BIBLIOMETRICS: AN OVERVIEW

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ABSTRACT

Information manager have adopted a number of quantitative method in recent years in order to evaluate library resources and services more objectively and effectively.

Bibliometrics is one of the quantitative techniques applied by information managers. To measure the records of human communication it is used to identify the pattern of publication authorship, citation used for a subject etc. over a period of time and there by offering insight into the dynamics at the area, under a particular study.

Bibliometrics has attained significance in recent years because of its practical applications in various library operations and services. It is estimated that out of the total periodical literature published in the library and information science at the global level 25% on bibliometric studies.

Keywords: Genesis, Lotka's Law, Zip's Law, Bradford's.

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1. INTRODUCTION

Bibliometrics is of recent origin relatively a new one which has emerge as research front in its own right in information science. Periodicals are on bibliometrics and its related topics. It has also been found that many of the social science and science periodicals are also carrying a large number of articles on bibliometrics. This increase in the number of publications may have been due to the use of bibliometric techniques. In various discipline and to the greater interest in the theory of literature structure.

2. GENESIS OF BIBLIOMETRICS

Cole and Eale's study on the "The history of comparative anatomy part:1 A statistical analysis is considered to be the first bibliometric study. Where for the time in 1917 the expression 'Statistical Analysis' has been used in the literature.

Mr. E. W. Hulme was the first to use the expression statistical bibliography in 1923 and later it was used by many others.

The British standard glossary of documentation of terms explained bibliometrics as the study of the use of documents and patterns of publication in which mathematical and statistical methods have been applied.

Sen Gupta: organization, classification and quantitative evaluation of publication patterns of all macro and micro communications. Along with their authorship by mathematical and statistical calculus.

3. NEED OF BIBLIOMETRIC

Librarians, like managers in industries, need objective data to take decisions. Librarians can we reference statistics, cost of library collection that is price distribution of documents, cost of purchase an replacement of both documents an non-book materials, library performance indications, circulation figures, library hours, number of users, toot notes and reference, data and place of publication academic programmes. In the case of university libraries, distributions data. These data quant table in since that it can be interpreted statistically in the same way as econometricians do with econometric data.

4. USE OF BIBLIOMETRIC

1. Productivity counts of literature.
2. Comparative study of literature generated, areas of study, quantity and quality of research in different branches, different areas of regions during different period etc.
3. Type and amount of publications.
4. Scatter and pattern of scatter of literature.
5. Impact of literature.
6. Identification of peers, social change etc.

5. SCOPE OF THE BIBLIOMETRIC STUDY

Bibliometric study may broadly be classified into two

1. Descriptive studies.
2. Behavioural studies.

5.1. Descriptive Studies

Descriptive studies include those that the characteristic feature of documents or literature such studies brings out.

1. Study of bodies (individuals and institution producing document.)
2. Documents that carry information.
3. Form of presentations
4. Nature of Information.
5. Quantity of information.
6. Time and frequency of studies.
7. Origin and geographical scatter or distribution etc.

5.2. Behavioural studies

Behavioural studies are those that examine the relationship between various elements like –

1. Authorship
2. Title statement
3. Bibliographic history (Editions, Change of titles, dates etc.)
4. Frequency of publication (in case of serials)
5. Form
6. Place
7. Language
8. Subject
9. Related Document
10. Level of market orientations
11. Content analysis
12. Physical make up, size, quality of production values.
13. Price
14. Circulation
15. Translations, formats
16. Citations etc.

If one carefully studies that scope of librometry and definitions of bibliometrics, one may notice that in both the fields one examines statistical distributions of the process relating to :

1. Utilization on documents
2. Library staff, and
3. Library users
4. To establish a theory for structure aspects of a library.

Dr. Sen Gupta (Sen Gupta 1990) quoted the following applications.

1. Quantity research and growth of different areas knowledge.
2. Estimate comprehensiveness of secondary periodicals.
3. Identify users and authorship of document on various subjects.
4. Measures usefulness of Adcock and retrospective SDI services.
5. Identification of core journals in different disciplines to formulate a need based acquisition policy within the limited budgetary provision without detriment to the research interest of the parent organization.
6. Initiate effective multilevel network system.
7. Regulate inflow of information and communication, and
8. Development norms for standardization.

Bibliometric studies can be grouped into the following:

1. Citations and references.
2. User studies
3. Circulation statistics and
4. Document and content analysis

The three fundamental laws which laid the formation bibliometrics are:

1. Lotka's inverse square law of scientific productivity.
2. Bradford's law of scattering of scientific papers, and
3. Zip's law of word occurrence.

6. BIBLIOMETRIC LAWS

The bibliometric laws are useful in understanding some of information phenomenon and may help in planning many of the library activities. Three fundamental laws actually laid the solid foundation of bibliometric. They are Lotka's law of productivity of authors in terms of scientific paper: Zip's law of frequency of occurrence of words in a text and brand ford's laws of scattering papers.

6.1. Lotka's law (1926)

Lotka's in his classic paper published in 1926 in the Journal of the Washington Academy of sciences on the frequency distribution on scientific productivity. Presented and analysis of the number of publication listed in chemical abstracts fom1907to1916with the frequency of publications of the authors. Based on his data, he proposed an inverse square law of scientific productivity,

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$$y_x = \frac{a}{n^2 x^2}$$

$$= a > 0$$

$$X = 1, 2, 3, \dots$$

Where y_x is the relative frequency of authors publishing papers, the value of a is found to be 1.8a for chemist and 2 for physicists.

It N is the total number of authors.

Ny_1 s Lotkas equation gives the number of author who have published single paper each.

Table 1 Lotka's Law of Productivity of Authors

Author	Paper
100	1
25	2
11	3
6	4
4	5

To state the law differently .Lotka's found the productivity of scientists confirmed to inverse square law in such a way that for every 100 authors contributing one article 25 will contribute two articles 11 contribute 3 articles and 6 will contribute 4 and 4 contribute 5 articles.

6.2. Impact of Lotka's Law

Lotka's proposition led to a whole gamut of studies on scientific productivity. Such productivity studies have gained momentum in the post second world war period. This in fact, has calumniated in the rise of a new discipline called scientometrics. Scientometrics is defined as the study of measurement of scientific and technological progress. It provide and understanding of the structure of scientific activity.

Scientific productivity studies have been made from different angle. Impact of social change on scientific productivity relationship of publication output on scientific recognition, identification of elites in different disciplines occurrence of discoveries in different cultures etc. Price, who had traced the development of science since Babylon and potted the growth of big science from little science had observed that Lotka's law applied equally well to the

productivity of scientists in the 17th as well as in the 20th century. This meant that majority of publications emanated from a handful of people. We have already seen this as price's square root law, similarly the conclusion of an extensive review of early studies of scientific productivity made by Narin was that scientific talent was highly concentrated in a limited number of individuals.

6.3. Bradford's law

Samuel Clement Bradford in 1934 formulated the law of scattering to describe the distribution of article on a particular subject in different periodicals and this law has received the greatest attention in library literature. His article "sources of information on specific subject" was the first publication on observation or scattering.

Much before the publication of the above treatise, Bradford described the pattern of scattering of literature in various periodicals. He chorused the areas of applied Geophysics and lubrication for study because the bibliographics on these subjects us systematically available to him. In this study he found out that if a large collection of papers is ranked in order of decreasing productivity of papers relevant to a given topic three zones can be identified in such a way that each zone would produce one third of the total relevant papers.

Thus Bradford concluded that in a given subject area, periodicals can be categorized into 3 separate groups;

1. Those producing more than four references in a year.
2. Those producing between two or four reference in a year and
3. Those carrying one or fewer reference in a year.

The first group thus becomes the nucleus of periodicals in a subject field and necessarily contains more articles on that subject than periodicals that include articles on related subjects. The second zone contains a large number of moderately. Productive journals and the third zone contain large number of low productivity articles.

Therefore, the hypothesis of Bradford put forth in 1934 and again 1948 is that if the scientific journals containing articles on a given subject are arranged in decreasing order of the number of articles on the subject form the simple geometric series $I : n : n^2$.

Table 2 Bradford's Pattern of Scattering

Zone	No. of Journals titles	No. of papers
1	9	429
2	59	499
3	258	404

If scientific journals are arranged in order of decreasing productivity of article on a given subject they may be divided into nucleus of periodicals more particularly devoted to subject and several groups or zones containing the are number of articles the nucleus when zone will be as $I : n : n^2$. $I : n : n^2$ In 1948 summarized his earlier observation in a book which contained a theoretical derivation of his law of scattering.

6.4. Zip's Law (1933)

This law states that in a long textual matter if the words are arranged in their decreasing order of frequency, then the rank of any given word of the text will be inversely proportional to the frequency of occurrence of the word. Mathematically Zip's law can be written as:

Table 3 Simple Zipf's Distribution

Word	Rank	Frequency	Rank x Frequency
the	1	245	245
of	2	136	272
terms	3	98	294
to	4	81	324
a	5	65	325
and	6	61	366
in	7	55	385
were	8	52	416

In the example given there is only an approximation to the constant where an exact fit is obtained, the curve plotted is the well-known hyperbola.

$$r.f. = c$$

where 'r' denotes rank word. 'f' stand for frequency of words and 'c' is a constant.

G.K. Zips was Philologist from Harvard university who has worked on the theory application of his principles of relative frequency in the in structure and development of law. Zip's law suggests that the product of the number of occurrences of each word in the body the text and its rank is constant. Then it states that,

$$rf = c$$

Where 'r' is the rank of word type 'f' the frequency of occurrence of the word type and 'c' is a constant.

Ziff's law can be effectively used in the generation of semi-automatic indexes useful for an information retrieval system. Its use has increased tremendously with the emergence of natural language indexing of textual matter especially in electronic form several studies aimed at finding out the pattern of frequency distribution of descriptors of thesaurus and the distribution of indexing terms are available Zip's law provides a measure of the richness in vocabulary of an author. This technique can be used for deciding the correct authorship of disputed works.

The law is also used for identifying words more frequently used in different foreign language. These words are taught first in the instructional programmes of foreign languages.

7. CONCLUSION

Bibliometrics has emerged as the most active field of library and information science. It is estimated that literature on this topic occupies more the 25% percent of the total contribution in library and information science. Citation analysis studies form a major portion of it. The rate of growth of the literature is obvious from the number of entries of the bibliographies on the subject. A major portion of these studies pertains to the application of bibliometric laws and models. However, there is a long way to go in achieving perfection in the studies. Even the widespread use of computers for retrieval, counting and analysis are unlikely to achieve perfection in the studies. The changes those re frequently occurring in the publication practices are likely to complicate the studies in future. In such circumstances, it is advisable to consider the results of such studies are more guidelines rather than ends in themselves.

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