CHAPTER: 8

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Citation counting techniques are used in the evaluation of scientific activities for the last few years. The main objectives of the citation analysis are to evaluate and to interpret citations received by articles, authors, institutions and other aggregates of scientific activities. It is also used as a tool for measuring communication links in the sociology of science.

Weinstock (1) observes that scientific tradition requires that when a reputable scientist or technologist publishes an article, he should refer to earlier articles which refer to his theme. These references are supposed to identify those earlier researchers whose concepts, methods, apparatus, etc. were used by the author in developing his own articles.

The use of citation frequency as an index of the significance of the cited document is based upon certain assumptions (2):

(1) The subject content of the cited document is related to that of the citing document.
(2) The number of times a document is cited is directly proportional to its value or intrinsic worth.

(3) The primary or secondary publication used as the base for deriving citation data is representative of the entire subject field.

(4) If more base publications than one are used, then all of them can be weighed equally.

(5) All publications cited have actually been used by the citing author.

(6) All publications used in preparation of the citing document have actually been cited.

Brittain and Line (3) have categorized the various types of citation analysis and their possible applications. Analysis of the bibliographic citations can be used in the following types of studies:

(1) identification of key documents and creation of core lists of journals;

(2) study of the coverage of primary journals and other material in secondary services;

(3) clustering of documents according to common references and citations;

(4) study of the attributes of literature including growth rate, obsolescence, citation practices;
(5) study of the structure of scientific literature according to language, country of origin, age, subject, form, authorship, or any combination of these attributes;

(6) study of the historical and sociological aspects of scholarly communication in science and technology.

The citation analysis, for the purposes of this work, is taken to mean the analysis of the citations or references which form part of the articles in journals. It is not taken to include study of references appearing in secondary periodicals. Citations in journals explicitly state a connection between two documents, one which cites and the other which is cited, whereas citation of secondary journals does not usually imply any connection between documents. The citation analysis is largely used for putting things in order. The things ordered can be journals, articles, books, authors, organisations, etc. The type of ordering can be linear as in ranking or multidimensional as in citation networks. Studies of obsolescence rates of journals or documents may be considered to be special case of ranking.

Like any other academic discipline there has been phenomenal increase in research and scholarly output in the field of linguistics in recent years. The quantum of journal growth in Linguistics is like that in any
other developing sciences. As per Ulrich's International Periodical Directory (18th ed., 1979-80), there appears 568 periodicals published from 56 countries. The largest number of the periodicals are published from U.S.A. (23.06%), followed by West Germany (10.91%) and France (8.2%).

In linguistics researches, the position of India is better than some of developed countries, i.e., United Kingdom, Canada, U.S.S.R., etc. India gets 4th rank in the ranking order with publishing 3.98% of the total periodicals published so far.

70.6 per cent of the total number of periodicals in Linguistics is covered only by ten countries and the rest 29.4% of periodicals is published from rest of the countries of the world as shown in Table 2.

The 568 periodicals are analysed by the language used in periodicals. A majority of the periodicals are published in English language (34.85%) followed by French (15.66%), German (9.68%), Esperanto (2.46%), Russian (1.76%) and Italian (1.4%), etc. 11.61 per cent periodicals are bi-lingual and 15.84 per cent are multi-lingual.

Upto 1738 there was not a single periodical publication in the field of linguistics. The first periodical was published in 1739 under the title "Goettingische Gelehrte Anzeigen" from West Germany by
Akademie der Wissenschaften, Goettingen. In India the first periodical was started in 1931 by Linguistic Society of India under the title "Indian Linguistics".

This study represents an application of citation analysis in the field of linguistics. In selecting the source literature from which data are collected, it was decided to take citations from research journals published in English language. The data were analysed to find out the number of citations to different forms of literature, i.e., periodicals, books, conference proceedings, government publications, theses, patents, standards, etc. To begin the analysis of trends of citations in linguistics researches over the past fifteen years from 1966 to 1980, in all 1719 research articles were compiled in bibliographic form.

The authors of 1719 research articles cited 27030 references in all. The analysis of these 27030 citations resulted 31.9% in the book form during the given fifteen years. In the last ten years the book form of publication has been gaining in relative and absolute frequencies. Book chapters have fluctuated widely in relative frequency but in absolute numbers they are generally increasing. The fluctuations may have occurred randomly through the edited books which were available from which to pick out individual chapters. The book chapters are of some more importance in the
publication of linguistic research as they have contained 23.5% of the total citations. Research in the form of dissertations has also become increasingly important to linguistics. Government reports have declined in importance while "conference proceedings" have increased indicating that more research findings are being reported at national and international levels and that linguists have begun to play a more prominent role in these meetings.

The frequency counts for publication types in each journal provide a picture of how publication types have differed in quantity of research. As journals have been shown to be the most dominant channel for researchers to publish their findings, further analysis of journal citations has been made year-wise. In between 1801-1900 there were only 32 periodicals published in linguistics. In order to ascertain major trends within linguistics research frequency counts were obtained for each variable for each three-year time period. The highest number of citations is to the journals published during the years 1969 to 1971. There appears to be a peak in number of research findings published in journals in 1970. Following this peak, the relative frequency for journal articles has declined gradually with minor fluctuations upto year 1980.
Ranked lists of journals may be used as an aid in the development and management of journal collections. If one were developing a core list of primary journals based on their frequency of citation in published articles in journals, then, the journal cited the most number of times would be ranked first on the core list, the journal receiving the next highest number of citations would be ranked second, and so on. The journal receiving the lowest number of citations would be the last item on the list.

A core list of primary journals in linguistics is shown in Table 10. Only the names of those journals that were cited twenty or more times are given in the list. The 7194 papers cited in the bibliographical references have been published in 363 different journals. Out of the total periodicals (568) from different countries, 64 per cent have covered the total citations referred to. The first ten periodicals listed in order of ranking, covered 75 per cent of the total documents referred to. The periodical "Language" gets top position in the list with a maximum number of papers (1920) followed by "International Journal of American Linguistics" (with 1047 papers) and "Foundations of Language" (with 500 papers) respectively. 'Lingua' and 'Word' get fourth and fifth ranks respectively. These first five periodicals covered 61 per cent of the documents referred to.
Such a core list of journals, ranked by the frequency of citation would provide a simple tool for identifying the significant journals in a subject, if one assumes that frequency of citation of a journal is a valid measure of its significance.

In order to ascertain major trends within linguistic research frequency counts were obtained for the total fifteen years. For the discussion 15 branches of linguistic researches have been considered. The most highly researched area in linguistics is morphology. This area has increased by 4.4% since the first five year period (1966-70) to the last five-year period (1976-80). In 1966-70, the researches done on morphology were 21.2% which increased gradually to 21.3% in 1971-75 and 25.6% in 1966 to 1980. The second most highly researched area is phonetics which has increased by 2.3% since the first five-year period to the last five-year period.

Sociolinguistics is another important area in linguistic research. It has increased by 1.1% since the first five-year period to the last period, although in recent years it has declined somewhat in comparison to researches done within 1971-75 by 1.9%. As far as the research done in the category of field linguistics and dialectology is considered, it has declined somewhat in relation to other subject areas in recent years by
6.7%. This subject area has declined sharply since the first time period. Within 1966-70, it was 15.9% which gradually decreases to 10.1% in 1971-75 and 9.2% in 1976-80.

The category semantics scored 6.9% of the total research output occupying fifth position in order of ranking. It has increased by 1.3% since the first five-year period to the last period. The total output of the researches in syntax within 1966-1980 is 6.3% which has increased by 1.7% in comparison to the first five-year period to the last five-year period. There were no changes in the percentage of the research work within 1971-75. It was 5.8% as similar to the first five-year period. The total work done for transformational grammar was 4.2% within 1966-70 and 3.3% within the period 1975-80 showing a slight decrease by 0.9% in recent years.

The field Lexicography constituted new avenues of research in linguistics. 3.3% of researches have been done on this subject area. While making the survey of the work done in psycholinguistics within 1966-80, it has been found out that in all the fifteen years of this study, maximum researches have been done within the years 1971-75 with 2.7% in psycholinguistics. But this category of linguistics is growing up for establishing itself as a separate branch of linguistics.
In U.S.A. and Europe mathematical linguistics is a commonly used term among the scholars of today, which denotes scientific operations in the sphere of linguistic problems carried out by mathematical methods. This category has increased since the earliest period, 1966-70, by 1.1%. In earlier periods and also continuing into recent years, emphasis has been placed on examination of the usefulness of mathematical methods in linguistics. Etymological studies (0.8%) are the most traditional while an entirely new discipline machine translation has been the focus of extremely lively linguistic interest during the last fifteen years. The research papers contributed on machine translation appear 0.6%. In the category of language learning the increase of 0.8% has been the result of the addition about learning foreign languages. Comparative linguistics has decreased by 0.5% since 1966-70 and has not been growing in recent years relative to other subject areas.

The first six subject areas listed in ranking order cover more than 80% of the total research output in the field of linguistics which shows the maximum interest of linguists in these areas.

Linguistic research has been dominated since the beginning of the study by authors working alone and this trend is continuing. Studies where two or more
authors have collaborated, however, have also gained in number especially in the last ten years. The work of single authorship has been decreased by 3.73% and the variables measuring two authors have increased by 4.38%. Out of 17.98% cases of multiple authorship, 14.78% belong to two authors indicating that the trend towards multiple authorship is increasing exponentially and that the percentage of two-author papers, for instance, is increasing more rapidly than three or more authors per paper. The work of three joint authorship has decreased gradually from 2.72 in 1966-70 to 2.36% in 1976-80, i.e. by 0.36%. The work of four or more joint authorship has also decreased by 0.28% as it was 0.64% in 1966-70 and 0.36% in 1976-80. In the period 1971-75, there is a slight increase in the work of three or more authorship. The maximum increase in the work of two joint authorship is in the period of 1976-80.

The constraints and reasons for single and multiple authorship are clearly compounded of numerous variables including institutional policies, nature of research and personal prejudices among many others.

The number of countries having maximum and minimum number of authors engaged in research have also been analysed on the basis of their papers published in 363 journals. There are only 3 countries which have
more than one hundred authors engaged in research work. Two countries have below 100 but more than 50 and 6 countries have more than 10 authors but below 50 who are busy in linguistic research. There are 32 countries which have produced less than 10 authors for research work. Out of the total 43 countries only 10 countries are actively engaged in linguistic researches. Out of these 10 countries, the first four, i.e., U.S.A., Gr. Britain, Canada, and the Netherlands, cover about 80 per cent of the total contributors of the world. India gets 9th position in the rank and is not lagging behind Germany, France and U.S.S.R. Indian linguists are going ahead in different fields of linguistics. About 50 per cent contributors are American, 17.56 per cent are British, 10.05 per cent belong to Canada, and 4.18 per cent to the Netherlands.

Expanded University facilities in linguistics, encouragement from the Indian government, in terms of financing, and interest among students in studying the problems facing their society have all helped to increase the number of Indians engaged in linguistic research.

The total number of times that an author was cited could not be used to judge its value, whether cited a thousand times or never cited. In this study only cited works could emerge, and even at that, the number of citations alone could not be a determining
factor in assessing worth or importance. However, 'citation frequency', when coupled with 'citation duration' has proved to be a better way to measure the worth or 'impact' of a writing. This must not be constructed as the best, but only as an improvement, however slight this might be.

The examination of all the references made by 1719 authors in their research articles and their analysis resulted in a total of 2217 references to earlier writings with which to proceed in building the network, containing a total of 7194 citations. An analysis revealed that a few authors in the area had been highly productive while a majority had produced one or two papers. The field contained a larger proportion of single-author publications (64.5%). All authors in this study which were cited at least 15 times were sorted out. The 65 authors which had been cited 15 or more times were listed in Table 18. These 65 authors represent 3 per cent of the 2,217 authors which comprise the network and were responsible for 2,596 (36.08%) of the total citations of 7194.

All these authors which had been referred to at least fifteen times were pulled and a new file of "most cited authors and their works" was created. There resulted a total of 465 works of 65 authors containing a total of 2596 citations. Out of these...
465 works there are only 28 works of 21 authors which were cited at least 15 times. These 28 works have been listed below in decreasing sequence of the citations. The number in parentheses at the right of each author indicates the number of times that the work appeared in the network.


If we tally this list with Table 18, it may be seen that the ranking order has been changed. Dwight L. Bolinger getting top position in rank falls down on 17th position on the basis of the work and J.J. Katz gets the top position. The same happened with other authors. Thus the total number of times that the name of an author was cited could not be used to judge his value but his particular work may be judged on the total number of times it was cited. This group of 28 works of 21 authors may be called 'classics'.

The government of India since independence has made efforts to stimulate research in linguistics and to relate to problems of development. Universities and research centers have been financed by State and federal governments in order that studies may be undertaken on development problems and in order to accumulate scientific knowledge on various aspects of Indian languages to help the government in the task of transforming a tradition-bound society. In India now a
number of universities have included linguistics in their academic activities. The libraries of Maharashtra State are the richest depository of currently received linguistics periodicals in the country. Out of the total number of periodicals publications 41.54% periodicals are available in different libraries of Maharashtra State. It constitutes nearly half of the world output of linguistics periodicals. If we combine Maharashtra, Delhi and Himachal Pradesh, it will constitute more than three-fourth of the world output of linguistics periodicals.

For the analysis of the citation patterns in Indian periodicals, data of five years from 1979 to 1983 have been collected. In all, 311 research articles are compiled and distribution of references cited in these articles have been analysed. It resulted that out of the total citation 5010, periodical citations were 27.9% and non-periodical materials were 72.1%. The trend of citing documents in Foreign and Indian periodicals is somewhat on the same pattern. The foreign periodicals have 26.6 per cent of periodicals citations in comparison to 27.9% of periodicals citations cited in Indian periodicals. However, whether there are foreign periodicals or Indian periodicals, more emphasis has been given to books citations in comparison to periodicals citations.
A further analysis of 27.9 per cent of periodicals citations have been made. Journals are filling a vital role in Indian linguistic research. The periodical "Language" ranks first with a maximum number of papers (154). The first five periodicals of the Table 22, covered 35 per cent of the documents referred to.

Out of the total number of research papers published within the years 1979 to 1983 in Indian periodicals, 22.5% have been published in 1979. There is a slight decrease for the papers published in 1980 and 1981. Following this, major trends in specific subject areas have been analysed and a comparison with the results obtained for foreign periodicals has been made. In Indian periodicals no research papers have been found on mathematical linguistics, machine translation and comparative linguistics. Similarly, some important categories like language teaching and stylistics have been ignored in foreign periodicals during the period 1966 to 1980. However, the subject 'Morphology' gets its top rank with maximum research publications in foreign as well as in Indian periodicals. The change in the ranks of different subject categories in different periodicals may be due to canon of local variation.

Indian linguistic research has been dominated since the beginning of the study by authors working a\"alone and this trend is continuing. In Indian periodicals, the
single authorship has 90.99% of the total papers, two authorship has 7.07%, three has 1.6% and more than three authorship scores 0.32% of the total publications. The trend towards multiple authorship is increasing exponentially, and that the percentage of two-author papers is increasing more rapidly than three or more authors per paper.

Out of 311 research papers published in Indian periodicals 58.52% research papers have been contributed by Indian authors and 41.48% by foreign authors. This percentage of foreign authors is very much significant for Indian periodicals indicating their good standardization that they have attracted the foreign authors to contribute their papers in them. In some year, i.e. 1983, the foreign authors have contributed 20.63% more than the Indian authors. Total 32 countries have taken part in contributing their papers in Indian periodicals. Out of these total contributions of 311, about 60 per cent are Indian, 17.04% authors are American, and 3.21% authors belong to Canada and 2.57% to U.K. The authors from Srilanka and Germany are 1.92% and 1.6% respectively. Other important developed countries, like U.S.S.R., Australia and Netherlands have also their contributions in Indian periodicals.

The examination of all the 1402 references of periodicals cited by authors in their 311 research papers
resulted in a total of 460 authors. A very few authors had been highly productive and a majority had produced one or two papers. Only 2.4% authors had been cited 15 or more times which is similar to the authors cited in foreign periodicals and is 2.9%. Only 25 authors were cited for at least 10 times. These 25 authors represent 5.4% of the 460 authors which comprise the network and were responsible for 407 (29.02%) of the total of 1402 citations of periodicals' articles.

Citation analysis is a very useful tool in the selection of journals and other types of documents. However, two important factors have to be kept in view while interpreting the results of citation analysis for collection development purposes.

First, all citation-based measures of significance have a common limitation: the use of journals is strongly influenced by their availability. Authors of papers cite those journals that become known and available to them through personal subscription, library, or reprint dissemination. An indeterminate quantity of journal literature pertinent to their work may remain unused by authors because of linguistic, geographical, cultural or other barriers. These limitations also apply to other types of publications.
Second, the importance of a journal to an individual user or group of users is subject to change with time because of changes in user interest or in journal scope and quality. Hence, regardless of the measure of significance used, ranked lists of journals have to be revised from time to time.

Citation studies on the significance and obsolescence of scientific and technical literature are especially helpful in developing and managing collections. Like any other evaluation tool, citation frequency should not be used in isolation. Like one scale on a monogram, it must be used along with other scales to obtain anything useful or meaningful, particularly if the object of the evaluation is in any way qualitative (4).

This study may raise questions about other subjects and it is hoped that this investigation will inspire further research for others who may be interested in undertaking such studies.
Bibliographical References


