germany. This indicates that, “Researchers mostly prefer Foreign publications” (hypothesis no. 5) is valid.
12. In overall citations amongst States, New York tops the position having maximum citations, followed by London, New Delhi, North Holland and Maharashtra. This indicates that, “Researchers mostly prefer Foreign publications” (hypothesis no. 5) is valid.

13. In overall citations amongst Places, New York tops the position having maximum citations, followed by London, New Delhi, Washington and Amsterdam. This indicates that, “Researchers mostly prefer Foreign publications” (hypothesis no. 5) is valid.

14. “Gadd, G M” author is cited in majority and hence tops in Environment Science. “Neilands, J B” author is cited in majority and hence tops in Microbiology. “Kothari, R M” author is cited in majority and hence tops in Biochemistry and in Biotechnology also. “Nikam, P S” author is cited in majority and hence tops in Chemistry. “Joshi, M S” author is cited in majority and hence tops in Physics. “Patil, D S” author is cited in majority and hence tops in Electronics. “Pawar, B V” author is cited in majority and hence tops in Computer Science. “Mathur, S N” author is cited in majority and hence tops in Mathematics. “Hydee, K D” author is cited in majority and hence tops in Botany and “Lomte, V S” author is cited in majority and hence tops in Zoology.

15. The ranking list of web-resources to help the research scientist to select the web-site of maximum utility in relation to their coverage of new and important literature in particular subject area. Out of 45517 citations only 160 (0.35%) citations are cited as web resources. This indicates that their in lack of awareness of use of Internet amongst the pure science researchers.

The result of the study would be useful to researchers to select the documents for their studies and useful to librarian for planning and managing the information sources.

1.10 Conspectus

The thesis has been presented in five chapters.

Chapter No.1

The objective of the present chapter is to highlight need and importance of the study, objectives, hypotheses, sample, and methodology of the study.
Chapter No.2
The purpose of the present chapter is to focus on scanned literature on citation analysis.

Chapter No.3
The chapter consists of the history of Department of Environment Science, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics/Statistics, Botany and Zoology, North Maharashtra University, Jalgaon.

Chapter No.4
The basic purpose of the present chapter is to analyse collected data, presented in the forms of tables and figures.

Chapter No.5
The present chapter deals with findings, conclusion and suggestions.

Bibliographical references.

Appendix

References


Vijayakumar, K.P. (1997). Application of bibliometrics in libraries and information centers in Devarajan Bibliometric Studies, Delhi, ESS.


