CHAPTER - 5

Conclusion
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The exponential growth of literature and rapid development of libraries generated several evolutionary studies about the effectiveness and efficiency of information services. These studies led to the identification and application of appropriate quantitative measuring techniques known as bibliometrics. Libraries and Information managers all over the world began to use bibliometric techniques in their day to day administration. These bibliometric studies throw light on the pattern of growth of literature, inter-relationship among different branches of knowledge productivity and influence of authors, pattern of collection build up their use etc. Day by day bibliometrics is attaining inter-disciplinary character and sophistication.

Bibliometrics is one of such modern developments in library science that help library personnel to design accurate strategies associated with their work.

The following are the major findings that are drawn from the present study.

Average Number of Citations

The Ph. D. Theses during 1995-2000 accepted / registered by North Maharashtra University, Jalgaon were taken as source data for present study. For this study 93 Ph.D. theses were taken from various disciplines as follows - 1) Botany, 2) Bio-chemistry, 3) Bio-technology, 4) Chemistry, 5) Electronics, 6) Microbiology, 7) Physics, 8) Zoology, 9) Commerce, 10) Economics, 11) Geography, 12) History, 13) Political Science, 14) English, 15) Hindi, 16) Marathi.

12892 citations were collected from 93 theses; it is revealed that average number of citation per thesis is 138.62 and the average citations per thesis per subject as follows -

Theses in Microbiology occupy in first place with 247.00 citations per thesis followed by Bio-chemistry with 211.00, Physics with 203.14, Chemistry with 198.38,
Botany with 182.91, Bio-technology with 182.50, English with 178.00, Electronics with 176.50, Zoology with 151.00, History with 113.00, Marathi with 94.80, Hindi with 80.00, Geography with 76.33, Political Science with 75.00, Economics with 65.33 and Commerce with 53.00 citations per thesis.

**Analysis of Citations**

The various sources of information used by researchers in their theses are studied by analyzing the citations according to their bibliographic forms, subject and country of origin. 15 types of bibliographic forms of documents are cited by the researchers in 93 theses covered in the study.


**Geographical Distribution**

Geographical Analysis of cited Journals reveals that during the period of study contributions from abroad were more in science subjects viz. Botany (61.40), Bio-chemistry (73.63), Bio-technology (76.51), Chemistry (71.44), Electronics (58.37), Microbiology (66.84), Physics (71.27), Zoology (60.78) than Commerce, Economics, Geography, History, Political Science, English, Hindi and Marathi.

Indian publications are highly cited in the subject of Commerce (94.48), Economics (89.61), Geography (89.63), History (95.21) and Political Science.
(90.08), in the subject of Hindi and Marathi are 100% cited by Indian authors. Country wise distribution of citations to Books shows that in all subjects, India stands first followed by USA and UK in term of publications of number of books cited.

Authorship Pattern

Multiple authors are a distinctive feature of the modern science is exhibited in the present study. Authorwise analysis of citations of Journals reveals that in the field of Bio-chemistry, Chemistry, Electronics, Microbiology, Physics and Commerce, Joint Authorship is occupying first position. Among the subjects, Bio-chemistry had the highest percentage of multiple authorship compared to other subjects, difference between single authored and multi authored references were relatively low in Geography, English and Electronics.

The distribution of citations by single author from books secured the first position. The percentage of single authored books is for more than joint authored books in Commerce (80.69), Economics (84.70), History (86.83) and Political Science (86.36). In History only two journal citations are found, so it is not taken for the study of Author pattern.

Ranking and Scattering of Cited Journals

In this section the areas discussed include ranking of cited Journals, productivity of Journals, and applicability of Bradford’s Law of scattering of Journals.

The ranked list of Journals in the field of Botany reveals that the Journal citations cited by the researchers are distributed among 351 Journals. The first two Journals in the ranked list have contributed to more than 25 percent of Journal citations. The first five Journals in ranked list contributed more than 50 percent of total cited Journal literature. The first 37 Journals (10.54%) contributed to 75 percent of the total Journal citations and the remaining 25 percent of citations are scattered among 314 Journals.
Among the ranked list "Hydrobiologia" occupies the first rank, contributing the highest number of citations (15.87%), followed by American Journal of Botany (9.68%), Phykos (8.94%).

The ranked list of Journals in Bio-chemistry shows that the citations are scattered over 196 Journals. "Bio-chemistry" occupies the first rank with 22.83 percent of the total cited Journal citations followed by Polymer Science (12.92%), "Indian Journal of Experimental Biology" (3.36%), "Pure and Applied Chemistry" with (1.59%). It observed that the first 13 Journals cover nearly 51 percent of the total citations. The first 44 Journals covered more than 70 percent of the total citations; the remaining 30 percent of citations are distributed among 152 Journals.

The rank list of Journals in Bio-technology reveals that the total journal citations in the field are distributed among 125 Journals. "Journal of Economics Entomology" topped the list with 27.91 percent of the total cited Journal citations, followed by "Journal of Experimental Biology" (17.67%) and Bio-chemistry (8.14%).

These three Journals have contributed more than 50 percent of the total Journal citations and remaining 50 percent of citations are scattered over 122 other Journals peripheral to the field.

The ranked list of Journals in Chemistry reveals that the total Journal citations are distributed among 329 Journals. "Chemical Abstracts" occupy the first rank with 19.79 percent of the total cited Journal citations, followed by Journal of Chemical Engineering Data" (10.85%), "American Chemical Society" (6.86%). These three Journals have contributed more than 35 percent of the total cited Journal literature. The first 16 Journals have contributed above 60 percent of the total Journals citations. The remaining 40 percent of citations are distributed among 313 other Journal citations.

The Journal citations in Electronics are scattered over 77 Journals. The "Journal of Electrical Chemical Society" occupies the first rank with 15.56 percent of the total citations. Followed by "Indian Journal of Pure and Applied Physics"
These two Journals have contributed 29 percent of the total citations. The first 17 Journals have contributed 75 percent of the total citations, the remaining 25 percent of the citations are scattered over 60 Journals.

The Journal citations in Microbiology are scattered over 275 Journals. "Journal of Bio-chemistry" occupies the first rank with 12.30 percent of the total citations, followed by "American Chemical Society" (9.09%), "Applied Environment Microbiology" (7.49%). These three Journals together have contributed nearly 28 percent of the total citations. The first 15 Journals have contributed 63 percent of the total citations and remaining 37 percent scattered over 260 other Journals peripheral to the subject.

In the field of Physics the total Journal citations are distributed among 300 Journals. The "Journal of Applied Physics" occupies the first rank with 21.56 percent of the total citations. The first five Journals cover more than 50 percent of total citations and the remaining 50 percent of the citations are scattered over 295 other Journals.

The Journal citations in Zoology are distributed among 90 Journals. The "Journal of Zoology" occupies the first rank with 16.67 percent of the total citations followed by "Indian Journal of Experimental Biology" (10.13%). These two Journals contributed 26 percent of the total citations. The first nine Journals in the ranked list have contributed more than 50 percent of the total citations and the remaining 50 percent of the citations are scattered over 81 other Journals.

Productivity of Journals

In the field of Botany, the productivity of cited Journals is measured by grouping all the Journal citations into four groups, so that each group contains roughly the same number of citations. It is found that in the field of Botany 25 percent of the total citations are contributed only two Journals in the first group. The average
productivity of each Journal in the first, second, third and fourth group is 190.00, 128.50, 24.17 and 1.26 respectively.

This marked difference among four groups confirms the decreasing productivity of Individual Journals in the ranked list.

The field of Bio-chemistry, the study reveals that the first group of citations are contributed by only one Journal (Bio-chemistry) found to be more productive with 22.83 percent of 129 citations in the ranked list.

The average productivity of second group is “Indian Journal of Experimental Biology”, Polymer Science, Pure and Applied Chemistry (15.20%) and third and fourth group is 3.07 and 1.03 respectively.

In the field of Bio-technology the first Journal in the ranked list is “Journal of Economics Entomology” is most productive Journal with 27 percent citations. The average productivity of second group is 98.00. The average productivity of each Journal in the third and fourth group is 5.68 and 1.08 respectively.

In the field of Chemistry it is observed that the first groups of citations are contributed only one Journal (Chemical Abstracts) found to be more productive with 19.79 percent of 228 citations in the ranked list.

The average productivity of second group is 68.00 and third and fourth group is 4.93 and 1.10 respectively.

In Electronics it is observed that in the first group to contribute to citations. None of the Journals in ranked list in the field of Electronics have contributed citations in the first group are to the Zero. The average productivity of each Journal in second group is 30.25 and it has decreased to 1.08 in the fourth group.

In the field of Microbiology the study reveals that group of citations are to the first two Journals in the ranked list, thus signifying their high rate of productivity. They are "Journal of Bio-chemistry and "American Chemical Society". The average productivity of Journals in the first group is (100.00) and the average productivity of
each Journal in second group is (66.75). Third and fourth group is 6.85 and 1.00 respectively.

In the field of Physics the study reveals that the first group of citations is contributed only in one “Journal of Applied Physics”. In the ranked list, this is the most productive Journal in first group.

The average productivity of Journals in first group is 248.00 and it has gone down to 1.10 in fourth group.

In Zoology it is observed that the first Journal viz. “Journal of Zoology” in the ranked list have contributed 16.00 percent of citations. The average productivity of each Journal in the first group is 51 and it has decreased to 1.26 in the fourth group.

**Applicability of Bradford's Law of Scattering**

Bradford’s Law of scattering is verified in Botany, Bio-chemistry, Biotechnology, Chemistry, Electronics, Microbiology. Physics and Zoology are the subjects studied and remaining subjects viz. Commerce, Economics, Geography, History, Political Science, English, Hindi and Marathi are not taken for study due to very negligible percent of Journal citations.

Bradford’s Law of scattering in all eight subjects are studied, core Journals, those which are in the Nucleus, of each of the above subjects were found out. Among these subjects highest number of Journals in the Nucleus is 4 and in the subject of Microbiology have 4 core Journals. Botany and Zoology have 3 core Journals each. In the remaining 5 subjects, Bio-chemistry, Bio-technology, Chemistry, Electronics and Physics have 2 core Journals were found in the Nucleus zone.

In addition to core Journals, prominent Journals in the above subjects were also found out. Electronics secured the first position with 12 prominent Journals with coverage of 70 percent total cited literature, followed by Bio-technology with 13 Journals 70 percent, Microbiology and Botany have 17 prominent Journals each 70
percent of the total cited Journal literature in their field. Then Zoology 24 prominent Journal with 70 percent, Physics 24 prominent Journals with 70 percent, Chemistry 39 prominent Journals with 70 percent and Bio-chemistry 25 prominent Journals with 60 percent of the total cited Journal literature. Thus it reveals that among the 1763 Journals 171 prominent Journals covered more than 65 percent in total cited Journal literature.

Obsolescence of Literature and Half life of Journals

Age wise distribution of citations to Journals in Botany reveals that in the field of Botany. About 22 percent of Journal citations are 10 years old, about 50 percent of Journal citations are 15 years old, and more than 30 years old Journal citations percentage is 21.99 percent. The analysis shows that half life period of Botany Journal citations is 15 years.

The agewise distribution study of citation to Journals in field of Biochemistry, it is observed that above 30 percent of cited Journal are with in 8 years of age, above 50 percent of cited Journals are within 12 years of age and above 75 percent citations are 20 years old. It indicates that the half life period of Biochemistry Journals is 12 years.

The agewise distribution of citations to Journals in the field of Biotechnology, about 25 percent of Journal citations are three years old, about 51 percent Journal citations are seven years old and about 75 percent Journal citations are 13 years old. The analysis shows that the current materials are important because the authors usually discuss topics of current utility and interest. It indicates that the half life period of Journals is seven years.

The agewise distribution of Journal citations in Chemistry reveals that about 32 percent of Journal citations are 7 years old, about 52 percent of Journal citations are 12 years old, about 75 percent of Journal citations are 19 years old. Analysis reveals that the half life period of Chemistry Journal is 12 years.
The agewise distribution of citations to Journals in the field of Electronics reveals that about 33 percent of Journal citations are 8 years old, about 50 percent Journal citations are eleven years old and 82 percent of Journal citations are 22 years old. The agewise distribution of Journal citations reveals that out of 257 total citations 129 Journal citations are come from 11 Journals. The analysis indicates that the half life period of Journals is 11 years.

The agewise distribution of citations to Journals in field of Microbiology, total number of Journal citations in Microbiology is 935. The study reveals that the six years old Journals covered 269 citations and percentage is 28.77, 11 years old Journal covered 485 citations and percentage is 51.87 and about 81 percent of Journal citations are 25 years old. Analysis indicated that the 11 years Old Journal covered 485 citations and percentage is 51.87. It indicates that the half life period of microbiology Journal is 11 years.

In Physics the agewise distribution of citations to Journals is 35.00 percent of the cited Journals citations are used by the researchers within 8 years of their publication, above 70 percent of Journal citations are within 15 years old. The above analysis indicates that the 11 years. Old Journals covered 632 citations and the percentage is 55.20 it indicates the half life period of physics Journal is 11 years.

In the field of Zoology the agewise distribution of citations to Journals, it is observed that above 23 percent of cited Journals citations are with in six years of age, above 54 percent of cited Journal citations are with in 12 years of age and nearly 71 percent of cited Journal citations are with in 22 years of old. It indicated that half life period of Zoology Journal is 12 years. Even in the science subjects half life of the journal citations ranges from 10-15 years only in Bio-technology. It is in the range of 5-8 years.

The agewise distribution of citations to books in Botany, is observed that above 27.38 percent of cited books are with in eight years of age, above 51 percent
of cited books are within 13 years of age and nearly 80 percent of cited Botany
books are within 19 years old. It is indicated that half life period of books is 13 years.

The agewise distribution of citations to books in the field of Bio-technology, about 26 percent of books citations are 3 years old, about 53 percent of books citations are 8 years old and about 76 percent of books citations are 11 years old. The study reveals that the eight year old books covered 131 citations are the percentage is 53.47 it indicates that the half life period of books is eight years.

The agewise distribution of citation to books is in field of Chemistry. About 25 percent of book citations are 12 years old, about 51 percent of books citations are 20 years old, and about 75 percent of book citations are 26 years old. The study implies that half life period of books is 20 years old.

The agewise distribution of book citations in Electronics, about 33 percent of Book citations are six years old, about 53 percent of book citations are nine years old and about 75 percent of book citation are 19 years old. The study reveals that out of 66 book citations 35 citation are within nine years with 53.03 percent it indicates that the half life period of books is 9 years.

The agewise distribution of citations to books in the field of Microbiology reveals that about 26 percent of book citations are ten years old. Nearly 54 percent of the book citations are 19 years old and about 78 percent of the book citations are 25 years old. Agewise distribution of citation indicates that the half life period of Journals is 19 years.

The agewise distribution of citation reveals that the total number of book citation in Physics is 187. Out of 187 total citations, 99 citations are covered with in 15 years with 52.94 percent and about 75 percent of book citations are 22 years old. The study reveals that half life period of book is 15 years.

The agewise citations to books in Zoology, it may be observed that about 23 percent of books, citations are 14 years old, about 52 percent of books citations are
23 years old, and nearly 70 percent of books citations are 29 years old. It indicates that the half life of Zoology books is 23 years.

The agewise distribution of book citations in Commerce, about 26 percent Book citations are 5 years old. About 51 percent of the Book citations are 12 years old and about 75 percent of the book citation are 26 years old. It indicates that half life period of Commerce book citation is 12 years.

In the field of Economics the agewise distribution of citations to books. The total number of citations in Economics is 183. The analysis reveals that 14 years old books covered 47 citations with the 25 percent, about 55 percent of books citations are 28 years old and it indicates that half life period of Economics books is 26 years.

In the field of Geography the agewise distribution to books is about 26 percent of the book citations are 10 years old. About 53 percent of the book citations are 18 years old and about 73 percent of the book citations are 22 years old. Analysis indicates that half life period of Geography books are 18 years.

The age wise distribution of book citations in History observed that about 35 percent of the book citations are 10 years old, nearly 50 percent of the book citations are 22 years old and about 61 percent of the book citations are 29 years old. It indicates that the half life period of books is 22 years.

The agewise distribution of books citations in Political Science about 26 percent of book citations are 9 years old, about 52 percent of book citations are 15 years old and about 76 percent of book citations are 24 years old. The total number of book citations in political science is 242 and 15 years old citations covered 126 citations with 52.07 percent it indicates that half life period political science book is 15 years.

In the field of English the agewise distribution of citations reveals that the 7 years old books covered 216 citations with 25.56 percent. About 55 percent of the books citations are 15 years old and about 76 percent of the books citations are 22 years old. It indicates that the half life period of Books is 15 years.
The agewise distribution of book citations in the field of Hindi is about 24 percent of book citations are 13 years old, about 52 percent of the book citations are 19 years old, and about 76 percent of the book citations are 23 years old. The study reveals that 52 percent covered 456 book citations and are 19 years old. It indicates that the half life period of books is 19 years.

In Marathi the agewise distribution of Journal citations about 27 percent of book citations are 12 years, about 54 percent of book citations are 20 years old and about 80 percent of book citations are 27 year old. The total number of book citations in Marathi is 889. In 20 years old books covered 486 citations. It indicates that half life period of Marathi Books is 20 years.

Citation Classics

Social sciences have a very wide connotation and appropriately a very large number of books, including several valuable classical titles are in use today. In all subjects, Hindi occupies first position in citation classics followed by English and lowest citation classics found in Bio-technology, Zoology and History and no citation classics were found in the field of Electronics.

Availability of cited journal literature in the library of North Maharashtra University

It is observed that out of 6328 citations to journals of nine subjects, 4166 citations were available in the library and the percentage is 65.83. Zoology occupies the first place with 77.45 percent of journal literature available followed by Physics (75.55%), Geography (74.51%), Botany (69.87%), Microbiology (67.70%), Biochemistry (63.36%), Chemistry (62.67%), Bio-technology (55.58%) and Electronics (52.53%).

North Maharashtra University Library is also member of INFLIBNET program. The library is also a member in the e-journal consortia i.e. UGC
Infonet co-ordinated by INFLIBNET. This consortia covers the major faculties of Arts, Humanities, moral and social sciences and sciences covering full text of research articles, reviews and abstracting databases. This program facilitates unlimited and seamless campus wide access to electronic information to the university user community.

Self Citation

The term self citations is used by different people to refer the various forms of relationship between citing and cited documents. In the present study following type of self citation is studied.

The citation of a document, which has been authored or Co-authored by the researcher. The finding of the study reveals that in all sixteen subjects as a whole and the percentage is very negligible (0.98%).

Validation of Hypotheses

Based on the testing validity of the hypotheses formulated, the researcher arrived at following conclusions.

It is evident that the results that first hypothesis states that Journal citations are the most preferred than book citation in science research. The first hypothesis is valid. The findings show that Journals are the highly cited sources compared to books in science subjects viz Botany, Bio-chemistry, Bio-technology, Chemistry, Electronics, Microbiology, Physics and Zoology.

The second hypothesis states that "the book citations are more than Journal citations in Social science and Commerce research." This statement is found to be true in the case of social science and Commerce. However findings show that books are highly cited source compared to Journals in case of Commerce, Economics, Geography, History, Political Science, English, Hindi and Marathi. Earlier studies by Knievel J. (2002), Herubel, Jean-Pierre V. M. and Buchanan Anne L. (1994) have also revealed the Importance of books as main source of information in social sciences.
The third hypothesis states that Foreign authors are preferred than Indian authors in science faculty. This statement is found to be valid; in case of Journal since finding shows that researcher preferred foreign Journal publications than books, so above hypothesis statement is found to be invalid in the case of books of foreign contribution in science faculty. The findings show that in all science subjects Indian books more favored than foreign authored books.

The fourth hypothesis states that half life literature of Journal citations is 5-8 years in science and 10-15 years in Social sciences and Commerce faculties. It is found to be invalid, since findings shows books is the most referred source of information in social science and Commerce. Due to negligible percentage of Journal citation, it may prove the "literature use pattern in Journals" so it is not included in the present study. Even in the science faculty half life of journal citation ranges from 10-15 years. Only in Bio-technology it is in the range of 5-8 years.

The fifth hypothesis states that In house (Host Institution) Journal citations are less in number. It is found to be invalid. The findings show that availability in Journals in North Maharashtra library. Near about 65 percent Journal citations are available in the North Maharashtra University Library. It is productive percentage of Journal citation cited by researcher but the number of journals is only 34 percent. Besides this the library provides online access to e-journal through U.G.C. Info-net facility to the researcher.

**Suggestions**

The present study has revealed many interesting findings as explained in the preceding section. Based on the observations made from this study, few suggestions are put forward by the researcher in the following paragraphs.

As a result of enormous growth of knowledge the number of publications has also increased. Due to the shortage of fund most of libraries are compelled to restrict the subscriptions of periodicals and purchase of other reading materials. In order to get maximum benefit, the libraries can limit the procurement by subscribing to core Journals in main subjects.
Materials in developing subjects can be acquired by means of other methods of procurement. It must be ensured all the libraries in a Geographical area to see at least one of the core Journals is available in any one of the libraries in a locality. Selection of core Journals in this regard has to be made using appropriate bibliometric techniques.

Citations studies in social sciences revealed that books are referred more widely than articles. The findings of the present study also reiterated the same. These evidences establish that books have high impact and thus under the rules of bibliometric should not ignored, bibliometricians ignoring books as major source of scholarship will distort the picture of social science literature. Further studies are required in the field of social sciences, to measure the impact of books as source of information on the research output.

However there are other aspects that are to be taken into account while measuring the impact of national literature. Number of books and journals published in English language and regional languages, the writing habits of social sciences researchers are to be studied to draw scientific conclusions.

Present study has analyzed the citations appended to doctoral theses submitted for the award of Ph. D. degree similar type of studies may be carried out based on the theses submitted to other universities in social science and science. This would help in generalizing the findings of the study and gaining an in-depth knowledge of the characteristic features of the literature used by features of the literature used by the researcher in science and social science.

The present study covers research activity in the university in the field science and social science as the U.G.C. Info-net program was recently launched in University. The impact of Info-net in various disciplines research output could not be measured by the present study.
Future Research Area

1) Impact of e-journal citations in Ph. D. Theses
2) Analysis of Host Library Journal availability studies in each discipline.
3) Identification of major barriers to Electronic Availability.
4) Comparison of Print Source Citation and Electronic Source Citation in the field of Science.