CHAPTER - II

REVIEW OF LITERATURE

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CHAPTER - II
REVIEW OF LITERATURE

2.0. Introduction

Literature review is a descriptive analysis of the literature relevant to the particular field or topic under study. It gives an overview of what has been said, provides identification of the key writers, the prevailing theories and hypotheses employed are revealed, the questions that are being/likely to be asked are discussed and the methods and methodologies appropriate and useful are discussed. As such, it is not in itself a primary research, but rather it reports on other findings.

Definition Review of Literature:

Cooper H.M. explains Literature Review in the following words - “... a literature review uses reports of primary or original scholarship as its database, not reporting the new primary scholarship itself. The primary reports used in the literature in a vast majority of cases are written documents but they may also be verbal reports. The Scholarship may be Empirical, Theoretical, Critical/Analytic, or of Methodological types in nature. Literature Review describes the summaries and helps to evaluate, clarify and integrate the contents of the primary reports.”

A Literature Review may be of purely descriptive nature, as has been observed in an annotated bibliography. Literature Review may otherwise, just provide a critical assessment of the literature in a particular field, by stating where the weaknesses and gaps exist, by contrasting the views of particular Authors or by raising questions. Such a review will not merely be a summary alone, but it will also evaluate and show relationships between different materials, so that the key themes could emerge frankly. A descriptive review merely lists and paraphrases, which may not be sufficient, therefore, it is necessary that it should add comments and also bring out the themes and the trends.

The researcher has given major importance to this section as being an important part of the review. The researcher does not give a mere paper-by-paper summary; instead, he deals with Themes and draws together results from several
papers, for each Theme involved. For this section, four Themes have been identified as follows:

(i) Assessing the quality of published work.
(ii) Interpreting effects.
(iii) Points of Grammar and Style
(iv) A few remarks about tables and figures: Themes are dealt with under sub-headings to make it easier to write the review and easier for others to read it.

When writing a review for another Journal, or a Thesis, one is encouraged to read these guidelines on scientific writing and adopt them for better utilization. The main points mentioned there-in are:

• Avoid technical terms (if & where possible):
• Avoid abbreviations.
• Use simple sentences.
• Avoid the errors of punctuation and grammar.
• Rather than Passive voice, use of direct speech using first person (I, we) be preferred.
• Ideas need to be linked into a sensible sequence without repetitions or discontinuities.
• Like original research, Reviews too vary in quality. There are information sources for literature Review Sources, Books, Journal articles, Reports, Dictionaries, Encyclopedias, Theses, News Paper Reviews, Web Resources, Online Resources, Subject Databases & Abstracts and various other such Resources.

Literature search is the first major phase of this research work. The investigator has collected all relevant literature-material and studied them to have insights into the important concepts involved in the topic. The domain specific databases such as LISA and LISTA searched. In addition, other databases such as Web of sciences and ERIC databases searched and suitable literature for the study found. It is envisaged that this phase of the research work provided the investigator a strong basis for the future work. Basically I have collected information about Citation-Analysis’ origin and development, utilization of Citation-Analysis, its impact
and benefit to library functioning, how a user could derive the benefit from this study, this concept has been covered by me in the ‘Literature-Reviews’ section.

2.1 Origin and Development of Citation Analysis.

Citation Analysis there is number of excellent literature reviews that provide a history of Citation Analysis. Although most Citation Analysis belongs to the 1960’s when citation indices began to appear, they all agree that Citation Analysis probably originated much earlier. Fraideh Osarch (1996) indicates there is evidence of bibliometrics studies as far back as 1890. Linda Smith (1981) describes research published in 1929 by Gross and Gross that utilized Citation Analysis as a collection development tool Citation Analysis is a Bibliometrics technique that uses citation patterns in documents to trace the relationships between those documents and the original sources and authors. The relationships found provide a picture of the cultures of those disciplines. Eugene Garfield (1979) - "Citation links...provide a quantitative picture of Journal utility and relationships that is useful". Garfield wrote several articles in the 1970s on the Citation patterns of engineering Journals.

A few significant studies on the use of Citation Analysis emerged in the 1980s and 1990s. Citation Analysis of the Science/Engineering Journal literature has been used by librarians. Primarily it is of guiding the journal collection development. One of the earliest examples of this type of study was Gross and Gross's seminal 1927 study of Citations in a year's worth of the Journal of the American Chemical Society. Other researchers have used the information gathered in Citation Analyses to create a picture of information use within a specific discipline. For example, Musser and Conkling (1996) looked at citations in major scholarly engineering Journals. They found that engineering Journal Citations averaged 53% Journal articles, 19% conference papers, 12% monographs, 9% technical reports, 2% dissertations, and 1% each of theses and standards. Musser (2007) also looked at references in selected mining engineering Journals from 1995, finding the document use pattern to be similar to that for general engineering seen in the 1996 study she did with Conkling. Both articles mention the implications of their results to library collection development.
A list of References is the list of publications that have been consulted by the author of a work. References are also called Citations. Citation is a frozen footprint in the landscape of scholarly achievement … which bears witness to the passage of ideas (Bliss Cronin). Though there is a subtle difference between the words ‘Reference’ and ‘Citation’, in the literature they are used interchangeably.

Mark suggests that authors should cite better and cite less, rather than seek comprehensive literature reviews, they should cite the “most important and valid research evidence.” This is useful advice. However, there are no clear-cut rules for truncation of a citation search. Research is often faced with problems of time, availability, influence, and relevance when deciding to truncate a search. Authors read what they cite, they become aware of literature that previous contributors considered important. These authors were being less likely to use unnecessary Citations because reading such papers might reveal their irrelevance. Therefore, elimination of unread citations should result in substantial progress toward meeting the Mark goals. It also urges authors to inform readers of the relevant evidence provided in each Citation. If there is no evidence, authors should explain the purpose of the Citation. When the first author of this paper does reviews, he strikes out references that do not meet these criteria. This means that he typically strikes out most references. It is incumbent on citing authors to ensure the accuracy of their Citations. Errors in the Citation detract from the functions of a bibliography and often impede retrieval of cited literature.

Smith (1981) reviewed the literature on applications of Citation Analysis and identified the following areas of applications.

1) “Literature of studies”: In these case Citations in a particular subject area to be studied to describe the pattern of Citations.

2) “Type of literature” studies: Citation Analysis can be used to gauge the dissemination of results reported in certain types of literature.

3) User studies: The application of citation analysis technique in determining user needs is very much useful for collection development and design of library services.

4) Historical studies: Citations can be used to trace the chronology of events.
5) Communication Pattern: It is stated that Citations can be thought of as a plausible indicators of scientific communication patterns.

6) Evaluative bibliometrics: it is defined as evaluation and interpretation of citations.

7) Informal retrieval: Citations are considered as useful supplements to keywords in identifying relevant documents.

8) Collection development: Citation analysis can be used as a tool for collection development. The journals are costlier than books and number titles of journals are many and the collection also grown is very quickly. The Citation Analysis often helps in deciding titles of Journals.

Kriz Harry (1978) studied, who reads from time to time of libraries that have suspended book buying. The number of new titles in the social sciences has grown at an alarming pace while subscription prices for established Journals have been rising at rate much higher than the general rate of inflation. Libraries have been forced to cancel a number of titles in order to keep up with increasing costs, as well as purchasing new titles and making room for the current volumes. Mccain (1981) summarized previous research in weeding serials and space problems.

Bourne and Gregor (1975) reviewed the techniques used by a number of libraries in selection of titles for cancellation. They proposed a collection development methodology based on a network of libraries rather than an individual library and showed how estimates of subscription savings be made. These studies suggest that decisions to contains or cancel subscriptions in a library must be made on a subject by subject basis.

Citation Analysis has become one of the popular methods employed in the identification of core Journals in a particular subject field or for a particular scientific community in a geographical area. It is a technique of listing of references cited to articles in significant periodicals and counting the frequency with which periodicals are cited. This method emphasizes that Journals most desirable ones in a library collection, for they are likely to be frequently used by the scientists. Garfield (1979) stated Citation Analysis provides a number of interesting and useful insights into the
network of Journals that function as the primary formal communication medium of science.

The studies have led some people to believe so and they are asserting that Citations Analysis can be used to predict world highest scientific honor of Noble prize winners. It is not an exaggeration. In recent research data are helpful in forecasting which fields may eventually be acknowledged with a Nobel Prize class. Generally one of the criteria of a Nobel Prize quality work is that it is frequently cited over a considerable period of time. But to “predict” which individual were win a specific prize in a specific year is pure guess work. One would have to be privy to consideration by the Nobel committees, to intelligently guess the outcome. A large number of Citations studies have been made all over the world. In India, several such studies and references have also been conducted but so far so attempt has been made to prepare the list of significant documents (Books, journals, reports, etc) and their back files required by Indian Social Sciences and Scientific Research working in various specialized areas. Ranked lists thus prepared, can be used by librarians and the Science Community to select Journals of greater coverage and productivity in particular subject areas in the Science subject.

Garfield (1979) explaining comprehensive discussion on the use of Citation Analysis for rate of scientific performance, there was some controversy surrounding it. The general adverse criticism that Citation counts include an excessive number of negative Citations (Citations to incorrect results worthy of attack), self-citations (Citations to the works of the citing authors), and citations to methodological papers is analyzed. Included are a discussion of measurement problems such as counting Citations for multi-authored papers, distinguishing between more than one person with the same last name (homographs), and what it is that Citation Analysis actually measures. It is concluded that as the scientific enterprise becomes larger and more complex, and its role in society more critical, it is become more difficult, expensive and necessary to evaluate and identify the largest contributors. When properly used, Citation Analysis can introduce a useful measure of objectivity into the evaluation process at relatively low financial burden.
Burton and Kebler (1960) introduced the term half-life to quantitatively describe the rate of obsolescence of the scientific literature (in analogy with term ‘half-life’ used in Nuclear Physics to describe radioactive decay). Brookes (1968) developed a model which provides a mean of interpreting the differences between the slowly aged and quickly aged Journals. Line (1970) defined ‘half-life’ as “Half the active life, i.e., the time during which one half of the current literature was published”.

Griffith (1979) studied that the Citation data confirms the Brooks model. He further presented that ageing rates vary among Journals and it is relatively easy to indentify Journals which age at about the same rate, at which the literature grows and Journal which exhaust their utility within few years.

Smith (1981) suggests that Citation Analysis of Theses and Dissertations can have implications for both collection-development and user-services. She cautions librarians towards the fact that Citation does not imply quality or importance. It is a methodology; controversial methodology because it does not represent all the possible needs or uses for information (Haycock, 2004). Though valid criticism of Citation Analysis exists, several authors have shown that Citations correlate with other methods of collection analysis, including impact factors, circulation statistics, in-house use, and user surveys.

Garfield (1983) described Citation Analysis is used to study the journals, and people work of science. Citation Analysis of different subjects is based on a literary model of scientific process (Garfield, 2004). Based on this model, Citation Analysis has been carried out in a variety of ways (Johnson, 1996). Garfield (2004) has observed that scientific work is represented by the papers published to report it, and the relationships between works are represented by references.

Narendra Kumar (1985) studied the pattern of information use of the faculty of management studies by analyzing the Citations given in the Ph.D. Theses submitted to University of Delhi during the years 1965 – 1985. He concluded that the book is highest cited source. The cited periodicals are published by USA an India.
The obsolescence factor in business management as the scholars use even 36 years old sources.

**Alvarado and Cortes (1988)** studied 748 periodical Citations in “Geological review of Chile” for the period of 1995-1996. The result showed that 1974 publications is 13%. The half life and median life of the literature were 12 years and 8.3 years.

**Sangam (1990)** analyzed the Economics literature and studied obsolescence and determined the aging factors such as annual aging factor, half life, mean life, utility factor for Journal literature and books in the field of economic.

**Momoh (1996)** noted that several researchers have used citation analysis to look at subject focus of postgraduate students and determine their journal needs. It was observed by Gooden (2006) that citation analysis were used by librarian in different fields to eliminate costly low use/unused journals, identify core journals needed for use and to purchase the needed materials.

**Aina and Mabawonku (1997)** worked on literature of information in Anglophone Africa and discovered that majority of publications used for research were published within ten years of their publications. Citation analysis which involves counting how many times a paper or researcher is cited, assumes that influential scientists and important works are cited more often than others.

**Labonte (2005)** studied Citation Analysis to determine if a science engineering library was meeting the needs of an interdisciplinary group of faculty. This study was aimed at developing a core list of Journals and identifying Journals that should be added to the collection. The three most recent publications of each faculty member (published within the last five years) were analyzed using Science Citation Index. Results indicated that the library subscribed to 98 percent of the Journals in which faculty members are published or cited frequently.
Edzan (2007) describes the analysis of bibliographies of final year project reports emanating from the Faculty of Computer Science and Information Technology, University of Malaya. A total of 73 reports were analyzed using a pre-designed score-sheet and the results presented included number of pages, number of Citations, types of sources used, usage of Web resources, currency of sources and Citation style. The contents analysis of the bibliographies indicates: (a) the least number of Citations per report is 6 and the most is 165 with the most number of Citations within the range of 11 to 20 cites; (b) there are more Web Citations than citations to books, Journal articles, undergraduate reports, Masters dissertations and conference papers; (c) there are more citation to .com than to .org, .edu, .net and other URL extensions; (d) most Citations are not dated, while, most of those dated are from within the last three years, with the most current being the year 2005 and the oldest dated citation is year 1935; and (e) most references have their print citations cited correctly but the Web Citations cited incorrectly.

Melissa (2007) studied Citation Analysis of Minnesota department of health official publications and journal articles. This study is assessment for the RN Barr Library. The result is heavily cited journal literature and current source is within 5 years. The library subscribed 70% of journal and book of cited resources.

Nkiko and Adetoro (2007) studied citation analysis of Covenant University Students' Research Project, Canaan Land, Ota, Nigeria found out that books were more cited and 36.5% of total citations were made between 2001 – 2006 years. Which was at that time very recent. They concluded that a high citation count reflects depth and diversity in the literature review, as well as measure of honesty in research reporting. Moreover, on the recency of consulted information materials,

Zainab and Goi, Sook Sze (1997) Analysis of 5,610 Citations from 104 Master's degree and Doctoral Dissertations submitted to the University of Malaya between 1984 and 1994 in the Humanities (religion and philosophy; history; language and literature) has been conducted. The average Citation per Dissertation in various Humanities fields, are 56.7 for religion and philosophy; 102 for history and 45.3 for language and literature. Over 52% (2,927) of the Citations were to books, 23.55%
(1,321) to Journal articles, 9.43% (529) to book chapters and 6.24% (350) to Theses. A total of 4,766 (89.94%) authors of the Citations were single authors and 700 authors formed the core authors contributing a total of 2,160 (36.59%) of total Citations. The use by humanities researchers of a wider number of Journals and book titles indicate that they need to use a greater number of sources for their research information needs. More than 50% of the Citations were aged between 1 to 20 years and some were aged even more, more than 100 years. Researchers use a high percentage of documents in the English language even though about 66% of the Dissertations were written in the Malay language. The references by and large are of Malaysian or Asian in origin reflecting resource needs of these researchers.

Lois Buttlar (1999) studied Citation Analysis to analyze sixty-one library science and information science dissertations and result that 80% citations were to single authors and 46% are Journals articles for their research work.

Daljeet Ghai (2001) studied the Citation Analysis of Ph.D. Theses in LIS submitted to the eight Universities of Madhya Pradesh and Punjab during the years 1975 to 1999. In this paper result identified eight types of sources for the research and Journal is the highest cited forms. The time dispersion analysis highlighted the general trend to cite recent material not earlier than 19 years.

Kushkowski (2003) conducted a longitudinal study of over 9100 citation from 629 master's and doctoral theses and found that authors favour current researches regardless of discipline.

Haycock (2004) studied the reference lists of forty-three education Dissertations on ‘Curriculum & Instruction’ completed at the University of Minnesota during the calendar years 2000-2002 were analyzed to inform collection development. As one measure of use of the academic library collection, the Citation Analysis yielded data that was useful to guide, Journal selection, retention, and cancellation decisions. The project aimed to ensure that the most frequently cited Journals were retained on subscription. The serial monograph ratio for Citation also was evaluated in comparison with other studies and explored in the context of funding ratios. Results
of Citation studies can provide a basis for liaison conversations with faculty in addition to guiding selection decisions. This research project can serve as a model for similar projects in other libraries that look at literature in education as well as other fields.

**Lokhande and Chikate (2008)** analyzed the Citation Analysis of Doctoral Theses submitted to the department LIS at Poona University. Around 20 of those Theses are analyzed. The result identified Journals (45.16%) is the most preferred sources of LIS. The highest cited Journal is Scientometrics (4.13%).

**Kuruppu and Moore (2008)** analyzed information use by Ph.D. students in Agricultural & Biology subject. This paper studied the Agricultural Biology graduate students of Iowa State University. The result is states that journal is prime source.

**Yeap Chun Keat and Kiran Kaur (2008)**, this study applies Citation Analysis method to examine the use of information resources by students of the Master in Library and Information Science (MLIS) at the University of Malaya in preparing their Dissertation. References from a sample of 40 MLIS Thesis from the period 2000-2005 were examined for: year of publications, author; source title, bibliographic format, language, subject category, and place of publications. Core Journal titles are compared with Journal Citation Report (JCR) listing and also for availability at the University of Malaya Library. The study displayed that Journals and books are still the most used sources for information and there is a steady increase in the use of electronic media by Library and Information Science (LIS) researchers. Authorship pattern indicates preference for single authored works. This study serves as a baseline indicator of resources used by LIS researchers. It can be utilized by librarians to focus on collection development to support research needs.

**ShiJian Gao and Luo (2009)** conducted study of Citation Analysis of 56 Ph.D. Theses submitted to Wuhan University in China. In this study identified most of the researcher prefers English language sources.
Hellqvist (2010) studied Citation practices in the Arts and Humanities from a theoretical and conceptual viewpoint, he drawing on studies from fields like Linguistics, History, Library & Information Science, and The Sociology of Science. The use of references in the Humanities is discussed in connection with the growing interest in the possibilities of applying Citation Analysis to humanistic disciplines. The study displayed how utilize of references within the Humanities is connected to concepts of originality, to intellectual organization, and to searching and writing. Finally, it is acknowledged that the use of references is connected to stylistic, epistemological, and organizational differences, and these differences must be taken into account when applying Citation Analysis to humanistic disciplines.

Graham Sherriff (2010) presented in his article need for quantitative investigation into students’ use of information resources in Historical research. He studied more than 3,000 Citations from Master’s level History Theses submitted between the years 1998 and 2008 at a midsized public University. The study’s results support the hypotheses that the predominant format in History research is the monograph and that History research entails use of older resources, and in greater proportions, than other disciplines. Results also support the conclusion that journal usage is comparatively low and that there is a high degree of Citation dispersal across Journal titles.

Joanne Smyth (2011) this study uses Citation Analysis to examine students’ Dissertations and Theses in History, Psychology, and Education, noting changes in research practices since the introduction of electronic Journals and other online sources. It shows that students are making greater use of Journal back files and that this trend may be driving them toward monographs with a wider range of publications years. While the disparate research styles between the broad categories of Sciences and Humanities and Social Sciences are generally understood, this study also found significant differences among students within Humanities and Social Sciences programs. However, all disciplines in this study seem to be invigorated by their access to electronic resources.
Jamal Nasir and Devendra Kumar (2011) studied 4,875 Citations in the Doctoral Dissertations submitted between the years 1990-2010 in the Department of Economics, Aligarh Muslim University, Aligarh, India were analyzed to ascertain the authorship patterns, distribution of literature by format, language, country and decade, and rank of Journals by Citation frequency. It is found that books are the most dominant form in which information is communicated in economics. The dominant language of the literature cited is English. And the single authorship prevails in the Citations.

Jadhav and Santosh (2011) This Research paper presented Citation Analysis of all the journal articles published in the journal University News, from January 2004 to December 2008 is carried out in 5 volumes. The Citations taken for the study are 5968. The maximum number of Citations were referred in the two years, 2007 to 2008 and the count rose to 2950 (50.6%), the most Cited type of document is book 1549 (26.39%), the maximum number of Citations were from India that number is 3675 (62.61%), in authorship pattern single author Citations are dominant than that of others, that number is 3011 (51.30%).

Mulla, Dhanamjaya and Talawar (2013) studied the obsolescence of Engineering literature cited in 137 Doctoral Dissertations of Engineering and Technology awarded during the years 1961 to 2008. The study reveals that, an overall of 7467 Citations of periodical articles and 2014 book Citations are scattered primarily among fifteen subjects. However, Citations were derived from early 1990 to after the year 2001, 86 % of books cited by Engineers and Technologists in their PhD Theses of 9-39 years recent associated an outsized share of the Journal Citations (68.58 %) utilized by the researchers was published 20 years back or older than the recent ones. It together brings that extra Journals literature cited during 1971-2000 equally in books literature cited at intervals of 1961-1990.

The literature review studied and grouped under following science subject of Physics, Chemistry, and Zoology. This subject studies cover based on our research objectives. The review literature of Authorship collaboration, Rank and scattering Journals, Form wise distribution, Country wise Journal Distribution, Language, and Obsolescence of literature, Half Life and other aspects are revived.
2.2 Citation analysis in Physics

Govinda Raju (2014) study is based on 30691 Citations, cited in the 163 Theses in Physics submitted to Andhra University, Visakhapatnam. The study analyzed Ph.D degree during the period 1942-2002. The analysis found out the Physics researchers referred mostly Journal source rather than other sources. Journals are considered to be the most primary and authentic channels of communication for scientific information, Distribution of cited Journals in Physics clearly indicates that a very small number of Journals are contributing to maximum number of Citations.

Somashekara and Kumbar, M (2014) studies the research performance of Department of Physics, Bangalore University, Bengaluru, Karnataka. This study covers 2485 Citations. The study analyzed major part of Citation is Journal Citations 80.68 % followed by books 10.99% and 1.21 % is E-resources. In total Citations Collaborative authorship is the highest 72.39%. The Physics researcher highest cited between the years 1991-2000 (28.89%) and the cited citation of journal article published by U.S.A., (849) 42.34%, U.K. 278 (13.87%) and India is 163 (8.13%).

Jadhava Vandana and Khapardea (2013) Researcher studied the Ph.D. Theses submitted to Dr. Babasaheb Ambedkar Marathwada University. The present study, 30 Ph.D. Theses of Physics were chosen as a sample from the year 2004 to 2008. There are 5726 Citations in these 30 Theses. The data collected from the bibliographical entries listed at the end of the Theses was used by the researchers for completing the Theses. These Citations were photocopied. Citation Analysis is carried out to find the types of cited documents, the chronological distribution of cited documents, to find out the authorship pattern of cited documents. The ranked list of cited journals and books, language-wise distribution, geographical distribution of cited documents, the ranked list of cited web – sources are analyzed.

Rahman Ziaur and Bhattacharya (2013) studied Ph.D. Theses in Physics, submitted to the North Bengal University Darjeeling, West Bengal during the years 1987 to 2007. This study aims to determine the year wise distribution of Theses, the guide-ship pattern and to determine the most productive guides and average number of Citations per Theses. The studies also investigate the Citation distribution to show
which format is cited most in each subject of Science. It also identify the characteristics of the cited references in terms of format, source of information, chronological distribution of cited literature, which show the time during which literature in the particular subjects remains active. The study presents the trends in authorship pattern and collaborative research in Physics. Journals and Books/monographs were the two formats that were most frequently cited in Physics (81.76% and 8.34%). The ratio between single and multi-authored papers is approximately 1:3. The degree of collaboration in Physics is 0.774. This study indicates that maximum references were used during the year of 1980-1989 and Journals published by India, USA, United Kingdom and Netherland. The most frequently cited Journal titles were The Physics Letter, Physics Review and Mol. Cryst. Liq. Crystal.

**Pushpa and Easwarakumar (2012)** this paper analysis the algorithms like Page Rank and HITS are significant extensions to Citation count, for determining the importance of scientific papers in a bibliographic network. The original Page Rank algorithm is insensitive to the search topic. It attempts to assign high rank to the Web pages based on the link structure of the Web. However, more often the rank of documents is topic dependant e.g., web page of high influence in Arts may be an unknown entity in Business. The traditional Page Rank algorithm doesn’t include temporal dimension in its analysis. Consequently, old Web pages receive high rank than new pages. A novel approach called Time-Sensitive and Topic-Specific Page Rank (TTSP) has been proposed in order to study their combined effect in a completely unsupervised fashion. In addition, to locate authoritative documents in a given topic, varying transition probabilities based on the impact factor of the journal is also included in the proposed approach. The empirical study of the proposed model’s output on High Energy Particle Physics (HEP) dataset, demonstrates its ability to identify contemporary and authoritative documents in a given topic

**Dhanamjaya, Talawar, Mulla and Chowdappa (2011)** the researcher visibility of reference patterns in Doctoral Theses of Engineering and Technology awarded by the various general Universities of Karnataka. The study consists of 17,151 Citations which have appeared in 137 Doctoral Dissertations awarded during
1961–2008. Large number of Citations were traced during the years 1981 to 2000, awarded Doctoral Dissertations. The distribution pattern of citation by type of documents i.e. Journals are heavily cited (43.54%). It was observed that books in the next order (11.74%) followed by conference proceedings, reports, symposia papers representing 28.42% of the total which occupy an important place in usage. The average number of Citations per Thesis was 125.18. It is also noted that majority of Citations patterns were traced in civil, mechanical and electrical engineering. Further the characteristics of references cited by the Engineers and Technologists in their Ph.D Theses were studied. This paper also studied bibliographic form, language, country, subject, authorship pattern and frequencies of Citations are presented in different tables and figure with some well known statistical and Bibliometrics parameters have been applied for the study.

Sudhier (2011) studied University of Kerala Physics Department’s Theses during 1999-2003, it was observed there that Journals and books are the most preferred bibliographic form of Citations used by the Physicists, which are 82.08% and 12.92% respectively. The comparative gender-wise study indicates that the average number of Citations of male scholars is more than that of female scholars but the numbers of theses of female scholars involved in research are more than the male scholars. The result of the study is aimed at appraising the Physicists to make them aware of the direction of the ongoing research in Physics.

Sudhier (2010) studied five years’ data of the Journals cited by the Physicists at the University of Kerala, India. It has been found that, work has been carried out to examine the applicability of Bradford’s Law of Scattering on a sample of 303 Journals containing 2655 Citations collected from 12 Doctoral Theses during the period 2004-08. Ranked lists of Journals are prepared, and the most preferred Journal is found to be the Journal of Geophysical Research containing 345 Citations (amount to 12.97%), with this being the highest number of Citations among the Journals under study. The paper provides summary and review of the scholarly contribution on the various facets of Bradford’s law. In addition to the theoretical aspects of the law, the review covers papers dealing with the application of the law in the various subject fields. Bradford’s law has been tested. The Journal distribution pattern of the Doctoral
Theses does not confirm to the Bradford’s distribution pattern. The Bradford multipliers are calculated, and the law was found to be applicable with the value of $k$ as 2.66. The distribution of the Journals in three zones done and the number of references in each zone was then calculated. The Bradford’s Law of scattering doesn’t follow the Journal distribution pattern.

Edward Eckel (2009) studied the Citation patterns in 96 Master Theses and 24 Ph.D. Dissertations completed at Western Michigan University's College of Engineering & Applied Sciences, U.S.A., between the years 2002 and 2006. The data analysis indicates that Doctoral Engineering students use a significantly greater number of scholarly Journal articles (44.3% to 29.3%) and conference papers (21.9% to 12.5%) than master's degree students. The master's students depend more heavily upon literature available on the web (web sites, government papers, grey literature, trade magazines, and patents).

Gururaj Hadagali Kumbar and Amrut Benahal (2009) in this paper analyzed Physics theses submitted to Karnatak University, Dharwad during 1992–2006. They studied 10,057 citations given in the references in the 37 theses. Journal of Chemical Physics ranked first among 548 journals. It is found from the study that Half-life period of journals is 33 years.

Pillai Sudhier (2007) studied in his paper attempts to examine the obsolescence of literature in Physics by Citation Analysis. They studied the 3,180 citations, cited in the 12 doctoral dissertations of Physics awarded from Department of Physics, University of Kerala, India during the period of 1999-2003. It is observed that journals and books are the most preferred bibliographic form of Citations used by the Physicists, and they occupy 82.08% and 12.92% respectively. The findings show that the half-life of Journal Citations was 14 years and for books it was 25 years.

Mini Devi (2007) in this paper “A New derivation for Bradford’s Law of Scatter” highlights the significance of Bradford’s Law in today’s information age. The classical law is applied to the toxicology literature collected from the international database, toxicology information online (TOXLINE), and its validity on that was
tested. The data was found unfit for the law. Hence a new formula is derived and applied which was found fit for the study.

**Rajendran (2005)** studied the global output of fiber optics research. This article covered in the Ei-Tech index databases, the period 1999-2003 have been considered for the study. Based on the study, it can be concluded that about 1500 to 1700 articles on fiber optics are produced each year. Majority of the article are published in English language. About 45% of the articles published are in Conference proceedings. The number of articles contributed by the Indian authors is insignificant with just about 2% of the total literature and India ranks thirteenth. A ranked list of the articles is that maximum numbers of articles in the database are from USA. Journal of Light Wave Technology occupying the first rank.

**Yasar and Umut (2006)** this article analyzes the bibliometrics features (the number of pages, completion years, the fields of subject, the number of Citations, and their distribution by types of sources and years) of 100 theses and dissertations completed at the Department of Librarianship of Hacettepe University between 1974 and 2002. Almost quarters (24%) of all Dissertations were on university libraries, followed by public libraries (9%). Doctoral Dissertations were, on average, twice as long as Master's Theses and contained 2.5 times more Citations. Monographs received more Citations (50%) than Journal articles (42%). Recently completed Theses and Dissertations contained more Citations to electronic publications. Fourteen (or 3.2% of all) Journal titles (including Turk Kutuphaneciligi, College & Research Libraries, and Journal of the American Society for Information Science) received almost half (48.9%) of all Citations. Eighty percent of Journal titles were cited infrequently. No correlation was found between the frequency of Citations of the most frequently cited Journals and their impact factors. Cited Journal titles in Master's and Doctoral Theses and Dissertations overlapped significantly. Similarly, journal titles cited in dissertations also overlapped significantly with those that were cited in the journal articles published in the professional literature. The distribution of Citations to foreign journal titles fit Bradford's Law of Scattering. The mean half-life of all cited sources was 9 years. Sources cited in master's dissertations were relatively more current. Single authorship was the norm in cited resources. Coupled with in-library use data,
findings of the present study can be used to identify the core journal titles in librarianship as well as to evaluate the existing library collections to decide which journal titles to keep, discard, or relegate to off-site storage areas.

Keith Waugh and Margie Ruppel (2004) in this paper, Citation Analysis of 265 Workforce Education and Development (WED) Dissertations, Theses, and graduate research papers at Southern Illinois University Carbondale (SIUC) was used to determine core serials in the discipline, provide Morris Library with a guide to serials acquisition and maintenance, and it provide future WED students with a core list of WED journals. This study has applicability as a specific instance of applied citation analysis as well as for academic librarians faced with acquiring and maintaining serials in WED.

2.3. Citation Analysis in Chemistry

Anjan Gohain and Mukesh Saikia (2014) studied 10983 Citations, cited in the 30 Ph.D. Theses of Chemical Sciences submitted to Tezpur University, Assam for the award of Doctoral Degree during the period 2008-2012. Study revealed that Journals were the most preferred sources of information used by the researchers in the field of Chemical Sciences accounting for 78.83% of total Citations, followed by books with 15.57 % Citations. The Journal of Journal of American Chemical Society has ranked the first with 617 Citations accounting for 7.13% of the total journal citations. Journal of Molecular Catalysis a: Chemical 6.57% occupies the second rank getting 569 citations, followed by Macromolecules 6.27% with 543 citations. Authorship pattern for Journal Citations displayed that most of the Citations were contributed by more three authors that mean the collaborative research is prevailing in Chemical Sciences. Journal Citation, 39.89% are by more than three authors, followed by two authors with 22.28 %.

Li Zhang (2013) identified in his study compared the subject focuses and uses of research materials in Chemistry versus Chemical Engineering Dissertations completed at Mississippi State University, 2002–2011. Unsurprisingly, Journal articles and books were the dominant format of cited sources, and conference proceedings and web resources accounted for much of the remainder. It showed a
distinctively higher rate of Citations to books. Moreover, Chemistry students were notably more likely to cite older references.

Joginder and Sheela (2011) studied total 3052 Citations were analyzed cited from 33 Dissertations submitted by LLM students of University of Delhi, Delhi in 2006. It was found that 25.52% Citations were from the Journal articles and EPW with 7.19% Citations was the most used journal. 69.78% Citations were from the subject of Law and 79.84% contributions are produced under single author-ship 41% periodicals are cited from U.S.A.

Thanuskodi (2011) studied a study dealing with bibliometrics analysis of articles and references, contributed in Indian Journal of Chemistry from 2005-2009. The study presented that most of the contributions are India. Maximum number of articles was contributed by two authors. This study also showed that majority of the contributors preferred core journals as the source of information.

Bulu Maharana and Sabitri Majhi (2011) studied 450 research papers of Chemistry. He reveals that 36 (8 %) papers are contributed by Indian researchers. In the rank of contributing countries, India reserves third position after the U.S.A. and China. More than 86% of Indian Chemistry research papers were cited by others. 25% of Indian papers are cited between 10 and 25 times each. The Journal Tetrahedron was found as the highest publishing Journal with 71 (16%).

Parvathamm and Gobbur (2011) studied Chemical abstracts during 1992-2006. The result present that a majority of Indian polymer scientists publish in periodicals or registered them as patents.

Gunjal and Sangam (2010) studied obsolescence of literature and factors in the field of Chemistry periodicals and Doctoral Theses during the years 1975 – 1995. The researcher observed that the average half-life of the Biochemistry Journal articles is low and highest is Organic chemistry Journal articles. But Doctoral Theses Inorganic Chemistry half life is highest and low is Biochemistry. It also define obsolescence factors of annual aging , half life, mean life, utility factor for the
Doctoral Theses and Cited Journal articles varies from one branch of Chemistry to another. Hence these findings have implications in a) the formulations of policies relating to the planning and organization, b) weeding of materials, c) binding of books and Journals, d) retrospective searching of literature in libraries.

Nandi and Bandyopadhyaya (2009) studied the research contributions in data of Chemistry submissions in the University of Burdwan. He analyzed 141 Theses submitted from the Chemistry department of the University during 1960-2000 and 979 articles. The objective was to i) find the trend of research, ii) article productivity and choice of Journals, iii) authorship pattern and iv) the position of the University in the State.

Vallmitjana Nuria and Sabate (2008), study was carried out on the Citations within the Chemistry field Ph.D. Dissertations. The analysis covered 46 Doctoral Theses presented at the Institute Quimic de Sarria (IQS) from year 1995 to year 2003. The results obtained from the 4,203 Citations revealed that the most frequently used documents which accounted for 79% of the total 33 journals were scientific papers, met 50% of the informational needs and the age of 50% of the Citations was no older than 9 years. Finally, the results can be used as a tool for the collection management of the library.

Kademani (2007) analyzed the Citations in 1733 publications published during 1970 - 1999 by the Chemistry division at BARC Mumbai. The Citation time lag was zero for 144 papers and one year from 350 papers. Single authored publications received 456 Citations and 1565 multi-authored publications received 10583 Citations. Parvathamma and Gobbur (2007) studied 6444 publications on plastics in Biological abstracts CD, during 1998-2002. Two or more authored papers constitute majority of the contributions and degree of collaboration amounts to 0.81. USA produces the largest number of documents related plastics and English is most predominant language of the publications.

Vijay and Raghavan (2007) analyzed 779 articles published in five volumes of Journal Food Science and Technology. The results indicated that collaborative
research was dominant in India and the degree of collaboration was 0.91. The average number of authors and papers also showed an upward trend from 4.89 in 1994 to 8.2 in year 2003.

**Biradar and Tippeswamy (2004)** studied the references in 62 M. D. Pediatrics Dissertations submitted to the J.J.M. Medical College, Davanagere. The result indicated that periodicals (79.12%) are the highly utilized source. Three authors have contributed 25% of the articles.

**Ullah Mohd Furqan Kanwar and Kumar Pradeep (2004)** researcher an analysis has been made of 20,046 Citations mentioned in 777 scientific and technical reports published by National Institute of Hydrology, Roorkee. The paper gives an account of year-wise break-up of different categories of reports. Different bibliographic forms of literature cited in the reports such as Journals, books, conference proceedings, technical reports, IAHS publications and other documents like Ph.D. Thesis, M.E./M.Tech Dissertation, bulletins, standards etc. have been analyzed and presented. A ranked list of 56 most important Journals related with hydrology and water resources, out of 140 cited Journals in the reports has been prepared. This ranked list of journals covers 92.7% of the total Journal Citations. The analysis have revealed that 40% of total Journal Citations relate to only 3 Journals namely Water Resources Research (15.01%), Journal of Hydrology (13.43%) and ASCE's Journal of Hydraulic Engineering (7.56%). The country-wise Distribution of most cited Journal has also been prepared and categorized.

**Ma Jianhua (2003)** studied in this paper introduces a Citation Analysis study on the references of Doctoral Dissertations of Organic Chemistry in Peking University from year 1995 to year 1999. The sequence of the most often cited international Journals is given. Among the total 2818 references, the Chinese literature counts for 13.2% and the foreign languages materials counts for 86.8%. Among the foreign language materials, the periodicals count for 92.7% in the whole cited foreign references. The statistics analyze that twelve titles of foreign periodicals can meet half of the users' demands and if the satisfaction rate rises to 80%, the library needs to subscribe to more than 60 titles of foreign periodicals.
Biradar and Sampath Kumar (2003) studied in this article obsolescence of literature, annual aging factor, mean life and utility factor of periodicals in the field of Chemistry. The obsolescence of literature was studied and half life of literature was found to be 11.8 years.

Davis (2002) studied in Cornell University undergraduate students prefer Internet resources over books. Similarly, in a study on undergraduate Engineering students at the University of Queensland, Australia

Gooden (2001) the researcher analyzed Citation Analysis of Dissertations accepted in the Department of Chemistry at The Ohio State University, during 1996-2000, data was performed as a way to determine material use. The 30 Dissertations studied generated a total of 3,704 Citations. Types of materials cited, currency of literature, and Dissertation topics were all analyzed. The current results corroborate past research by other authors. Journal articles were cited more frequently than monographs: 85.8% of the Citations were Journal articles and 8.4% of the Citations were monographs. The results of this study may be used to assist OSU and other universities in chemistry collection development.

Tiew Wai Sin and Kiran Kaur (2000) analyzed 4181 Citations cited to the References section of 250 research articles and 8 short communications in Journal of Natural Rubber Research. It was found that Journals/serial publications were the most cited source of information among Rubber Scientists (72.4%). The study also revealed the trend towards collaborative research among rubber scientists as two or more authors 61.56% of rubber literature. Rubber Scientists are also quite up-to-date in their search for knowledge, as references cited were fairly recent with 55.97% covering the period of 1978-1997.

Aruna Prasad Reddy (1999) she studied the Ph.D Theses in Chemistry submitted to Andhra University during 1964-1997. The study find out authorship pattern, Citation pattern, language, year wise Citation distribution are studied.

Maheswarappa and Praksh (1982) studied productivity of cited Journals it identified 50% Journal literature used by the phyto-morphologists. 50 % are published first 24 journals other 50 % is published in 640 journals.

Ragavan and Shalini Urs (1977) analyzed the periodical holdings of C.F.T.R.I., Mysuru and application of Bradford’s distribution. In this study top 20 most productive periodicals accounted for 45 % of the total periodical literature output in the field of food science technology. The scatter of periodical literature justified the Bradford’s law.

Sengupta (1974) studied the Citations in the annual review of Pharmacology and the annual review of Microbiology Journal, for the period of 1968 to 1970. In this study they prepared the Journal rank list in the field of Pharmacology.


2.4. Citation analysis in Zoology

Kannappanavar (2013) carried out Citations of 24 Doctoral Dissertations in Applied Zoology submitted to Kuvempu University. The study analyzed the principal bibliographic forms, the Journal used and their distribution of country of origin and chronological scattering. The application of Bradford’s Law of scattering to the literature of Botany reveals an exponential trend when plotted on the graph. The study furnish that the distribution pattern of Citations by type of documentary sources exhibit that periodicals are highly cited (75.52%). Books are considered as the second major source, which accounts for 17.25%. In other words, periodicals and books together constitute 92.77%, while other forms of sources remain almost negligible. Team research prevails in the field of Biotechnology. The degree of collaboration is found to be 0.66. The study furnishes that United States occupied the top position,
with 1,679 citations (32.69%), followed by India (1,303; 25.37%) and then the United Kingdom (842; 16.39%). It is evident from the result of the study that the Journal, Journal Mutation Research (212; 5.46%) occupies first in the rank list of Journals, followed by the Journal of Bombay Natural History Society 74 (1.90%) Aquaculture 70 (1.80%) and Journal Fish Biology 67 (1.72%) are most cited periodicals.

Laura Newton Miller (2011) focuses on the Citation Analysis of Graduate/Masters’ Theses from Carleton University's Biology Department with implications for library collection management decisions. Twenty-five Masters’ Theses were studied to determine, Citation types and percentages, rank of Journals by frequency of Citation, number of authors citing and age range of Journal Citations. The researcher examined what percentages of Journals were accessible through the local catalogue and conducted further analysis of specifics regarding unavailability. Journals were also ranked by subject specialty. Results indicate that although the library has many of the Journal articles cited, knowing why a Citation was unavailable is useful for establishing future purchasing needs. Although Journal rank are traditionally performed using total number of Citations, the rank by number of authors citing a source can make a difference when compiling core Journal lists. The researcher concludes by discussing implications for collection development in times of fiscal constraint.

Kannappanavar and Roopashree (2011) analyzed information use pattern of Indian Geneticists. They pointed out that Journals are heavily cited as compared to other forms of documents. The trend towards team research is very high. Around 48% of the Journals cited are from the U.S.A. Kumbar and Kumar (2011) identified the authorship trend and collaborative research on Genetics and Plant Breeding, based on the data collected from Indian journal of Genetics and Plant Breeding published during 1998-2002. The study showed that 215 papers are two-authored. The degree of collaboration in research in research is 0.87 in genetics and plant breeding as whole and ranged between 0.86 to 0.89 during 1998-2002.

Ram (2010) studied the use of Podophyllotoxin as Anti-Cancer research out of the 948 articles, retrieved from Web of Science or the period of 1975-2007, 86.6% documents are indexed journals and the remaining are other kinds of documents.
Majority of the research on Podophyllum has been carried out in three countries viz., U.S.A., China and India. The authorship pattern show that over 92% documents are by multiple authors.

**Nandi and Bandyopadhyay (2010)** were examined Zoological Research Contributions of the University of Burdwan in West Bengal, An Analytical Study of Research productivity in Zoology. The authorship pattern and nature of collaboration among the Zoology Scholars are studied by analyzing 236 Theses and 719 articles submitted by the Scholars of the Zoology Department at the University of Burdwan in eleven subdivisions of Zoology during 1960–2000. The highest number of Thesis submission was 64 and the highest number of article submission was 251 during the same time span viz., during the years 1986–1990. The highest number of Theses were submitted in Entomology (65), followed by Parasitology (51), Fishery (29) and Cytology (28) respectively. The highest (48) number of Theses were guided by Deb Kumar Chaudhuri. Authorship trend is towards multi-authored papers. The degree of collaboration is 0.51. The most prolific author was P.K. Choudhuri who topped the list with 80 papers during the period 1960–2000 followed by D.K. Choudhuri with 49 publications, S. Chakraborty with 49 publications, S.K. Ghosal with 45 publications, G. Majumdar with 44 publications and S.K. Moitra with 44 publications. Among the top rank journals publishing the papers are from India with 440 (61.18%) publications followed by Germany with 55 (7.64%) publications, Netherlands with 45 (6.25%) publications, USA with 40 (5.56%) publications, China with 25 (3.47%) publications and UK with 24 (3.38%) publications. Among the six state Universities of West Bengal, Burdwan University has produced highest numbers (719) of articles followed by Calcutta University with 452 articles, Kalyani University with 316 articles and North Bengal University with 77 Zoology articles during the period 1960–2000.

**Olatokum & Makind (2009)** conducted a study on citation analysis of doctoral works accepted at the Department of Animal sciences University of Ibadan, Nigeria. Journal articles are highly cited documents while web resources had the lowest citations.
**Prince and Rajyalakshmi (2008)** studied on Doctoral theses of awarded pharmaceutical science department in Nagpur University during 2000-2002. The paper studied only productivity concept and highlighted the significant contribution in research productivity.

**Jawed and Shah (2008)** analyzed 437 Citations appeared in 32 research articles in two issues of the “Rawal Medical Journal”. The study revealed that 49.5% Citations Journal Articles and rest to other resource types.

**Swanepoel (2008)** applied Citation Analysis as a research tool to analyze the references lists of 316 Theses and Dissertations submitted by Masters’ and Doctoral students and accepted by Tshwane University Technology (T.U.T.) during the years 2004 to 2006. Study reveals that over a period of time there was a gradual increase in web resources but not as much as one would expect.

**Bradley Brazzeal and Robert Fowler (2008)** study revealed 2,175 Citations from the 43 Forestry Theses completed at Mississippi State University, during the period between the years 1999 to 2003. The analysis is summarized Journal articles made up the largest category 44.6% followed by Government and University publications (17.2%), books (13.0%), and proceedings (12.5%). Less prominent were Theses and Dissertations (3.4%) and association and company reports (3.1%).

**Williams Nwagwu (2007)** research paper examined the significance of authorship biomedical literature is generally described, followed by an empirical illustration using data collected from papers listed MEDLINE of the National Library Medicine (U.S.A.) on Nigeria. The paper provides an answer to the following question. That is the trend in authorship of Biomedical literature on Nigeria since 1967. Addressing this question to our knowledge of the development and growth of biomedical research and its literature on Nigeria. Which include and turn is indicative of the productivity of the authors.

**Biradar (2006)** studied the references in the articles published in Indian Journal of Environmental Protection published in 1994, 1999, and 2004. The result found that team research was quite significant. The degree of collaboration varied
from 0.78 to 0.95. The study also found that on an average 11595 references are referred in each article. Universities contributed 31.6% followed by colleges 24%. It also observed that the proportion of single authored papers have decreased from 20.29% in the year 1994 to 4.76% in 2004

Williams and Fletcher (2006) performed a Citation Analysis on materials used by graduate students in Engineering and found that Journals (38 %), conference papers (19 %), and books (18 %) were the most heavily used formats, with the books among them, aging more slowly than other formats.

Krishna and Kumar (2004) studied using Citation Analysis of 68 Doctoral Theses on Agricultural and Veterinary Sciences submitted to the Rajasthan Agriculture University, Bikaner, during 1996 to 2000. They examined subject wise authorship pattern and trend graph for books and journals.

Kraus (2004) determine the Citation pattern of advanced undergraduate Biology students and later Kraus compared the differences between Citation usage of undergraduates and faculty in the Biology department. Graduate students use library resources for Theses and dissertation and readily available sources.

Naidu, Pawan Chouhan and Praveen Parshar (2003) studied Ph.D dissertations of faculty of biological sciences during 1990-2002. He summarized ‘journals “are main resource for their research work. And which is the premier mode of scientific communication. It has been found that most of the citations are from USA followed by U.K, India, and Germany.

Anup Kumar Das and Sen (2001) analyzed based on 781 Citations cited to 43 research articles pertaining to January to June 2000 issues of volume 109 of Indian Journal of Medical Research. The authorship pattern of the Citations presents that more than 15% contributions are single-authored, 85% are teamwork. The team size of this field is bigger than those in the fields of chemistry and physics. Single-authored articles amount to 15.52% of the total Citations and about 28% resulted through the collaboration of five or more authors and 88.73 % pertain to Journal
articles. The citing articles 38 contributed by Indian authors, 3 by foreign authors and 2 jointly by Indian and foreign authors. The total Citations 9.48% are author self-citations and 7.3% are Journal self-Citations.

**Das and Sen (2001)** presented in his studies around 1049 Citations that were cited to 34 articles in the *Journal of Biosciences* for the year 2000. It was found that out of the total Citations 85.89% of Citations are Journal articles, followed by Monographs (10.1%) and others (4.01%). Viji (2001) analyzed the LISA database for the years 1990, 1995, 1996, 1998, and 1999. The bibliographic form wise distribution of records represents that 93.79% records are Journals. Remaining records belong to other forms like conference papers (1.82%), reports (1.26%), books (0.6%) and others (2.26%).

**Vimala Pulla Reddy and Shanmugasigamani (1997)** examine the obsolescence of literature in zoology by Citation Analysis. Citations from 128 Doctoral Theses in Zoology submitted to Sri Venkateswara University, Tirupati, India, during the period 1962-1994. It is observed that the Citation frequency follows a negative exponential pattern. Half-life of literature is found to be 13 years for Journal Citations and 13.27 years for book Citations.

**Jawahar Lal (1994)** the investigator studied the 1630 references collected from the Journal of Indian Minerals published during the period from 1987 to 1989. The bibliographic form wise distribution of citations of journals 74.60 % of the total citations followed by books (21.76%), conference proceedings (11.17%) and Theses 91.47%.

**Arjun Lal (1989)** studied the Citation Analysis of Doctoral Dissertations in the field of Agricultural Sciences in Bihar. The bibliographic form wise distribution of Citation of journals accounted for 65.03% of total citations followed by government publications (10.68%), conference proceedings (8.64%), books (7.75%) and bulletin and reports (7.83%).

**Nweke (1988)** examined 964 citations cited to eight theses of Zoology submitted during period 1970 to 1975. The study identified English (91.8%) language
of communication followed French (4.9%), German (1.6%) and other languages (1.7%).

Maheswarappa and Mathias (1987) carried out the multiple authorship, authorship patterns and research collaboration in Biological Sciences. The reveals that proportion of single authored papers declined from 36.07% in 1965 to 14.31% in 1983. While multiple authorship showed increasing trend from 63.3% to 85.69% with an increase in average number of authors per paper from 1.92% to 2.25% the variation in the degree of collaboration.

De Oliveria (1984) analyzed Citation Patterns in the Veterinary Sciences by analyzing 495 citations cited in master’s degree dissertations submitted to the University Federal de Vicosa, Brazil. The result is 70% of citations are Journal citations followed 19% books and Theses are 3%.

2.5. Conclusion

Citation analysis is a Bibliometric technique that uses citation patterns in documents, to trace the relationships between those documents and their original sources and their authors. The relationships found provide a picture of the cultures of respective disciplines. Citation analysis is an applied research method employed by librarians, teachers and information Scientist. Citation analysis indicates the relationship that exist between cited and the citing document. Recent developments of the studies reflect an apparently growing trend among researchers across disciplines and boundaries, when conducting reviews of literature. While the methodology and resulting findings from this study become useful to researchers and academic librarians, they also exemplify a citation analysis process useful to determine core journals in other inter-disciplinary fields. The researchers and academic librarians equipped with this methodology can use the core list presented here as a guide for serial acquisition and maintenance decisions. These reviews were great help to my research work to build and create an objective of the study. The reviews help to identify the material that has to be studied and what results could be anticipate, thereby help evaluate the probable benefits that would ensue out of this research work.
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