CHAPTER II

REVIEW OF LITERATURE

Review of related literature, a significant and primary component of any research investigation enables the investigator to understand the earlier research interests, research pattern and magnitude of the research output in a field of knowledge. As far as the field of bibliometrics is concerned, the literature on the subject is constantly growing. A survey of the research trends is felt necessarily desirable to identify if any similar study already exists and also with a view to get knowledge of the process of application of quantitative analysis. The review of earlier studies pertaining to the growth rate of literature, scientific productivity of authors, collaborative trend of authors and citations are discussed in brief.

2.1 Studies Related to Bibliometrics in General

Deval Amit Kumar and Dangi Manohar Singh (2012) deal with a book literature published in India on Library and Information Science during the year 1995 to 2002. The data collected during the study was analyzed bibliographically to identify the subject representation and authorship pattern. The classification of the literature was made with the help of DDC 19th ed., whereas, the bibliographical description of entries were rendered according to IS: 2381–1978, with necessary local modifications. The trends analysis had been presented in tabular and diagrammatic form and on the basis of which conclusion are drawn with respect to year-wise distribution of books, broad subject distribution, detailed subject distribution, year wise broad subject distribution, ranking of authors, pattern of authorship, detailed mode of authorship, geographical distribution of work, etc.
Harsh Bardhan Arya and Mishra (2011) carried out an analysis of the literature on Bio-fuel. The purpose was to study the periodic growth of literature, distribution of authorship, distribution of subject, bibliographical forms of literature, productivity ranking, and geographic origin of literature on the subject. Data was collected through physical verification of both primary and secondary sources of information. This data set was analyzed using various bibliographic characteristics. The findings showed that there was an increase in the literature bio-fuel since 1971 and USA was the leading country in undertaking Bio-fuel research. Most of the literatures were from Bio-diesel and Alcohol fuel. The USA and India were the leading contributors to this literature.

Kannappanavar and Roopashree (2011) discussed about information use pattern of the Indian Geneticists. The study found that journals were heavily cited as compared to other forms of documents. It was evident from the study that the trend was towards team research. Multi authors lead over single author. United States contributed more number of articles in this subject. Around 4percent of the journals cited were from United States. It was observed from the study that more journals cited were of the period between 1996 and 2000, followed by 2001-2006 and 1990-1995. Therefore it could be deduced that current literature was more important for research in this subject field. It was observed from the study that “Genetics” was the most heavily cited journal followed by Science, both were from United States. The Indian journal, Journal of Genetics was in the 14th place. Cited literatures were as old as 174 years old.

Kunwar Singh et al (2011) analyzed the research publications for a period of ten years from 1992-2002 to assess the trends in the publication patterns in DESIDOC Bulletin of Information Technology by library and information professionals. The data
collected from the ten volumes were summarized in ten tables like volume wise distribution of contributors, authorship pattern of contributors, geographical distribution of contributors, institution wise, etc. The study revealed that 60 issues of the journal published 145 articles. Out of the 145 publications, 97 (66.90 percent) articles were published by single author. The study also identified that 128 articles were from (88.28 percent) India and the rest 17 (11.72 percent) were contributed from rest of the countries.

Mei-ying, Wang et al (2011) in their article provided bibliometric evidence from Chinese medical journals which was considered for the evaluation system of core journals. The authors had undertaken a comparative study on bibliometric characteristics between Chinese core journals and common journals. There were 203 Chinese medical core journals and 440 Chinese Common journals. The study revealed that the impact factor, ratio of articles supported with funding sources (foundation), total yearly pages and average article, length of core journals were significantly higher than those of common journals in China.

Mulla and Chandrashekara (2011) identified some bibliometrics indicators of 2253 articles published on industry and trade during 2002-2006. The online database of the Indian Science Abstract website (http://isa.niscair.res.in/) was the main source for their study. The average number of publications per year was 451, more number of articles were published during 2004-2006 i.e., 1690. Authorship trend showed that, maximum numbers of 968 (42.96 percentage) papers were contributed by corporate bodies. The degree of collaboration in industrial and trade literature was 0.61. In the country wise contribution of documents, India contributed 69.86 percentage of the total publication. In the state-wise contribution of documents, Maharashtra stood first with
323 (14.34 percentage). Among journals, Indian Journal of Fiber and Textile Research was ranked first with 327 (27.88 percentage) articles and among corporate bodies Procter & Gamble Company stood first with 172 (17.77 percentage) documents.

Pradip Joshi and Nikose (2011) presented the analysis of the articles of 27 years back issues of an open access biomedical electronic journal namely Journal of Postgraduate Medicine, of Seth G.S.Medical College and K.E.M.Hospital, Mumbai for the period 1980-2006. The bibliometric study using content analysis technique showed that there were more articles of surgery published as case reports which were mostly contributed by Indian authors. However, there was progress in contribution of international authors after the journals went online as an open access for free visibility and accessibility of articles since 2001.

Sarala (2011) took Sixty seven book reviews published in Journal of Scientific and Industrial Research during 2002-2007. The scrutinized data revealed that 70 percent of the books reviewed were original works. Nearly 50 percent of the works were single authored. Documents reviewed comprised monographs (94 per cent), yearbook, reviews and special issue of journal. About 60 per cent of the books were published from New Delhi. 19 publishers were responsible for publishing 67 books. Sage publications alone had published 29 books coming to the top position. Indian books price ranged within Rs.251-500. Thirty one scientists belonging to 14 institutions were responsible for the review works. Pagination of books ranges from 100 to more than 1000 pages. Books containing 201-300 pages accounted for 39 per cent. Broad classification showed that books on applied sciences accounted for about 50 percent.
Asha Narang and Anil Kumar (2010) did bibliometric analysis of 4798 citations appended to 400 articles in the five volumes from no 34(2003) to 38(2007) and a maiden volume (1970) of the Indian Journal of Pure and Applied Mathematics. Their study carried out to observe the number of contributions and their distribution in different volumes, authorship pattern, foreign and Indian author contributions, citation analysis and number of pages used in each volume. A comparative study of articles published in 5 volumes had been made. Results indicate a decrease in the number of contributions in successive volumes. The most cited documents are articles from research journals. The number of foreign contributors is more than Indian contributors. Growth and popularity of the journal is showing mixed trends i.e. upward and downward progress.

Patil (2010) examined the articles published in Herald of Library Science for authorship pattern, degree of collaboration and geographical distribution of papers. The study found that majority of papers was single authored. The degree of collaboration was found to be 0.30. The geographical distribution revealed that the contribution by Andhra Pradesh was the highest in India while Nigeria was at top in case of foreign countries.

Mukherjee, Bhaskar (2009) in his study investigated the impact of 17 open-access journals published uninterruptedly during 2000-2004 in the field of library and information science, in terms of quantity of articles published, subject distribution of the articles, synchronous and impact factor, immediacy index, and journals' and authors' self-citation. They found out that during the 5-year publication period, there were as many as 1,636 were articles published by these journals. The articles had received a total of 8,591 Web citations during a 7-year citation period. Eight of 17 journals had received more than 100 citations.
Sambhu Nath Halder and Suvra Chandra (2009) highlighted the growth patterns of Library and Information Science literature on the basis of bibliometric study. Efforts had been made to analyze the articles of IASLIC Bulletin published from the year 2003 to 2007. The investigation focused on distribution of contributions, authorship pattern of contributions, distribution of references, analysis of length of literature, distribution of illustrations used, state wise distribution of contributions and subject trends of the articles, etc. Different graphical representations had been used as and when needed to reveal the real field scenarios. It contained details findings of the entire study and ends with conclusion.

Dinesh Gupta (2008) took a study on the Bibliographies available on Marketing of library and information services. Select bibliographies, Webliographies and reviews were included. Useful evaluating criteria were used to help the readers in selecting appropriate bibliographies for the use.

Nah, In Wook et al (2008) used bibliometric indicators for comparison among different or interdisciplinary categories, the work of individual scientists, and their research teams and institutions. They also assessed basic research performances of some projects at the Korea Institute of Science and Technology (KIST) using bibliographic factors with IPQ-Normalized impact factor to compare with an international level and other research groups in different or interdisciplinary fields. Some research teams at KIST showed higher quality publications in terms of the international measures.

Parvathamma and Devendra Gobbar (2008) revealed Aminabhav’s 36 years of teaching and 28 years of research experience in various fields of Polymer Science. Aminabhav published 521 research articles, 57 popular articles and 94 conference papers
in eight domains of Polymer Science. He had three US patent to credit and completed research project worth 6 crores. They found out that the year 2006 had been the productive year in their career in which Aminabh published 96 research papers. The journal of Applied Polymer Science published in USA had been the most preferred journal for publishing his research findings. Their study revealed that T.M Aminbhavi’s 70.81 % of research articles were published in the journals originating from USA and 11.70% in India.

Sevukan and Jaideep Sharma (2008) presented a detailed analysis of research performance of biotechnology faculties in Central Universities of India from 1997-2006. The data used for the study were retrieved from two data base viz Pubmed NCBI and ISI Web of Science data base. Bibliometric Techniques had been employed to analyse the data. The results indicated that the growth of literature in biotechnology had steadily increased from 15 articles in 1997 to 43 articles in 2006. Two authored publications amongst the pattern of authorship and the applicability of Lotka’s law was validated from values n= 2.12 c=0.669 and d=0.027. However the application of Bradford’s law did not fit to the literature analysed.

Neerja Verma, et al (2007) dealt with the analysis of 131 contributions of the journals entitled ‘Annals of Library and Information Studies’ published during 1999-2005. They examined year wise, institution wise, state wise distribution of contributions, authorship pattern, citation analysis, length of contributions etc. The study revealed that the journals were the most cited publication amongst the library and information scientists. They found out that the source journal was the most cited journal.
Rama Krishnan and Ramesh Babu (2007) carried out a bibliometric analysis of literature output in the field of Hepatitis covered in three bibliographic databases namely MEDLINE, CINAHL and IPA for a period 1984-2003. They found out that there were 82617 records in Hepatitis in three databases during their period of study and also there were only 4 percent of duplicate records and the collaborative research trends to be more in the field of hepatitis.

Gunasekaran et al (2006) found out from their study that Indian researchers published 6186 papers from 569 journals and 12 non-journal sources. More than 45 per cent of these papers appeared in journals with an impact factor less than 1000. The average impact factor for journal article during this period was 1.359. He found that 26 per cent of papers published by Indians were in US journals. It was 21 and 20 per cent respectively for Indians and UK. In 2002, 563 institutions contributed 6199 papers and 68 percent was contributed by Indians. Indian Institute of Science, Bangalore ranks first with 345 papers.

Susanta Koley and Sen’s (2006) study based on 251 papers of Prof. B.N Koley published during 1958–2001. They examined the year wise distribution of papers, research groups of the scientist and scattering of papers in different communication channels. In addition, their study found out author productivity, spectrum of research activity through analysis of the title keywords and productivity of Koley’s research group. They also found out that the data set did not follow Branford’s distribution.

Gupta and Sujit Bhattacharya (2004) attempted to highlight the role of bibliometrics in studying the dynamics of Science and Technology Tools and Techniques available in bibliometrics, to address and understand the complexities of scientific fields.
They concluded that, for wider acceptance among academicians and policy makers, bibliometric approach should ingrain itself within sociology and philosophy of science in studying the different facts of science and Technology.

Suresh Kumar and Gupta (2003) revived the different approaches for studying the growth of scientific knowledge, as reflected by publications of Chemical Science literature. The study explored the applicability of selected growth models in the growth of the world research output in the form of papers, patents and books in the field of chemical sciences during 1907-1999.

Sen et.al., (2002) traced the history of bibliometric research and related training activities in INSDOC. They described briefly the objectives, facilities, services, research activities and publication of National Centre of bibliometrics.

Kawatra (2000) made a study on bibliometrics, other analogous and synonymous terms, Empirical laws and models of bibliometrics, characteristics of bibliometric distribution, application of Bradford’s law, application of bibliometrics in library user studies and limitations in applications.

Lalithamba and Ananda (1997) made an attempt to analyse the bibliometric study on library buildings. The objective of the study was to identify, examine and analyse the literature in the field of library buildings and aid to libraries in decision making with regard to journal selection. They applied Bradford’d law of scattering to find out the value of ‘n’ i.e., the number of journal in the nuclear zone.

Panda (1997) analysed the definitions and facets of bibliometrics. He explained bibliometric studies into descriptive studies and behavioural studies which are an
important area in bibliometric studies. He applied Bradford’s law in age relations, zipf distribution and Lokta’s inverse square law. Citation analysis, bibliometric doubling, journals clustering and obsolescence were also dealt in his analysis.

Paramjit Singh Kawatra (1994) dealt with the definition, application of bibliometrics in library user studies and stated the limitations and applications.

Parvathamma (1993) brought out the various definitions of the term ‘bibliometrics’. She analysed the bibliometric techniques applied, to study the following aspects in any discipline (i) Growth rate of literature (ii) Scientific productivity of authors (iii) Collaborative trend among authors and (iv) Core journals. She reviewed in brief the important studies under taken in each of these categories.


Subir K Sen and Sunil Kumar Chatterjee (1990) made an attempt to provide well organized glossary of terms for bibliometrics. The terms were collected from the original sources where a definition cum description was available. In many cases they modified or reword the definitions. In case of adopted terms from other areas of knowledge such as statistical and mathematics, they had not included those terms whose definitions were easily available and adopted terms which had significant applications and much use in bibliometrics.

Sengupta (1985) in his study gave a bird’s eye view on bibliometrics. He defined the meaning, definitions of the biobliometric terms and the three fundamental laws with mathematical applications.
Rathor and Rajeshawar Mishra (1981) presented the relative usefulness of periodicals in Biochemistry in India with the object of keeping the ever rising subscription requirements of serials within budgetary constraints.

Tague (1981) used negative binomial distribution to explain Breads – success phenomenon

Narin (1976) reviewed the early studies of scientific productivity and concluded that “scientific talent is highly concentrated in a limited number of individuals“ and therefore pointed out that the scientific policy should be designed to encourage the most productive scientists.

Leimkuhler (1967) analysed Bradford’s law and concluded that Bradford’s law of scattering was the inverse function of the Bradford’s distributions.

Kendall (1960) in his analysis of the bibliography, pertaining to Operations Research claimed that the scattering of articles in journals was similar to that of income distribution and he equated the journals to persons and number of articles to size the of income.

Dennis (1959) studied the relationship between the quality of publications by outstanding scientists and scientific recognition and his study was based on 71 members of the National Academy of science. He observed a close correlation between the quality of scientific publications and the achievements of the eminence as a contributor.

Vickery (1948) published first notable paper on Bradford’s Law of Scattering in which the results of an analysis of 1600 periodical references, borrowed from various libraries by the Butter wick Research Laboratories were compared with Bradford’s work and discovered that the Law as Bradford’s stated was not in total agreement with his algebraic expression.
2.2 Studies Related to Literature Growth

Thanuskodi (2010) in her analysis aimed at analysing the research output performance of social scientists on social science subjects. The analysis covered mainly the number of articles, authorship pattern, subject wise distribution of articles, average number of references per articles, forms of documents cited, year wise distribution of cited journals etc.

Krishnamurthy et al (2009) made an attempt to analyze the Diabetes literature indexed in the MEDLINE database for the period 1995-2005. They found out that the maximum number of records (13244) was during 2003, followed by 12690 in 2002 and 11061 in 2001. In their findings, Relative Growth Rate (RGR) was decreasing year wise. During their study they identified that USA was the largest contributor of literature on diabetes research.

Mohammed Nazim and Moin Ahmad (2008) aimed to offer an overview of research trends in the field of nanotechnology and characterized its most important aspects such as, growth of literature, authorship pattern, most productive journals, authors, countries etc. A total of 2675 articles for the period of 1991-2006 were collected from the Web of Science especially via the Science Citation Index. Authorship pattern and core journals were examined using Lokta’s law and Bradford’s law of scattering respectively. Their yearly analysis showed that there was a rapid growth of nanotechnology research from the beginning of 21st century.

Asha (2007) analyzed articles and citations in Demography India for a period of ten years from 1972 to 2001. She identified the core areas demographic studies, institution-wise contribution of articles and geographical area pertaining to the articles.
Using regression analysis, she formulated Lokta’s relationships and determined the value of constant K and index # relationship. She also found out that Lokta’s relationship was only valid for authors with more than 3 publications. She identified most-cited journals and examined bibliographic forms cited documents, average age of citations and rate of citation per article.

Kamal Lochan Jena (2006) carried out bibliometric study in the journal ‘Indian Journal of Fiber and Textile Research’ from 1996 to 2004. His study covered the trend publications such as year wise distribution of articles, bibliographical distribution of citations, authorship pattern, citation pattern, average length of articles, number of tables and figures used, time lag, geographical distribution of authors, etc.

Mahapatra and Padmanav Jeans (2006) described the growth of scientific literature in Orissa published during 1985-2004. In their study, they included 875 research papers from forty different journals. They analysed the data by authorship pattern, year wise growth, subject wise break of papers, category of journal, place of origin, length of papers and productivity of journals.

Rekha Mittal et al (2006) analyzed 536 papers published on library and information science education during the period 1995-2004, in which, productivity of authors and core periodicals were determined by using Lokta’s and Bradford’s law. The literature growth, country-wise distribution of papers and language pattern were also analysed. They found out most of the papers had been contributed by single authors (72.8 percent) and two authors (20.69 percent) and 72 percent of literature was published in 72 journals.
Swapan Kumar Patra et al., (2006) undertook a study on the growth pattern, core journals and author’s contribution in the field of bibliometrics using data from Library and Information Science Abstracts (LISA). Bradford’s Law of scattering was used to identify core journals. Lofka’s law was used to identify author’s productivity pattern. This study also identified 12 most productive authors with more than 20 publications in this field.

Rajendran et al (2005) analysed the global output of Fiber Optics research. They studied the articles covering for the period 1999 – 2003 from hi – tech Index database. They also analysed the growth of literature year wise, country wise, authorship pattern, bibliographic form, ranking of journals and nature of research.

Kamlesh Goel (2001) brought out a preliminary bibliometric analysis of Social Science research for the year 1998. He made an attempt to identify the highly productive Indian Institutions in Social Sciences, researches under taken in the various disciplines of Social Sciences, journals (Indian / Foreign) in which the findings of the researches were published and the regional distribution of Social Science research in India.

Parameswaran and Smitha (2001) in their study on ‘Bibliometric analysis of LISA’ found that the contribution of LISA during the study period (1994 – 1998) fall under communication and information technology with 13.4 percent coverage. They also stated that the proportion of Indian contribution compared to the total output of LIS literature was meager and it was only 1.142 percentages.

Arundhaty Das (2000) presented a bibliometric analysis of the articles published by the institute in the field of ‘plasma sciences’. It was found that nearly 8400 articles were written from institutions in India in the field of ‘plasma physics during the period 1989 – 1998. Institute of Plasma Research contributed 198 articles (83per cent), which
was also the highest for an institution. It was found that the mathematical theoretical treatment had been attributed for most of the articles (62 percent). Multiple authorship patterns were common. However there were significant 17 percent of articles written by single author.

Dhiman (2000) examined a ten years bibliometric study on Ethnobotany journal. The year wise, Institution wise, and country wise distribution, authorship pattern, range of performance cited and length of articles were also analysed by him.

Giri raj G Halkar et al., (1998) made a bibliometric study on the Journal of Family Welfare during the period 1990 – 97. His analysis included authorship pattern, country wise and institutional wise distribution of papers etc. The study also covered the subject wise breakup of articles, average length of papers and study of references provided in the articles.

Manoj Kulkarni (1997) attempted to analyse quantitatively Dr.Bhde’s contribution towards the fields of yoga research. All the 147 research papers were analysed and authorship pattern, collaboration trends, year wise distribution, media utilized, types of research design etc. were highlighted.

Ushadevi (1997) analysed the contributions in agricultural economics and subtopics, authorship pattern and sex wise distribution for ten years (1983 –1992). It was found that the largest contributors belonged to government institutions. Next to that, ranks the contributors from the universities corporate bodies functioning in the area of agricultural economics constituted the largest contributing sector.

Praveen Sharma and Garg (1993) made an attempt to analyse the bibliometrics of solar power research in India.
Mahapatra (1985) suggested a new method for measuring the growth of science and studied the rate of growth of plant physiology literature by calculating relative growth rates and doubling time for both the number of publications and pages published during the study period 1951–1980.

Meadows (1974) was of the opinion that the total growth curve passes through an S–shaped path consisting of three positions, an initial exponential growth, then a central linear section and finally an exponential decrease towards saturation.

Goffman and Newin (1965) explained the growth of literature in a scientific discipline as an epidemic process. He compared the scientific ideas of injective materials, and recognised three types of members in scientific publications: (I) Invectives, (II) Susceptible and (III) Removable.

Price (1963) proposed an exponential rate of growth of scientific literature. He predicted a regular exponential growth with doubling period of ten to fifteen years. Bradford (1934) described the scattering pattern of journals in the area of Applied geophysics and lubrication. He proposed a law on the scattering pattern of journals known as “Bradford’s Law of Scattering “He was of the opinion that in any scientific discipline, a relatively few ‘Core’ journals are likely to contain a substantial number of articles on that discipline, while the remaining articles are usually scattered in a large number of journals that are peripherals to the discipline.

2.3 Studies Related to Research Collaboration

The study revealed that two author papers were maximum 215 (44.24 percentages). The degree of collaboration in research was 0.87 in genetics and plant breeding as a whole and ranged from 0.86 to 0.89 during 1998-2002. The contribution from research institutions and laboratories i.e., 216 (44.08 percentage) was vividly ahead of other segments such as universities and colleges. The Indian authors contributed 475 articles and a significant percent i.e., 107 (22.49 percentage) was reported from Delhi State.

Mohamed Esmail et al (2011) discussed the authorship trend and collaborative research in the field of agricultural extension. The required data had been collected from the “Journal of extension system” published during the period of 2000-2009. The result showed that multi-authored papers contribution was more in number compared to single authored papers. The study also focused the degree of collaboration of authors in agricultural extension research.

Jeevan (2010) reported the extent of collaboration in research publications in library and information science based on the papers published in two successive years in the Proceedings of conferences of CALIBER, the annual conference organized by INFLIBNET Centre in 2003 and 2004, the Conference of Indian Library Association (ILA) in 2003 and 2004 and the Conference Society for Information Science (SIS) in 2003 and 2004. The study also estimated the same for two consecutive volumes of journals, volume 22, issues 1-6 for 2002 and volume 23, issues 1-6 for 2003 of DESIDOC Bulletin of Information Technology and volume 47, issues 1-4 for 2002 and volume 48, issues 1-4 for 2003 of IASLIC Bulletin. The single authorship contribution had more publications. More than 55 percentage of collaborated papers were with authors.
working in the same institution and another 17 percentages with authors working in different institutions located in the same place. Only 27 percentages of the collaborated papers were written by authors in different institutions from different places.

Rakesh Mani Sharma (2009) studied a total of 2603 research articles published by the scientists of Central Potato Research Institute (CPRI) during 1991 to 2007 by scanning the annual reports of CPRI and the Journal of the Indian Potato association. In his analysis, he showed that majority of the Scientists preferred to publish research papers in joint authorship (82.67 percentage) having 0.82 degree of collaboration. There was no uniform pattern of Literature growth but factors like fund availability, Scientists’ recruitment and years that had special occasions like Conferences, Seminars etc., had impact over scientific productivity of Scientists during the period under review.

Sudhier Pillai (2007) presented a case study of the trends in authorship pattern and collaborative research in Physics with a sample of 11,412 journals and 1328 book citations appended in the physics during 1999-2003. In his study, he found out that the team research was preferred in the field of Physics rather than solo research. The authorship collaboration was more in journal articles than in books and concluded that authorship pattern, degree of collaboration and average number of authors were different in journals and books.

Biradar (2006) highlighted the authorship trend and collaborative research in environmental science during 1994, 1999 and 2004. The study found that team research is preferred in the field of environmental science rather than solo research. The degree of collaboration was calculated and found to be 0.85. The study also found that on an average, 11.595 references were referred to by each article. It was observed that major
contribution was made by Universities (31.622 percentages) followed by colleges (24.054 percentage) research institutions (23.784 percentages). Single authored papers decreased from 20.290 percentages in the year 1994 to 4.762 percentages in 2004.

Vijay (2005) highlighted the Collaborative research and authorship trend in the area of Food Science and Technology in India. The study had revealed that collaborative research was preferred to solo research in the area of food science in India and the degree of collaboration was found to be 0.91.

Suresh Kumar (2003) analysed Lotka’s law and author productivity in the field of Computer Science in India. He had applied K-S test to measure the conformity to Lotka’s law. He observed that 95.45 percentages of low productive authors had made 10 or fewer contributions representing about 72 percentages of the total contributions produced and 1.62 percentage highly productive authors had contributed more than 15 contributions each representing 18 percentages of the total contributions produced.

Udofia Iton Udofia (2002) focused on author collaboration in the periodical literature of African Trypanosomiasis. The study was based on the literature abstracted in the 1990-2000 articles of Tropical Diseases Bulletin and Tseta and Trypanosomiasis Quarterly (TTQ) using the counting method. It was found that both the annual rates and cumulation of author collaboration for the period for each of the ten years were high although the figures obtained for 1992-1995 and 1998-2000 were higher than those for 1990-1991 and 1996-1997. The study had provided factual information in support of information services in the field of African Trypanosomiasis literature.

Biradar and Sujatha M. Mathad (2000) studied the authorship pattern of three different scientific disciplines of forestry, pathology and civil engineering. Data were
collected from primary periodicals like Indian Forester, Journal of Pathology and Magazine of Concrete Research which were published during 1982 – 1997. It was found that major contribution made to the field of Forestry, Pathology and Engineering was 4.47 percentages by single author and 43.96 percentages by two authors. The author also observed that the proportion of single authored paper had decreased from 31.86 percentages to 17.8 percentages in 1997.

Subramanyan (1983) studied the degree of collaboration in a discipline, He analysed the ratio of the number of multi authored papers to the total number of papers published in a discipline during a certain period of time.

Pao (1982) studied the degree of collaboration in the field of computational musicology and observed that only 15 percentage of the publications were co – authored in the discipline.

Ravichandra Rao (1980) in his analytical study showed that the negative binomial distribution describes the pattern of scientific productivity under success – breads – success condition in a wide variety of social circumstances.

Price (1971) conjectured that the number of elite in a science is small compared to the total number of scientists. He also claimed that “any population of size $N$ constrain an effective elite of size $N$”.

Zucker man (1967) studied the collaborative trends of noble laureates in United States and observed a close correlation between eminence of scientists and their scientific productivity.
Lokta (1926) proposed his ‘Inverse Square Law of Scientific Productivity’ for measuring the scientific productivity of authors in a given discipline. It is one of the earliest studies in the direction of measuring scientific productivity using the number of publications of an author as a measure.

2.4 Studies Related to Citation Analysis

Marx Werner (2011) in his article dealt with the specific features of historical papers relevant for information retrieval and bibliometrics. The analysis was based mainly on the citation indexes accessible under the Web of Science. The limitations of specific search fields as well as several database errors were also discussed and discussed the problems of complex author names, complicated journal names and other sources of errors that result from prior citation practice.

Mu-Hsuan Huang and Chi-Shiou (2011) examined the citations of Western journals in eight LIS journals and six history journals published in Taiwan. The findings showed that both the Western journals' impact factor values might not necessarily indicate their real use in Taiwan's LIS and history research-especially in history research.

Baumgartner, Hans (2010) analysed the citation data over 7000 articles published in the Journal of Marketing, Journal of Marketing Research, and Journal of Consumer Research between 1936 and the end of 2009 to address five questions relating to the history of consumer research: What types of articles have been influential in consumer research? Does consumer research have sleeping beauties and shooting stars? How do consumer researchers achieve impact? Has consumer research become more or less influential over time? And finally, how much do older articles inform current consumer Research?
Moin Ahmad and Mohammad Nazim (2010) investigated the pattern of citing references of research articles published in D-Lib Magazine during 2002 to 2008. A total of 4775 citations were collected from 295 articles published during 2002 to 2008. Articles classified as editorial materials, power point slides, book reviews, columns, reports and news items were not considered for the analysis. They focused on year-wise distribution of articles and cited references, types of documents cited, country and language of cited documents, file format and domain of cited references, etc. The study showed the changing trends of research in the field of library & information science in the field of digital libraries particularly with the introduction of Internet and World Wide Web.

Kulkarni et al (2009) in their article in Indian Pharmaceutical and Research revealed that the journals were of predominant citation source followed by books. They found out that the majority of the scientists preferred to publish research papers in multiple authorship and there was a considerable time lag in the publication of articles from the date of receipt of papers.

Nosrat Riahinia (2009) presented Citation analysis of papers published in Library Herald for five-years. The study represented a new method of citation analysis, that is studying only sole journal citations. In this new method, the researcher sought to find scientific and intra-discipline Communication relations among the papers of Library Herald, being published during a five-year period. The journal has published 120 original papers during five years. Eighty eight percentages of contributors were from India. The journal had only 16 international contributions during the course of five years. As a
scientific journal, the author thought, Library Herald as a prestigious journal in the field of LIS which was worth to be subscribed by university libraries. Few numbers of international contributors are provided with an opportunity.

Vinayagamoorthi et. al (2009) did an investigation involving bibliometric analysis of herbal literature from the perspectives of medicinal plants. The size of the sample downloaded for the purpose was 3401. The study involved the analysis of herbal literature output during 1990-2004 and was pertained to the records downloaded exclusively from the Biological Abstracts. It was inferred that maximum literature output was found during the year 2000 and minimum in the year 1991. Authorship pattern ranged from single authored articles to as many as twenty two authors. It was observed that 80.64 per cent of the total authors contributed only one paper on Herbal research. Maximum frequency of author contribution occurred in the case of Sushil Kumar with 273 contributions. This showed that scientists, of “less productivity”, publish papers faster than scientists of “higher productivity”. This was not true in the case of Herbal research.

Zafrunnisha and Pulla Reddy (2009) presented the result of the citation analysis study in Indian Journal of Marketing. The major objectives of the study were to find-out the authorship pattern, Bibliographic form, Subject, Language, Country and rank wise distribution of citations of articles appeared in IJM XXX VI published in the year 2006 i.e., January to December 2006. A total of 74 articles were published in these issues. Overall 701 citations featuring 752 authors had been found. The results indicate that 40.94 percentage articles published in these issues were single authored. The results revealed that book source was predominant with 40.51 percentages of total citations
Lisee, Cynthia et al (2008) examined the scientific impact and aging of conference proceedings compared to those of scientific literature in general. They were of the opinion that the relative importance of proceedings was diminishing over time and currently represented only 1.7 percentage of references made in the natural sciences and engineering, and 2.5 percentage in the social sciences and humanities. Although the scientific impact of proceedings was losing ground to other types of scientific literature in nearly all fields. It had grown from 8 percentages of the references in engineering papers in the early 1980s to its current 10 percentages. Proceedings played particularly an important role in computer sciences, where they account for close to 20 percentages of the references. In her article, she showed that not unexpectedly, the proceedings age faster than cited scientific literature in general. The evidence thus showed that proceedings had a relatively limited scientific impact, on average representing only about 2 percentages of total citations, that their relative importance was shrinking, and that they became obsolete faster than the scientific literature in general.

Surendra Kumar and Kumar (2008) analyzed 8093 citations given in the Journal of oil seeds research (JOR) published during 1993 to 2004. Out of 8093 citations, 5642 were given in main articles and 2551 in short communications of JOR. The type of documents cited and journals were also analyzed. They covered the analysis of citation pattern of along with calculation of collaboration coefficient. Geographical distribution of cited references were also been analyzed. They concluded that 20 core periodicals cover more than 50% references and also indicated that collaborative research prevailed in oil seed research.
Vijay and Raghavan (2007) carried out bibliometric analysis of 779 articles published in five volumes from 2000 to 2004 along with citations. The number of contributions, institution wise distribution, citations, types of publications cited, geographical distribution of contributions, national and international as well as physical growth of the journals were also studied. They found out that there was an increase in the number of contributions in successive volumes with India being major contributor both in maiden volume as well as in the five volumes taken for analysis. They also identified that the contribution by joint authors were the highest. The growth and the popularity of the journal were showing a steady upward trend.

Arthur Young (2006) analyzed bibliometric dimension, including contributor attributes, various author rankings, and citation impact. Eugene Garfield’s HistCite software, linked to Thomson Scientifics’ Web of Science, as made available by Garfield for the period 1956–2004, was used as the core database for analysis. A brief comparison of Library Quarterly contributor citation impact and that of College and Research Libraries was also provided. He found out that the Library Quarterly continued to attract a roster of highly productive, international scholars.

Krishna and Kumar (2005) collected and analysed 10,505 citations from 68 doctoral theses on agriculture submitted to Rajasthan University. Their study was concerned with observation, findings of Lotka’s Law and degree of collaboration.

Ashu Shokeen and Sanjay Kaushik (2003) carried out a study to find out authorship pattern and citation pattern of articles appeared in Indian Journal of Economics published during January 2002 to December 2002. The Journal published 37 articles during this period. Overall 701 citations featuring 1038 authors had been
made. Nearly 48.46 percentage of the articles published in these journals were single authored. Journal articles were predominant with 52.78 percentages of total citations. It was clear that majority of documents cited in these issues were published not more than twenty five years ago.

Anjana Satish and Humayoon Kabir (2001) analysed the citations in the Quarterly Journal of Economics during the period 1995-1997. Most of the citations were on the subject Monetary Economics. The study revealed that the average citation was 30.98 and single author citations were also more in number. The ratio of single and muti-authored was 2.23:1. Econometrica ranked first in core journals. Very few Indian journals were cited.

Sinha and Dhiman (2001) studied the research published in Indian and Foreign Journals by Dr.R.C.Sinha, an Indian born Canadian and an internationally reputed Plant Virologist. This bibliometric study was an attempt to analyse his articles using Science Citation Index and their impact on the World Literature.

Sangam (1985) applied citation analysis techniques to draw ranking list of journals in social science based on the citation data collected from the doctoral theses submitted to Karnataka University, Dharwad.

Smith (1981) explained two kinds of citation. According to him “reference was the acknowledgement that one document gives to another; a citation was acknowledgement that one document gives to receives from another”. The relationship is implied between the cited document and citing document of all or part. Among 22565 citations, journal citations were considered for the study. A total of 14374 journals were utilized for their study. He identified that there was a predominance of multi authored papers over single authored papers.
Mc Alisler et al., (1980) ascertained the extent of agreement between expert’s subjective assessment of scientific journals and citation ratings of the same journals.

Scales (1976) compared the ranked list of the most used journals. According to the results of a survey undertaken at the National Lending Library, the highly cited were journals.

Clark (1957) in a study on eminent psychologists found that the citations to journals were highly correlated with one or the other measure of eminence.

Gross and Gross (1927) perhaps was the first to use the citation analysis. They suggested the use of citation in measuring the adequacy of a college library

2.5 Studies Related to Doctoral Theses

Mull and Konnur (2012) analysed doctoral dissertations awarded by Visvesvaraya Technological University (VTU). The primary objective of this study was to understand the growth and development of research activities of VTU in the past 13 years. The data for the present study had been collected from two authenticated sources: (a) the data published in the University News: a weekly journal from the Association of Indian Universities and (b) the VTU website (http://www.vtu.ac.in/). There were 250 doctoral degrees awarded from 2007 to 2011, in 14 engineering and allied domains. The data relating to research growth and development were analysed and presented under 9 heads

Jamal Nasir et al (2011) dealt with the citation analysis of 4500 citations that figured in doctoral dissertations submitted to the department of History, AMU Aligarh during the year 1990-2010. The study was carried out to determine the use pattern of literature by the researchers in the field of History. The citation analysis was pertained to
The result showed that the books had the highest number of citations, accounting 72 percent of the total citation. The majority of the documents, i.e. 45.52 percent out of the 4500 were in English Language and the rest i.e. 54.56 percent were in other language. It was observed that 61.29 percent of the articles were published from India. 77.41 percent of the articles had been produced by single author followed by a team of two authors, three and more than three authors. The “Journal of Bihar research society” occupied the first position with the highest citation numbers, while analysis was undertaken about the above studies, they were pertaining to one journal or Person or the publications for a certain period of time.

Sudhier (2010) reviewed the application of Bradford’s Law of scattering. In addition to the theoretical aspects of the Law, the review covered papers dealing with the application of the law in the various subject fields. A study on five year data of journals (2004-2008) cited by the Physicists at the Indian institute of Science., Bangaluru was carried out to examine the applicability of Bradford’s Law of Scattering which includes 690 periodicals containing 11319 references collected from 79 doctoral theses during the period 2004-08. Applicability of Bradford’s law in various methods was tested.

Zafrunnisha and Pullareddy (2009) in their paper presented a study of the authorship pattern and collaborative research in the field of Psychology. They collected data from 141 Ph.D theses submitted to three Universities and used this data as source materials. The collected data included 22565 citations among study. It could be identified that there was a predominance of multi authored papers over these only journal citations were considered for the study. A total of 14374 journals were utilized for their single authored papers.
Doraswamy (2006) carried out an analysis of citations cited in the Ph.D Theses. He analyzed 4050 citations and found journal articles to be the most preferred source of information for research scholars in Botany and studied the distribution of cited literature in different bibliographic forms and authorship pattern and also rank list of cited journals.

The researcher selected a set of journals for specified period of time. Since there was hardly any study related to this, the researcher was motivated to ascertain the research performance of 9 journals pertaining to Economics for a period of 25 years and also on specific subject head ‘Public Finance’.
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