CHAPTER 1
INTRODUCTION

1.1 Introduction

Library and Information Science is a multidisciplinary, multicultural field of activity. It has the capacity to assimilate relevant ideas from different fields of knowledge. It incorporates practices from many authors from different fields of knowledge. The recorded knowledge comprised in the collection of a library is a surrogate for cultural transfer of knowledge from place to place. In fact the knowledge transfer that occurs between professionals in many fields of knowledge is primarily through records. Librarianship has the capacity to adapt and adopt new ideas, practices and techniques for providing user oriented services.

1.2. Definitions

Pritchard is generally credited with coining the term “BIBLIOMETRICS” to describe “all studies which seek to quantify the process of written communication.” He defined it as, “the application of mathematical method to books and other media of communication.” Fairthorne defined bibliometrics as the “quantitative treatment of properties of recorded discourse and behaviour appertaining to it.” Hawkins in 1977 interpreted bibliometrics as “quantitative analysis of the bibliographical features of a body of literature. Potter in (1981) defined Bibliometrics as the “study and measurement of the publication patterns of all forms of written communication and their authorship.” According to ALA Glossary of Library and Information Science, Bibliometric and similar studies involve “the use of statistical methods in the analysis of a body of literature to reveal the historical development of subject fields and patterns of authorship, publication and use”. The scope of Bibliometrics is according to Simon, “studying the relationship within a literature or describing a literature”.

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1.3 The Need for the Study

Bibliometric studies try to portray a certain kind of human behavior with respect to the flow of information. They reveal how authors in a particular subject organize and communicate their intellectual efforts. Baerman enumerates that “From the shape of things, one can better understand how things happen.” Similarly Frohmann has observed that “Just as a command of geography aids navigation, a good representation of the structural characteristics of a discipline helps both researcher and scholar to identify issues and problems in the field. Schrader reveals that, “Bibliometric research aims at visualizing and describing the authors who create such structural patterns, with particular emphasis on their publication habits.”

1.4 Importance of Bibliometric Studies

Bibliometric studies have been gaining momentum in the field of information science in recent years. It is interesting to note that during the last few years, bibliometric analysis has been increasingly used to evaluate the research performance of the scientists and the growth of various disciplines.

The enormous growth of literature, increased cost of written communication and shrinking library budget have made it difficult for the library professionals to cater to the information needs of the researchers. The situation demands for an effective means of measurement of the growth of literature, recognition of researchers who have had major impact in their discipline, recognitions of core journals in their discipline and identification of trends in the discipline etc. for framing effective library policies by the professionals. Results of such studies also help the policy makers to decide priorities in resource allocation for social activities. In this direction, a number of studies have been undertaken by library and information professionals to evaluate written communication by applying mathematical, statistical and operation research technique, commonly known as Bibliometrics. At present Bibliometrics has been established as a viable and
distinctive research technique for studying the social science based on authorship trend, bibliographical and citation data.

1.5 Communication – An Important Factor

The effectiveness of scientific research performance could be realized through a proper communication system. Hence the prevalence of an effective and systematic communication in social science is the most important factor. In support of this statement one can proclaim that science is meaningless unless the information in the process of discovery is recorded, stored and disseminated in the right direction. In the context, it is argued that communication is an event and a social activity. Hence communication in science could be viewed from the standpoint of a historian and a sociologist as well. One cannot merely say that it is an event in time, but it is also a process and means to an end. Communication envisages measuring the scientific movement, depending on the level of dissemination and effectiveness of information. Thus science and scientific communication are so inextricably intertwined that each makes constant influence on the other generating more information.

1.6 Information Explosion

When writing about science and scientific literature, one should focus on the attention of the nature of information and the class of professionals who contributes and gets benefited. It is observed that when the generators and the users are alert, information dissemination happens rapidly and permeates into the literature of the subject. All bibliographical aids developed by librarianship are designed to hasten this process.

Yet another important aspect of science is information explosion. It could be identified that as science progresses, scientific literature has also grown in quantity and complexity. It creates an imbalance between the individual’s capacity to comprehend the rate at which information proliferates. This process is referred to as Information Explosion. It necessitates the
emergence of a new class of professionals variously called Librarian, Bibliographer, Documentalist, Indexer and Information Scientist. The main mandate of the profession is to assure an error free transmission of information and their chief concern is to review and control the literature of science by studying its various aspects.

Regarding growth and development of science and scientific literature in India, it is imperative to study connectivity of Indian research to international research through journals and collaborative contracts. In favour of this aspect, it is inferred that more than 90 percent of the world research papers have been published in a few advanced countries of the OECD and Eastern Europe. Contrastingly in developing countries like India, a little attention has been paid to the scientific output and its impact.

1.7 Focus of the study

The major focus of the study is to apply the bibliometric analysis in describing the features of Indian research in one area of research activity which is important for its economic prosperity. The analysis of the research activity is of immense value with its rich potentiality. It could be attributed to the research contributions in the field of Social Science. The study of the growth and development of Social Science research may help to identify the areas which have not received the adequate attention of the scientists. A study of the existing level of performance based on the research contributions will enable the scientists in future to identify and concentrate on the neglected areas of research. Further it may also encourage and motivate the young scientists to make individual research contributions. This study aims at examining the emergence of research areas, research groups and countries with a view to map the cognitive or intellectual structure of research. Further it depicts the relations between authors, institutions, journals and articles as a means of assisting the peer review.
Bibliometric studies hitherto have proved that a bibliometric indicator plays an important role in social policy decisions and in the evaluation of research performances. There is considerable evidence that bibliometric indicators play an important role as evaluator tool of the performance of an individual research group.

1.8 Growth of literature

High quality output will reflect their due impact on the basis of content and utility. However, the medium and mode of dissemination of knowledge too is equally important. The validity of the output depends on the effective mode of communication, especially through published articles in scientific journals. Journal articles form the authentic record of information for effective dissemination in the present and for the future. Hence the need to examine the characteristics of good journal articles is a must in the information world.

In general, a journal article is not an immortal unit of communication unless it is recorded and preserved. It has to be written, published, examined by peer group, retrieved, referred and preserved for posterity. First it emerges as the private property of an author or researcher. But to make a proclamation of its contents, it has to be published and made known. It is a fact that the private property becomes authenticated only when published. A scientific paper is either accepted or rejected after scrutiny by a team of subject experts or a peer group who examine the validity of the information and determine the expertise of the scientists. Thus the research articles published in important social journals create avenues for further investigation and remain a treasure for the posterity.

All research articles add information to existing knowledge. But as years pass by some information becomes obsolete, while other articles are still worthy for inquisitive budding scientists who make active use of this information and contribute more research articles in the field. This reflects
the enriched quality and high standard of the research contribution with respect to the content, meaning, implication and coverage of research focus. Hence a study of the scientific contributions in the light of its content and meaning is the salient feature of Library Science.

1.9 Implication of Bibliometric Studies

The implication of Bibliometric studies is of manifold significance in any field of analysis. In this context it is relevant to examine a great deal of literature existing in library science which has discussed the problem of identifying important literature in any area. The studies of scientific literature indicate that the Librarian and Information Scientists have spent a great deal of time to understand the nature of a scientific, use of information and literature.

It is observed that as a result of the extensive research in the communication of information by scientists, there is a need of a great deal of work to be done with respect to the nature of scientific literature particularly using quantitative mode. Such studies mainly fall under the purview of bibliometric analysis. Generally bibliometrics is an application of mathematical and statistical methods to books and other mass media of communication.

In recent years, the bibliometric techniques have become very popular. The literature on bibliometrics has been growing over the two decades. It reveals that it is a measurement of the pattern of all forms of written communication and their authors. The new form and component of professionalized communication system should consist of foot-notes and reference with the text written in an impersonal language and also elimination of subjectivity.

While communicating the information through papers, the following attributes should be borne in mind. Every paper should have a set of document descriptions such as author, title and imprints of the journals in which it appeared. Functionally these document descriptors of a paper help to
identify the paper uniquely. Sometimes the authorship of the paper is assigned to more than one person. In most modern research papers, two or more authors are responsible for the research communicated by them. The title is structured with a certain number of keywords and they have some correlation to contents, and the subject of a paper is a combination of a number of factors or categories. It is evident that the communication system and the network of journals play a very important role in the exchange of scientific and technical information.

The study of the growth of literature in bibliometric analysis is an important aspect. It should be noted that the growth of literature has made it difficult for the scientists to keep in touch with the latest advances in their disciplines. It is the responsibility of the Librarians to meet the information needs of scientists in various disciplines. The published literature is taken as a yardstick to measure the knowledge in a discipline. The growth rate analysis of publication would yield some useful results regarding growth pattern of literature and scientific productivity of authors in that discipline. This has received the attention of various researchers.

The growth of scientific output depends on the number of researchers and the level of intrinsic and extrinsic motivation and the resources available to the research institutions in a specific time or during a certain period. This aspect could be examined by evaluating the research output and performance of scientists both at the aggregate level and at the institutional level. This analysis would assist the planners to identify the progress and deterioration of research over a period of time and plan for further progress in the respective field.

1.10 Need for Study of Collaboration

In Bibliometric analysis, the nature of research contribution in terms of collaboration should receive the due weightage. Generally, collaboration in research appears to have taken place when two or more investigators work
together as a team on a project and contribute resource and efforts both intellectually and physically. Collaboration in research increases with the increased interactions among experts. It has been found to be influenced by other functions, such as nature of the research project, availability of research grants, utilization of man power, magnitude of instrumentation, popularity and the rate of expansion of the areas of social science.

1.11 Ranking of Journals

Ranking of journals is an important factor in bibliometric analysis. The ranking of journals enables one to identify the core journals in a specific subject. It aims to identify the most relevant journals according to its productivity. The popularity of the journal is reflected in the cited reference. Hence the analysis of the growth rate of research output helps in understanding the growth and developing trends of research in general and the performance of an individual, institution, state and country in particular. Such study helps to:

- Frame useful policy to determine the resource allocation in those areas which are showing progressive trend.
- To explore a broad way of growth and development of different fields of subjects.
- To formulate useful social policy.

1.12 Bibliometric Study of Citation Analysis

Citation Analysis is one of the important and quite an old branch of bibliometric study. When a document refers to another document, the latter is called the cited document and the former the citing document. Brief description about the cited document is known as citation which includes the name of author, document, pages, and year of publication, place etc. The pattern of citation also differs from publication to publication. The citations are also called references, readings and they may appear as endnotes as well as foot notes.
Citations are “frozen footprints” in the sands of scholarly achievements of the ‘signposts’ left behind when the information is utilized. Linda C. Smith observes that a reference is the acknowledgement that one document gives to another and a citation is the acknowledgement that one receives from another. Thus, there is an implied relationship between the cited document and the citing document. This assumption has led to a number of studies, focusing on citations counts (Gross and Gross), impact factor (Garfield), bibliographic coupling (Kessler), co-citation (Small) and citation indexes.

In the beginning, the citation counts were used to determine the importance of journals. This method focused purely on statistical and quantitative nature and completely ignored the qualitative aspect of the work. This approach gradually diminished when analysts started examining the citation more closely. Thus, a qualitative dimension of citation analysis has now been increasingly emphasized.

- **Objectives**

The articles produced by the scholars not only reveal the new areas of research, theories and recent developments in the field, but also provide a list of references or citations, usually appended at the end of the articles or in the form of foot notes, indicating the previous publications related to that particular field or theme. Study of these citations is one of the methods to ascertain what information a researcher or a scholar uses seriously in the course of this research.

The citation analysis studies are based on citations appended to a publication such as a research paper, a review paper, technical communication and thesis etc. Early citation studies were frequently based on list of references provided in articles appearing in a limited number of journals. An earlier citation has to be transcribed and manipulated manually. But today computerized indexes presents the citation data in the machine readable form.
• **Applications**

Citation analysis has two broad areas of application. One of them is suitable for Librarians where citations are used as a tool to find out various features of literature use like type of documents, languages, age, country of origin, subject distribution, highly cited authors, journals, citation rate, and authorship pattern. The other kind of study of citations is mainly useful to derive the research activity in a field of study.

• **Literature of studies**

Here citations in a particular subject area are to be studied to describe the pattern of citation. The source for this kind of analysis may be limited to a single journal in a field, or they may cover many sources, including type of materials in addition to journals. The characteristics and types of cited materials are frequently examined in citation analysis. It may also include changes in the characteristics of literature over a specific period of time. Studies like bibliographic coupling and co-citation have been used to create mapping of the micro and macro structures of subjects and relationships of disciplines.

• **Type of literature studies**

Citation analysis can be used to gauge the dissemination of results reported types of literature such as government documents, dissertations, or the exchange of literature of regional scientific societies. The source of citations used for analysis clearly can determine the generality of one’s conclusion in this type of study.

The scientific importance of a paper can be measured in terms of the extent to which it is used by the others, i.e. the number of times it is cited. The knowledge of comparative importance of library materials is of great help in the selection and acquisition of documents within the available budget.
1.2 Research Design

Multiple authorship is an increasingly common phenomenon in modern science. Once it was relatively a rare phenomenon. But now it has become the norm in many disciplines and the rate of changes varies from time to time. Multiple authorship has become correlative with collaboration and despite the problems of interpretation; collaboration in research can apparently be measured with the multiple authorship. Hence a study is undertaken to study the authorship trend.

1.2.1 Technique of authorship studies

To conduct such authorship studies, the authors of publication are the main elements of study. The researchers after completion of a project or on completion of an area of study write the results in the research papers and publish them in the form of articles in different journals and books. The published research papers along with its text, the name and address of author(s) are responsible for the results of the works. While conducting the authorship study, the name and address of the authors who have contributed the articles are to be collected against each of the articles. The sources of collection of these data are mainly the indexing and abstracting periodicals. But it can also be collected directly from the journals and books. After collection of data, they are to be grouped as per the kinds of authors. The data may further be sub-grouped as single author, two authors, three authors, and above four. A grouping can also be made on the basis of their state or country of origin and the organization where they work. The study is generally carried out for a longer period such as thirteen years or more to give better results. The different facets of authorship studies are categories of authors, collaborative researches carried out by them, rate of citation of authors of different country, determination of core authors in a field, the rate of productivity of authors, rank of authors, institutions, and countries as regard to their productivity.
1.2.2 Bibliometrics in Authorship Study

Bibliometrics is “the application of mathematical and statistical methods to books and other media of communication” and “to shed light on properties of the written communication, by means of counting and analyzing its various facets of written communications.” Hence, the investigator has used this methodology for studying the multiple authorship trends and collaborative research. “Social Science” as different country Journal by Directory of Open Access Journals has been consulted for the purpose of collection of data. The relevant data of the authors and institutions were collected from the issues for 13 years (2002 - 2014), analyzed and tabulated for results and discussions.

1.2.3 Statement of the Problem

The study of research output has received the attention of various researchers, policy makers and planners. India is one of the predominant countries in the world in having a longer coastal. The effective and systematic utilization of information resources depend on progressive advancement in exploitation of resources.

Hence a proper assessment of the research productivity of Bibliometrics is highly essential in the present study. In India, research activities in the field of information studies are carried out in Central Institutions, Regional Research Stations, Colleges and Universities. However, the research performance of information studies varies from one institution to another depending on the aims and objectives of the institution. It is to be noted that some institutions are established exclusively and devoted to promotion of research activities, whereas Colleges and Universities are engaged in Teaching, Research and Extension activities.

The performance of activity in terms of author productivity is gaining importance. The scientific productivity of any institution depends on the efficiency of the scientists and the availability of adequate resources and
infrastructural facilities. The performance of any institution is determined by the policy and grants received from the Government. Further the degree of concentration of research in different areas of social science varies from one field to another and also from one institution to another. Hence a proper identification and assessment of the area which gets more concentration is the important reflection of the present study.

The Bibliometric analysis of the Research Productivity of information studies over a decade is a systematic study which reflects the progressive trend in the field of social science based on published papers in “DOAJ”. There is gap in bibliometric study conducted in this field. Hence the study is undertaken to fill up the gap present in this field.

1.2.4 Objectives

The researcher has framed the following objectives for the purpose of the present research.

1. To find out volume wise distribution and average number of contributions per volume.
2. To find out the authorship pattern.
3. To calculate the volume wise degree of collaboration.
4. To find out the statistics of distribution of contributions in various fields of Social Science.
5. To find out the institutional contributions in the journals.
6. To determine the geographical distributions of contributions in the journal.
7. To find out the citations distributed in the journals.

1.2.5 Hypotheses

1. There is no significant growth in the Research Publication in the Social Science Journals.
2. There is a significant change in relative growth rate article publishing in Social Science Journals and also the doubling time.
3. Significant difference in the contributions made by Single author articles and a difference in Co-author articles.

4. There is no significant relationship between the number of citations and number of research output.

5. Significant difference in the relationship between the journal citations and research output and also the book citations and research output.

6. There is significant difference in Indian authors and other country authors in the selected Social Science Journals.

1.2.6 Scope of the Study

The researcher has taken ten social science journals published in The United States of America, The United Kingdom, Canada, Germany, France and Denmark. The researcher has taken the following ten Social Science Journals for analysis:

1. IASSIST Quarterly
2. Catholic Social Science Review
3. Disability Studies Quarterly
4. Electronic Journal of Contemporary Japanese Studies
5. Ephemera: Theory and Politics in organization
6. Surveillance and Society
7. International Journal of Multicultural Societies
8. Demographic Research
9. Journal of Artificial Societies and Social Simulation
10. International Journal of Qualitative Methods

These are directory of open access journals and satisfy the Bradford’s Law and so the researcher has selected these journals and the period taken study for is thirteen years from 2002-2014. The data downloaded from DOAJ was taken for analysis.
1.2.7 Limitations of the study

The selected ten social science journals for the study covers a period of thirteen years spanning 2002 to 2014, both years inclusive. Records for the analysis in this investigation have been downloaded from DOAJ. Though there are many social science journals available in the website, the study is limited to only ten journals as the other journals do not meet the requirements. It gives more weightage in analyzing the growth trend and performance in publishing research articles. Book Reviews, Panel Reports, Research Notes, Short communications and Review Articles have been excluded from study. English language articles and citations in English language alone were included for the study. Analysis of the institutional affiliation of the authors provides a picture of the author relative level of research output. Hence they are collected from the author(s) address given underneath each research article which gives the details of the institution where the research is undertaken.

1.2.8 Methodology

For the present study the journal DOAJ Social Science has been selected as the source journals.

A Total of 3091 Articles of the DOAJ Social Science Journals (2002-2014) have been taken for the study. The details regarding each published article such as title of the article, number of authors, their institutional affiliations and addresses, number of reference with list, page number, number of tables and figures etc., were recorded and analyzed for making observations.

1.3. Data Collection

The data used for the present study was obtained from the DOAJ. The data regarding the ten journals was collected from this site for 13 years (2002-2014) in the social science subject journals. The details of the journal regarding total number of articles, authorship pattern, pages, cited reference,
number of times cited in the database and title dealing with subjects was also downloaded from this site.

A total of 3091 records were retrieved for the analysis. The search strategy that has been employed for collecting the total records is as specified in following tables. The following tables were prepared using excel or word format wherever necessary:

- Growth of Literature
- Authorship pattern
- Types of Documents
- Page wise Distribution
- Institutional wise Distribution
- Geographical wise Distribution
- Subject wise Distribution

1.3.1 Directory of Open Access Journals

All scientific and scholarly subjects are covered. Scientific and scholarly periodicals that publish research or review papers in full text resources as well as academic, government, commercial, nonprofit private sources are all acceptable sources. The level target group for included journals should primarily be researchers. A substantive part of the journal should consist of research papers. All content should be available in full text in all languages. All content is freely available. Free user registration online is acceptable. There is Open Access without delay (e.g. no embargo period). Journal to be included should exercise quality control on submitted papers through an editor, editorial board or a peer-review system. The journal should have an eISSN.

Journals should report primary results of research or overviews of research results to a scholarly community. A serial appearing, or intending to appear, indefinitely at regular intervals and generally more frequently than
annually, each issue of which is numbered or dated consecutively and normally contains separate articles, stories, or other writings is also included.

1.3.2 Statistical Tools

Relative Growth Rate

In order to identify the relative growth rate, the researcher has adopted a model developed by Mahapatra. The relative growth rate is the increase in the number of publications per unit of time. The relative growth rate \( R(1-2) \) over a specified period of interval can be calculated from the following equation:

\[
\frac{W_2 - W_1}{T_2 - T_1} = R(1-2)
\]

Where \( R(1-2) = \) mean relative growth rate over the specified period of interval

\[
\begin{align*}
W_1 &= \log W_1 \text{ (Natural log of initial number of Publication)} \\
W_2 &= \log W_2 \text{ (Natural log of initial number of Publication)} \\
T_2 - T_1 &= \text{the unit difference between the initial time and final time.}
\end{align*}
\]

The relative growth rate for publications can be calculated separately \( R(a) = \) Relative growth rate per unit of Publication, per unit of time (Year).

Doubling Time

It is also calculated that there is a direct equivalence existing between the relative growth rates and doubling time. If the number of publications of a subject doubles during a given period, then the difference between the logarithms of the numbers at the beginning and at the end of the period must be the logarithms of the number 2. If one used natural logarithms, this difference has a value of 0.693. Thus, the corresponding doubling time for publication can be calculated by the following formula:
Doubling Time (Dt) = \frac{0.693}{R(a)}

therefore,

Doubling Time for Publications Dt.(a) = \frac{0.693}{R(a)}

**Exponential Growth Rate**

This has been generalized as a general law characterizing the growth of scientific literature and information in general. In exponential growth model of literature, the growth of knowledge is linked to compound interest. In other words increase of literature at a time is a fixed percentage of current amounts. With the knowledge of the periodic rate i.e., the number of years through which the growth rate is to be calculated for the original literature, calculation of the exponential growth rate can be done with ease. The formula for calculating exponential growth is given as:

\[ F(t) = ae^{bt} \]

Where,

\[ F(t) \] is the literature when the time elapsed is “t” years
\[ a \] is the initial size of literature
\[ “t” \] is number of years
\[ “e” \] is the natural base of logarithms whose value is 2.711828

**Logistic Growth Model**

The logistic growth model is characterized by lower limit (usually 0) and an upper limit or ceiling beyond which the size cannot grow. Mathematically the logistic growth is represented as:

\[ U_t = \frac{K}{1+\mu} \]

\[ U \] = Expected size of Literature
\[ K \] and \[ \mu \] = constants
\[ t \] = time
Degree of Collaboration

The degree of collaboration is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period of time. The formula suggested by Subramanyam is used.

K.Subramanym’s formula
The formula is
\[ C = \frac{N_m}{N_m + N_s} \]
Where
- \( C \) = Degree of collaboration in a discipline.
- \( N_m \) = No. of multiple authored papers.
- \( N_s \) = No. of single authored papers.

Using this formula, the degree of collaboration is determined.

Percentage analysis
Further, the researcher has applied various statistical tools to analyze the various empirical data such as percentage and average.

Other tools
The researcher has applied mean, Median, Mode, standard deviation, co-efficient of variation and average apart from the above statistical tools. Graphic and diagrammatic representations are presented wherever necessary.

Cauterization of the Thesis
Chapter I presents origin of bibliometrics, definitions, pioneers of bibliometrics, Statement of the problem, limitations, objectives, hypotheses, the statistical tools used for analyzing the data and how the data was retrieved from the Directory of Open Access Journals data base.

Chapter II deals with a comprehensive preview of literature comprising of studies in foreign countries as well as in India.
Chapter III throws light on the profile of ten Journals in Directory of Open Access Journals online Journals taken for analysis. The researcher focuses on the detailed description of the Journals.

Chapter IV analyses the data taken for study by applying various statistical tools.

Chapter V comprehensively summarizes the entire analysis and conclusions and suggestions.

References: