CHAPTER I

INTRODUCTION

1. BACKGROUND

1.1 Bibliometrics

This is an age of research and expedition in every field of knowledge. Consequent increase in the production of information is best reflected in the literature of every discipline. Scientific and technological research plays a very significant role in economic, social and physical development of a country. Scientific literature is the mirror of scientific research around the world. Research activities have resulted in considerable output of scientific literature and the number of periodicals has grown in every branch of science. There are large mass of experimental data in different disciplines. It is high time to arrange theories, improve methods and standardize the system of main ideas. It is almost universally recognized that the methodology of a scientific branch is an integral, inseparable part of scientific branch along with its history and organization.

Methodology of any scientific branch is considered to be formed when:

(a) Its special methods are identified;

(b) The system of general scientific and philosophical backgrounds are established;

(c) The research and development activities are acknowledged on the basis of its methodology
Recent developments in the field of science of sciences, i.e. library and information science may be looked into. These metrics are rapidly forming a system of methodologies which is now called as ‘Bibliometrics’. The literature in this field is growing rapidly

1.2 Genesis of ‘Bibliometrics’

The history of bibliometrics can be divided into three distinctive periods: Early period covering the years 1917 to 1925; the second period from 1925 to 1950 and the modern period from 1950 onwards. In the year 1917 Cole and Eales reported in the Science Progress about literacy survey covering a period of three hundred years of contribution in the field of anatomy produced by different countries under the title 'The Title of Comparative anatomy’. This may be regarded as the first contribution in the field of bibliometrics.

Humes (1923) analysed the author and journal entries in the International Catalogue of Scientific Literature (published by the Royal Society), ranked the results, country wise, and showed that Germany occupied the first place in the production of scientific literature during the period 1900-1913.

Lotka (1926) initiated the second phase of development in the field of bibliometrics by giving it a theoretical basis by proposing a law in the year 1926. He studied the frequent distribution of scientific papers by the authors.

Bradford (1934) reported his findings that major portion of the literature of any discipline is concentrated in a small number of core journals.
Zipf (1949) proposed his law of Least Resistance which is based on the frequency of word distribution in a document. In the same year Fussier studied the journals in the field of subject chemistry and ranked the journals in the decreasing order.

The modern period in the field of bibliometrics began from the year 1950. Eugene Garfield entered the field in 1955 with his contributions in Citation Analysis, and ever since Bibliometrics has developed into a powerful methodological tool in the research in Library and Information Sciences.

Gross and Gross were the first to study the scattering of reference in journal articles. In the year 1977, they ranked the journals in chemistry based on the citation counts. They were also responsible for studying the distribution of reference by age.

1.3 Definition

Pritchard coined the term 'bibliometrics' in 1969, in his article 'Statistical bibliography or bibliometrics' published in Aslib's publication Journal of Documentation and it was known as Statistical bibliography. The word 'biblio' is derived from the combination of Latin and Greek word 'byblion'. It was a variation of the word byblion equivalent to bybl(os) meaning book, paper which in turn, was derived from the word byblos, a city of Phoenicia noted for its export trade in paper. The word metrics, on the other hand indicated the science of mere i.e measurement, and is derived from the Latin or Greek word metricus or metrike respectively, each meaning measurement. Pritchard further elucidated the term as the 'Metrology of the information transfer process and its purpose is analysis and control of process'. The British Standards Institution defines bibliometrics as 'The study of the use of documents and patterns of publication in which mathematical and statistical methods have been applied.'
Merton and Garfield (1963) defined bibliometrics as the “field of inquiry given over to the quantitative analysis of science and scientific field”.

Pritchard defined it as “the application of mathematical and statistical methods to books and other media of communication”. He also explained it as “the metrology of the information transfer process and its purpose is to analysis and control of the process”.

Fairthrone (1969) defined the term as, “the quantitative treatment of the properties of recorded discourse and behavior pertaining to it”. The British Standard Glossary of Documentation of Terms (1976) explained bibliometrics as, “the study of the use of documents and patterns of publication in which mathematical and statistical methods have been applied”. This is basically similar to Pritchard’s definition.

Hawkins (1977) interpreted bibliometrics as “quantitative analysis of the bibliographic features of a body of literature.” Nicholas and Ritchie (1978) in their book entitled literature on bibliometrics stated that “bibliometrics provides information about the structure of knowledge and how it is communicated”.

Potter (1981) editor of Library Trends defined the term as “the study and measurement of the publication patterns of all forms of written communication and their authors”.

Morales (1985) used the term informetrics to cover almost all the aspects of bibliometrics and librametrics. According to Broadus (1987) “Bibliometrics is the quantitative study of physical published units or bibliographic units or surrogates of either.”

Sengupta (1990) viewed bibliometrics as “organisation, classification, and quantitative evaluation of publication patterns of all macro and micro communications along with their authorship by mathematical and statistical calculus”.
1.4 The Pioneers of Bibliometrics

In 1926, Alfred J. Lotka proposed his Inverse Square Law correlating contributions of scientific papers to their number of contributions. His law provided fundamental theoretical base for bibliometric studies involving authorships. He was interested in determining “the part which men of different caliber contribute to the progress of science “For this, he checked the decennial index of ‘chemical abstracts of 1907-1916 and counted the number of names against which appeared 1, 2, 3 etc., entries. He tabulated the data for 6,891 names; beginning with the letter ‘A’ and ‘B’ similarly the data from Auerbach’s term 'bibliometrics' Geschiehtafein der physic was also collected for the 1325 physicists. Lotka (1926) then plotted the graph on the logarithmic scale, the number of authors against the number of contributions made by each author and he found that in each case the points were closely scattered in a straight line, having a slope of approximately two to one. On the basis of these data, Lotka deduced a general equation, for the relation between the frequency ‘y’ of persons making ‘x’ contributions as follows:

\[ X^n y = \text{constant} \]

And for the special case \( n=2 \), the constant is 0.6079. Further he summarized the results as follows:

“In the case examined it is found that the number of persons making 2 contributions is about one-fourth of those making one contribution, the number making ‘n’ contributions is about \( 1/n^2 \) of those making one and the proportion of all contributions is about 60%”. In other words, for every 100 authors contributing one article, 25 will contribute two articles, about 11 will contribute 3 articles and 6 will contribute 4 and so on.
Though the law was based on the study of chemistry and physics literature, later it has generated much interest and attached the attention of researchers and it has been applied and tested in many other fields.

1.5 Bradford’s Law of Scattering

Samuel Clement Bradford, another pioneer of bibliometrics should be considered for his classic paper “Sources of Information on Specific Subjects”, which is the first paper published on the observations on scattering. Bradford examined two bibliographies prepared in the Science Library on Applied Geophysics and Lubrication and he prepared lists of journals arranged by decreasing order of source items contributed by the journals to the bibliographies. He noticed that in each subject there were a very few productive sources, large number of sources which were moderately productive and still a large number of constantly diminishing productivity. The whole range of periodicals was thus seen as a “family of successive generations of diminishing kinship, each generation being greater in number than the preceding, and each constituent of generation producing inversely according to its degree of remoteness.”

In the list of periodicals ranked by diminishing productivity, Bradford (1934) identified three groups of periodicals that produced approximately the same number of articles on the subject, but number of periodicals in these three equiproducive zones increased by a constant factor. He stated his law as follows “If scientific periodicals are arranged in order of decreasing productivity of articles on a given subject that may be divided into nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same number of articles as the nucleus when the number of periodicals in the nucleus and succeeding zones will be as 1 : n : n².”
Bradford also plotted graphs of the cumulative number of source items R(n) verses the logarithm of the cumulative number of journals (log n). The resulting graphs for applied Geophysics and Lubrication were similar to the graph shown below. Such a graph is sometimes called as Bradford bibliography.

The graph begins as a rising curve API and then continues as a straight-line. The rising part of the graph represents the nucleus of highly productive journals. The points p1, p2 and p3 on the bibliography are the boundaries of three equiproductive zones in which the same number of articles as the nucleus (represented by OY1 = y1y2 = y2y3) derived from an increasingly larger number of journals (represented by OX1, X1, X2 and X2, X3). The law attracted the attention of many researchers in the field and has been the main topic of many articles in the literature.

1.6 Zipf’s Law of Word Occurrence

Zipf developed and extended an empirical law, as observed by Estoup, governing a relation between the rank of a word and the frequency of its appearance in a long text. If ‘r’ is the rank of any given word and ‘f’ is its frequency, then mathematically Zipf’s law can be stated as follows:
rf = c, where 'c' is a constant.

His law states that in a long textual matter, if words are arranged in their decreasing order of frequency, then the rank of any given word of the text will be inversely proportional to the frequency of occurrence of the word. Thus, these three laws are respectively based on (i) number of authors contributing in a discipline or other field; (ii) distribution of articles in a set of journals; and (iii) ranking word frequency in a particular set of documents.

1.2 Bibliometrics: Its Important Applications

The techniques of bibliometrics have been extensive applications equally in sociological studies of science, information management, librarianship, history of science including science policy; study of science and scientists and also in different branches of social scientists.

The important applications of bibliometrics are:

(i) to quantify growth of a scientific discipline and its literature;
(ii) to evaluate the productivity and quality of research of an individual, organization and of a country;
(iii) to undertake sociological studies of science and scientists;
(iv) to study history of science and scientists;
(v) obsolescence study of scientific literature;
(vi) to predict scientific classics;
(vii) to identify core periodicals;
(viii) to initiate effective multi level network system;

(ix) to regulate inflow of information and scientific communication.

Thus bibliometrics is not merely a theoretical discipline, but has an extensive application. It is used to identify the pattern of publication, authorship, citation and behaviour of a subject over a period of time or at a given time and thereby offering insight into the dynamics of the area under study. Considering its contemporary significance, an attempt is made by the researcher to bring out a bibliometric analysis of nine Economic Journals.

1.2.1 Scholarly Communications

Scholarly communication means the study of how scholars in any field (e.g., physical, biological, social and behavioral science, humanities and technology) use and disseminate information through formal and informal channels. The study of scholarly communication includes the growth of scholarly information, the relationships among research areas and disciplines, the information needs and uses of individual user groups, and the relationships among formal and informal methods of communication.

Bibliometric methods are applicable only to the study of the formal channels of scholarly communication that is the written record of scholarship. In combination with data gleaned from other methods, they can provide a large, rich characterization of communication process which is not possible otherwise.

1.2.2 Introduction

Bibliometrics is of recent origin and relatively a new one, which has emerged as a research from in its own right in Information Science. It is now being vigorously pursued
and with the result, it has been found that one fourth of all articles published in Library
and Information Science periodicals are on bibliometrics and its related topics. It has also
been found in a large number of Social Science and Science periodical which carries a
large number of articles on bibliometrics.

1.3 Statement of the Problem

The United States of America has the world’s largest economy. The failure in the
US housing and credit markets has resulted in a slowdown in the US economy. The GDP
growth in 2007 was estimated at 2.2% but in 2008 it is projected to be just 0.9%, down
from the 10-year average of 2.8 percentages.

The role of government in the US economy is crucial when it comes to decision-
making regarding monetary and fiscal policies. The federal government takes all the
necessary initiatives to ensure the growth and stability of the United States.

Even though the U.S. financial system nearly experienced a total meltdown in late
2008, the truth is that most Americans do not have any idea about the happening to the
U.S. economy. In this reason the researcher has attempted to analyse the journals in
Economics and its contribution in Monetary and fiscal policies of the Government
epecially in the field of Public finance.

Bibliometrics is concerned with analysis of the characteristics of published
literature including: studies of dispersion of literature on various topics; statistical
analyses of content types, references, etc.; and citation and co-citation studies within and
across the particular disciplines.
Under such circumstances, the researcher has intended to undertake this study as it is observed that there is no such study in the literature of the Economic journals of US and UK. The research topic of the present study is on “Literature on Public Finance (1986-2010); A Bibliometric Analysis based on EBSCO database”. The study aims to ascertain the growth of literature, sources of publications, identification of prolific authors, core journals and their related impact factor, calculation of activity index, etc.

1.4 Objectives of the Study

The researcher has undertaken the research with following objectives

- To identify and analyse the growth rate of scientific literature in nine Economic Journals
- To analyse the type of co-authorship pattern and examine the extent of research collaboration among the authors by using Subramanyam’s Mathematical formulae
- To measure the type of forms cited by the authors in all articles among the Journals
- To identify the geographic distribution of journals from which the Contributions get published and find out Indian contribution
- To find out the contributions of different types of institutions
- To identify the areas of research concentration on different subject headings in the field of Economics and especially in Public economics
- To calculate the number of times the articles cited in the database by the users

1.5 Hypotheses

The following hypothesis were formulated and tested with appropriate Statistical tools
➢ There is no significant growth in the research output among nine economic journals

➢ Contributions of Co-authored articles are much higher than the Single Authored articles

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

➢ The relationship between the journal citations and research output is much higher than the relationship between the book citations and research output.

➢ Indian Authors’ contribution in the selected economic journals is much lower than the other countries

➢ Articles related to Public finance are much higher than the other subject head

1.6 Scope of the Study

The researcher has taken nine Economic journals published in United States of America and United Kingdom. The researcher has taken the following nine Economic Journals taken for analysis

1. The American Economist

2. The American Economic Review


4. Economica

5. Journal of Economics

6. Journal of Finance

7. Journal of Economic Literature
8. Quarterly Journal Of Economics

9. Review of Economics

These are peer reviewed Academic journals and satisfy the Bradford’s law and so the researcher selected nine journals and the period taken was 25 years from 1986-2010. The data were downloaded from EBSCO data base and the data available in the database were taken for analysis.

1.7 Limitations of the study

The selected nine Economic Journals for the study covers a period of twenty five years spanning between 1986 and 2010, both years inclusive. Records for the analysis in this investigation have been downloaded from EBSCO database. Though there are many Economic journals available in the data base, the study is limited to only nine journals as the other journals do not meet the requirements. The findings of this study apply mainly to the fields covered in the EBSCO data base and the subject headings. The journal articles alone were taken into account for analysis leaving Notes, Editorial, Erratum, book reviews, etc. English language articles and citations in English language alone were included for the study.

1.8 Statistical Tools Used

The following statistical tools were used for analysis of data of the present study. Arithmetic mean, percentages, averages and cumulative percentages were the statistical tools used in analysing the data. In analysing the collaborative degree of authors, the following formula stipulated by Subramanyam was followed.
\[ C = \frac{N(m)}{N(m) + N(s)} \]

Where \( N(m) \) is the number of multi-authored papers and \( N(s) \) is the number of single-authored papers.

1.9 Operational Terminology

The following concepts have operationally been defined for the purpose of the present study.

1.9.1 Relative Growth Rate

Relative Growth Rate (RGP) is a measure to study the increase in number of articles/page per unit of articles/page per unit of time (Mahapatra 1985). The definition of RGR has been derived from the study of growth analysis of individual plants and effectively applied in the field of Botany, which in turn has its origin from the study of the rate of interest in the financial investment. The mean relative Growth Rate of articles over a specific period is calculated mathematically.

1.9.2 Doubling of Time

Doubling time (Dt) is directly related to Relative Growth Rate (RGR) It is the time required for articles/citations to become double of the existing amount. It can be applied to growth of literature, population, inflation, and many other things which tend to grow over the time. The doubling time formula is a great tool for rebutting this argument. It calculates the number of years that will take a population to double in size, given a certain growth rate per year.
The exact formula is

\[ n = \frac{n^2}{n[1 + (r/100)]} \]

Where \( n \) is the doubling time (in years) and \( r \) is the growth rate (in percent per year).

1.9.3 Authorship Pattern

It denotes the percentage concentration of single authored papers in relation to multi-authored papers.

1.9.4 Collaborative Co-Efficient

It is a tool suggested by Ajiferuke to measure the extent and strength of collaboration among the researchers in terms of their research contributions. It explains the prevalence of proportion of single-authored papers and multi-authored papers in research output.

1.9.5 Participative Index (PaI)

To evolve performance level of research of an institution, an index called ‘Participative Index (PaI)’ has been calculated. PaI is the ratio of the number of papers generated in a country or institution and the total number of documents collected in this repertoire.

1.10 Research Design

1.10.1 Data Collection Source

The data used for the present study were obtained from the EBSCO data base. The data regarding the nine journals were collected from this database for 25 years (1986-2010) 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 were also downloaded from this database. The typical bibliographic record retrieved from EBSCO database has been given below:

Shades of Discrimination: Skin Tone and Wages. By: Goldsmith, Arthur H.; Hamilton, Darrick; Darity, Jr., William. *American Economic Review*, May 2006, Vol. 96 Issue 2, p242-245, 4p, 2 charts; Abstract: The article discusses a study that used data from the Multi-City Study of Urban Inequality, which includes data on skin shade for each respondent, to examine issues of race and inequality in the U.S. The study looked at four issues including whether skin tone differences among blacks continue to be an issue after the civil rights movement. Another issue examined is whether there is any significance attached to cultural factors when explaining racial differences in economic performance. Also considered is whether there is any difference in the understanding of race in the U.S. as compared to Latin America. The final issue considered is whether skin shade is a factor for discrimination in labor markets. *(AN 20837937)*

Database: Business Source Premier

Add to folder Cited References: (8) Times Cited in this Database: (5)

PDF Full Text (63KB)
1.10.2 EBSCO Database

Electronic publishing has been revolutionizing the format of the recorded knowledge. Electronic information services attract readers’ attention in today’s networked environment. E-journals and E-databases bring new challenges before the library and information professionals which gives full text access to scholarly publications both in print and electronic version to its end users. According to an independent study conducted by Library Journal, “the number one reference source owned by academic (and public) libraries in electronic-only format is EBSCO host. The researcher collected data from EBSCO data base in order to analyse the data.

The following are the highlights of EBSCO data base

a) Access to full-text e-journal content through the most-used Premium online

b) It is an information resource, accessed by tens of thousands of institutions worldwide

c) Automatically search for e-journal results with every search driven by the power of EBSCO host

d) Personalize user experience through Journal Alerts, folders and more

e) Direct access to full text using Smart Links™ technology

Benefits of EBSCO data base

a) EBSCO data base increases journal content usage through the power of EBSCO host

b) Researchers gain access to the most recent literature, even if it has automatic set-up of holdings which means zero administration
c) No additional training required – users are already familiar with the EBSCO host platform

d) Faster results with fewer headaches through automatic e-journal results included with every database search

e) Keeps users on top of their areas of interest with a single place to manage Journal Alerts and Search Alerts.

EBSCO host Electronic Journals Service (EJS) is a gateway to thousands of e-journals containing millions of articles from hundreds of different publishers, all at one web site. Electronic Journals Service is differently useful to different users.

EJS can help the students quickly to find articles for research papers and other assignments done in record time. EJS puts the library’s e-journals acquired through EBSCO in a single place on the Web. With EJS, a student can:

- Find a specific journal quickly by using the Find Journals’ feature

- Browse through a list of all journals available with the Browse feature. Browse a list of subject categories, and then view a list of all journals that fall in a category of interest. This allows one to find easily the journals that cover specific topics.

- Find specific articles quickly using the Find Articles feature. Search by article title or by the author's name.

- Find articles that cover a specific topic by searching for keywords in the titles, abstracts, and even full text of millions of articles.

- Read article abstracts and link directly to full text of the articles.
EJS can help the researchers to stay on the top of the latest literature in the field. EJS consolidates over 20,000 e-journals from all major publishers, covering practically all disciplines. With EJS, the Researchers can:

Easily find journals, view Table of Contents (TOCs) and abstracts, and link directly to full text from over 20,000 titles from hundreds of publishers, all at one web site. No more jumping from site to site to read the journals they need. Limit searches to a specific journal or find all articles by a specific author.

Discover new e-journals in their field(s) of interest by browsing subject Categories

EJS can help the Faculty members to direct students to thousands of scholarly, peer-reviewed journals at one convenient URL while allowing faculty to stay up-to-date in their field (see the Researcher tab). With EJS, we can:

Browsing by Subject allows the students to find journals easily that cover specific topics, allowing them to find research material in scholarly journals.

Students can directly cite articles found in EJS when compiling bibliographies, allowing them to follow direct links to the cited articles to verify the content's research value.

For librarians, EJS is much more than just an e-journals gateway, while the staff can use all the end user features of EJS to help direct patrons to e-journals, The Librarians can also take advantage of the comprehensive EJS Administrator's site to take final control of the e-journals list. On the EJS Admin site, they can:

Use Access Management tools to set up access to EJS for all your users. You can set up IP addresses, Referring URLs, Usernames/Passwords, or use ATHENS authentication.
Download EJS's persistent (durable) URLs to load into their OPAC or library website to reduce drastically the amount of journal URL maintenance required by the library staff. Since EJS's durable URLs never change, their patrons will always follow valid links and they never have to worry about looking for broken URLs to publisher sites.

1.10.2.1 Various Databases in EBSCO

The EBSCO has the following data bases for its customers and the member user can make use of any database and search for the information

1.10.2.2 Academic Search Elite

Academic institutions in the worldwide depend on this database as their core resource of scholarly information. Academic Search Elite contains full text for more than 2,100 journals, Nearly 150 journals have PDF images dating back to 1985.

1.10.2.3 Regional Business News

This database provides comprehensive full text coverage for regional business publications. Regional Business News incorporates coverage of more than 80 regional business publications covering all metropolitan and rural areas within the United States.

1.10.2.4 Library, Information Science & Technology Abstracts

Library, Information Science & Technology Abstracts (LISTA) indexes more than 560 core journals, 50 priority journals, and nearly 125 selective journals; including books, research reports and proceedings. Subject coverage includes librarianship, classification, cataloging, bibliometrics, online information retrieval, information management etc.. Coverage in the database extends back as far as the mid-1960s.
1.10.2.5 Green FILE

Green FILE offers well-researched information covering all aspects of human impact to the environment. Its collection of scholarly, government and general-interest titles includes content on global warming, green building, pollution, sustainable agriculture, renewable energy, recycling, etc. The database provides indexing and abstracts for more than 384,000 records, as well as Open Access full text for more than 4,700 records.

The researcher used the EBSCO database to download the journals for analysis. Data were downloaded for the economic journals from 1986 to 2010 to calculate and analyze the data.

1.10.2.6 Business Source Elite

This business database provides full text for over 1,000 business publications. The rich collection of titles in Business Source Elite provides information dating back to 1985. More than 10,100 substantial company profiles from Data monitor are also included. This database is updated on a daily basis via EBSCOhost.

1.11 Methods of Data Collection

A total of 11,110 records were retrieved for the analysis. The search strategy that has been employed for collecting the total records was 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
• Geographical wise Distribution

• Institutional wise Distribution

• Subject wise Distribution

• Sub Fields in Public Finance

• Users citing the database

The researcher has designed the research output in the following chapters

**Chapter I** presents origin of bibliometrics, definition, pioneers of bibliometrics, Statement of the problem, limitations, objectives, hypotheses, the statistical tools used for analysing the data and how the data were retrieved from the EBSCO 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 Economic Journals taken for analysis. The researcher focuses on the origin, meaning, definition and significance of Public finance.

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

**Chapter VII** comprehensively summarises the entire analysis and conclusions and suggestions.
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