CHAPTER 3

CITATION ANALYSIS STUDIES
3.1 ORIGIN OF CITATION

The origin of citation or foot notes cannot be easily determined. But the practice seems to have been well established in scientific writing even when the early periodicals started about three centuries ago. Derek de Solla Price has found out that the earliest name of a foot note was 'scholia' which means "relating to scholarship". This is an indication that the practice of foot noting was considered to be a scholarly practice. Barr mentions an instance where this scholarly practice was overdone or misused. In a poem of fourteen lines there were so many as twenty references. The poem with this apparent overdoing of scholarly practice was dubbed as a "garland of ibids".

Although the practice of citations has a long history, yet the use of citation for other than their primary purpose seems to be of recent origin. The primary purpose of a citation is to enable a reader to go to the referred-to-document for more information on a point or check the authenticity of a particular view, finding or method. Each citation is a message from the author of a document to his readers. Citation brings out the connection between two documents; one which cites, the other which is cited. Garfield has stated, "authors refer to previous material to support, illustrate or elaborate on a particular point so that the act of citing is in general an expression of the importance of the material cited".
3.2 MEANING OF CITATION

According to Krause (1) "by reference we mean a foot note in an article which gives bibliographic information about an earlier article". By a citation we mean a foot note referring to a given article and necessarily contained in an article.

Roland Hierppe(2) takes the work citations in a generic sense, encompassing forms of written records or communications. Sangam(3) mentions, "Reference means' the acknowledgment one document gives to another, Citation is "the acknowledgment one document receives from another".

3.3 STUDY OF CITATION ANALYSES

In recent years citation analysis have emerged as useful technique for studying the trends in scientific research. Citation analyses uses bibliographic references and their count to identify what material is related to a particular topic and is worth reading. Besides, it helps in studying how a scientist interacts with his colleagues. Two assumptions can be made when a scientist cites another's work (a) The papers selected for citations are those which have been important to a research activity. (b) Citations are indicative of influence via the literature; in other words, material.

There is nothing to contradict the first assumption. References are selected not just for the sake of complete
bibliographical coverage, nor purely for historical reasons. As for the second assumption, an interesting example is found in Nature of 1970 where two papers on the same subject were submitted simultaneously, but independently, one from the U.K and the other from the U.S.A. The editor observed: seven of the eight references by both are identical, which is a neat exhibition of the principle that underlines their inclusion'.(4)

Why do authors cite? Why do scientists quote precedence? Why sometimes writers bring in such worthless and unimportant reference as 'Alice in the wonderland........' there may be one or more reasons for an author to cite an authority. The following are some of the specific reasons identified by Weinstock (5).

1. Paying homage to pioneers,
2. Giving credit for related work,
3. Identifying methodology, equipment etc,
4. Providing background reading,
5. Correcting ones own work,
6. Correcting the work of others,
7. Criticising previous work
8. Substantiating claims,
9. Alerting researchers to forthcoming work,
10. Providing leads to poorly disseminated, poorly indexed or uncited work.
11. Identifying the original publications in which an idea or concept was discussed.

12. Disclaiming work or ideas of others.

13. Disputing priority claims of others,

14. To check it further.

The list is by no means exhaustive, such extreme attitude as 'you-quote-me-1-quote-you' is not uncommon among the writers. From this it is inferred that when an author cites he finds the cited item to be worth citing, though the degree of relevance may vary.

However it is acknowledged that the number of references appended to a research paper or a thesis is roughly a valid indicator of its significance. Citations given by authors provide an indication of what form of material and how much of them are being used to support their findings. Scientific tradition requires that when a scientist announces his findings he should refer to earlier findings of similar nature which relate to his theme, these references are supposed to identify those earlier researchers whose concepts the author has used to shape his own research. It is believed that when an item is cited the citing author finds in the cited article something relevant to the topic of his work. Therefore, there is some degree of relationship between the citing thesis and the cited article or book. The frequency of the cited document appearing in a number of citing articles is in some measure an indication of the importance of the
document. According to this line of thought, citation analysis is defined by Martyn as "analysis by the citations or references, or both which form part of the scholarly apparatus of primary communication". (6)

The technique is largely used for putting items of references in some kind of rank or order. The technique is also used for arranging the cited materials in some kind of rank to study their relative importance. The item ranked may be journals or references in journal articles. The type of ordering may be linear as in the case of periodical ranking, or it may be multidimensional as in the generation of citation network as in Science-Citation-Index, or it may be a simple investigation of the structure of literature as attempted in the present study. Whatever the type of analysis performed the interpretation of the results throw light on identifying the nature of the relationship between the citing and the cited documents. Ranganathan(7) compared citations to the plums of Sabari, the legendary devotee of Lord Rama tested and yet fit for being offered to Lord Ram".

"Citation study according to Baughman(8)" -"is a systematic enquiry into the structural properties of the literature of the subject. He explains that the structure of literature is a quality, and therefore it is a distinct characteristic; it is not a given one; rather it is a continuing process within a literature system". Structure is only a way of looking at the components that go up to make a
literature. This in turn provides the librarian a practical guide when it comes to the matter of selecting materials for his library.

The citation approach has some advantages over the user studies. It helps to determine the usefulness of the literature of a subject in terms of its age. For example the one general finding of most citation studies is that scientific writing makes use of more recent and nascent informations whereas historical writings make use of older references. This is a sort of guideline to the librarian in the formulation of a separate acquisition policy for each subject, secondly the citation approach is independent of any particular collection. Hence its findings are universally applicable to all libraries.

3.4 HISTORY OF CITATION ANALYSES

Since 1920's library has recorded a number of citation study. But the term "citation analysis" never appeared till 1956. Many of them attempted to rank the importance of journals on the basis of an average number of references to journals cited in research papers. The first user study, based on systematic citation count, was by Gross and Gross (9) (1927). It attempted to rank the journals in chemistry. The method employed was to make a numerical counting of all the journals in chemistry cited in a small representative sample of research papers. The study remain
important for its historical significance. Because its findings formed the basis for Bradford's Law of scattering, Stevens, (10).

The next significant study was Fussler (11) - it was first study on the basis of 'citation analysis' as understood. Its main objectives were two folds: first to find characteristics of the literature used by the chemist of American origin and secondly to rank the journals in the order of their use. The methodology adopted was by the counting of bibliographic references cited by the American Scientists in their research papers. While counting the citations, the study noted the form of literature shown in each citation. This help to rank the journals as one form of literature and to study the structural characteristics of the literature of chemistry.

During 1950's and 1960's a good number of studies were reported, Stevens (10) was the first to undertake a comparative study of the materials cited in Ph.D. dissertations. A total of 6993 citations received from a sample of 90 theses, 50 on science and 40 on humanities formed the total data. The analysis revealed heavy use of journal articles in scientific writing and of the books in humanities; a larger number of citations used in humanities than in science, Stevens did not stop with this, he undertook the very laborious task of checking the titles against the holdings of the library of the respective universities that awarded the
degrees. He found that large number of titles in Humanities were not in the library. From these findings he made the conclusion that humanities scholars have to make use materials available in the libraries other than their own.

3.5 DEVELOPMENT OF CITATION ANALYSIS

The development of citation analysis has been marked by the invention of new techniques and measures, the exploitation of new tools and the study of different units of analysis. These trends have led to a rapid growth in both the number and types of studies using citations analysis.

Linda Smith\textsuperscript{12} opines that "the easiest technique to use in a citation count, determining how many citations have been received by a given document or a set of documents over a period of time from a particular set of citing documents. When this count is applied to articles appearing in a particular journal, it can be refined by calculating the impact factor the average number of citations received by articles published in a journal during a specialised time period. This measure allows one to compare the "impact" of journals which publish different numbers of articles".

Pinski and Narin\textsuperscript{13} have developed further refinement of citation counts which take into account, "the length of papers, the prestige of the citing journal, and the different referencing characteristics of different segments of the literature".
Linda Smith further reviews a few more articles regarding development of citation analysis. The techniques have been devised to identify documents likely to be closely related, bibliographic coupling and co-citation analysis. Two documents are cocited when they are jointly cited in one or more subsequently published documents.

Thus in co-citation earlier documents become linked because they are later cited together. In the bibliographic coupling later documents become linked because they cite the same earlier documents. The difference is that bibliographic coupling is an association intrinsic to the documents (Static), while cocitation is a linkage extrinsic to the documents and that is valid so long as they continue to be cocited (dynamic). The theory and practical applications of bibliographic coupling and citation analysis have been reviewed by Weinberg and Bellardo 14 respectively. Citation counts and bibliographic coupling were the characteristic citation analysis techniques in the 1960's but in the 1970's co-citation analysis became the focus of much research activity. Co citation analysis is of particular interest as a means for mapping scientific specialities.

Early citation study was based on list of references found in articles appearing in a small number of journals, citations had to be transcribed and manipulated by hand. Because of tediousness of this process, most studies were quite limited in scope. The availability of the computer has
significantly improved this situation in two ways: through the production of printed indexes which contains citation data from thousands of documents and through the analysis of citation data available in machine readable form, products of the Institute for scientific information (ISI) now provide a wealth of data for citation analysis, subject coverage has been expanded from the Science Citation Index (SCI) to include the Social Science Citation Index (SSCI). A number of studies have been carried out to draw ranking list of journals using absolute number of citations received by the journal as a criterion.

3.6 CITATION STUDIES OF SOCIAL SCIENCES LITERATURE

The number of studies in social sciences is small compared with those in science and technology. But attempts were made to know the existing literature in social sciences.

In Psychology Daniel 15 - suggests, psychologists involve in searching widely scattered sources, due to the scattering of the subjects.

Jone etc16 - discussed the nature of the materials used by the historians, a high use of non-serial publication compared with serials, a significant concentration of periodical use in a few 'core' journals. In the pattern of age distribution of references, the 'secondary' historical work became fairly rapidly 'Obsolescent' but the 'primary' sources for the historians retain their value over the time,
also revealed that History lies somewhat between the social science and humanities in its pattern of literature use.

With the help of citation study-Estabrook \(^{17}\) shows interdisciplinary nature of library science subject with sociology.

In sociology, MacRae \(^{18}\) studies, the rate of growth of literature depends on the age distribution of citations, suggested that citations in sociology tend to refer to older articles than those in the natural sciences, A parameter in the model, measuring the degree of selectivity in favour of recent articles.

A number of findings suggested by Xhignesse and Osgood \(^{19}\) in psychology-revealed that psychological journal network is arbitrary, self-feeding characteristics, degree of correlation between the source and destination probabilities when these are ordered according to corresponding units. A congruent network in which journals tends to make citations in proportion to the extent that they are cited-the most active source being also the most active receivers.

Sangam's \(^{3}\) study, reveals the information use pattern of social science research scholars based on the citation analysis. The Design of Information system in the social sciences (DISISS) Research Programme- a number of research reports, working papers are reported from Bath university. \(^{20,21,22}\)
3.7 CRITICISM OF CITATION ANALYSIS

May 23 described many abuses of citation indexing. He does not agree that citations give a fair picture of any intellectual links between publications. According to him, they are able, at the most, of depicting the picture that authors record. He attributes the unreliability in results of citation studies to the following factors:

1. Memory failure on the part of the citing author.

2. Lack of self-awareness in the citing author, the editor, or the reference.

3. Carelessness which may result in giving wrong or incomplete citations.

The originator of Science Citation Index, Eugene Garfield24 expressed his views that "unfortunately, some editors, writers are not as concerned as they should be about the proper use of cited references. Citations may represent an author's attempt to enhance his own reputation by associating his work with greater works or to avoid responsibility by leaning heavily on the work of others".

Thorn 25 argues that citation counts have spurious validity because documents can be cited for reasons irrelevant to their merit. The use of citation analysis for evaluative purposes is the issues that has generated the most discussions.
One can understand better the nature of citations if one knows the population from which they are selected. If one assumes that citations are made to the best possible works, then one must imagine that author's gift through all the possible documents that could be cited and carefully select those judged best. But studies of science information use have suggested that accessibility may be as important factor as quality in the selection of an information source. Soper conducted a study to investigate the effect of physical accessibility upon the selection and use of references. She found that the largest proportion of documents cited in author's recent papers was located in personal collections, a smaller proportion was located in libraries, in departments and institutions to which respondents belonged. Thus a paper might well have been cited because it happened to be on the citers desk rather than because it was the ideal paper to cite. Accessibility of a document may be a function of its form, place of origin, age and language. In the case of journal article, its accessibility may be determined by the journals circulation, reprint policies, and coverage by indexing and abstracting services. Just as a document is likely to get cited due to its accessibility, a researcher is likely to be cited because of the visibility. It may be that anything which enhances a researchers visibility is likely to increase his citation rate, irrespective of the intrinsic quality of his work.
With the above observation it can be concluded that further judgment is needed to analyse citation contexts and draw inferences.
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