



Research Output Analysis : Metric Studies


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- Developing countries like **India** should essentially **initiate studies to evaluate and assess the productivity and quality of research work** by its scientific community.
 - Research in Science and technology are the **thrust and driving forces of a modern society**.
 - Research in Social Science and Arts & Humanities are the **binding forces of a modern society**.
 - Analyses of these forces are **crucial in any national science policy or research management strategy**.

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- Scientific productivity is reflected in the literature as **scientific output which is measured in terms of research papers, patents, technical reports, research reports etc.**
 - A number of scholars have used these variables which are discrete in nature to measure scientific productivity of individuals, research organizations, institutions and universities **with coverage in different situations, subjects and periods.**

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- Research in various fields have been growing at a faster rate during recent years at every step with latest **innovations imparting knowledge** in the fields.
 - The **human resource has shown a considerable increase in numbers** by involving themselves in research in recent years.

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- **Research Output** of an organization as a scientific community can be measured and assessed both in **quantitative and qualitative ways**.
 - There are more specific and systematic methods available to measure and assess research output such as **Metric Studies**.

- **Metric Studies** are categorized depending upon the area they emphasize:
- **Statistical Bibliography:** Application of quantitative techniques to library and bibliographical work was until recently known as statistical bibliography. Witting (1978) stated that the term 'statistical bibliography' was traced and found used by Hume in 1923.
- **Librametry:** Ranganathan (1948, 1969) announced the term 'Librametry' on the lines of biometry, econometric, and psychometric and illustrated with a few examples of the application of statistics to library science.
- **Bibliometrics:** The first category of metric study was stated way back in 1969 by Alan Pritchard, he introduced the term Bibliometrics, which measures the bibliographic data with the help of mathematical and statistical methods.

- **Scientometrics:** The other area such as measurement and analysis of scientific literature by using quantitative methods for studying is known as **Scientometrics(1960 by Russian)**.
 - Measurement of scientific and technological progress.
 - Behavior of Scientists
 - Growth of Literature
 - Science policy applications
- **Informetrics** is another area covering and measuring all information objects.
 - Informetrics deals with the measurement, hence also the mathematical theory and modeling of all aspects of information and the storage and retrieval of information.
 - It is mathematical Meta information, i.e. a theory of information, scientifically developed with the aid of mathematical tools.

- **Webometrics** (Cybermetrics) which includes web connections and manifestations using bibliometrics techniques to study the relationship and properties of different sites on web.
 - Webometrics as a quantitative measure that concern four major areas of analysis as follows:
 - Web page content analysis
 - Web usage analysis (Including log files of user searching and browsing behavior)
 - Web technology analysis (Including search engine performance)
 - The web link structure analysis

- **Altmetrics** is an “alternative-to-metrics” tool which is already existed traditional metrics tools. This new method has evolved, as scholarly communication related to online resources via ***altmetrics.org***.
 - This free Web site is a central hub for information about the growing altmetrics movement, which it defines as “the creation and study of new metrics based on the Social Web for analyzing and informing scholarship.”
 - Free open source tool designed to support URL-based publishing through the aggregation of online altmetrics.

- **Public Library of Science (PLOS)** has emerged as the leading open access journal repository, in part due to its high traditional impact factors. PLoS offers an alternative to traditional impact in the form of Article Level Metrics. *plos.org*
- **Social Science Research Network (SSRN)**. SSRN is an online article repository. *ssrn.com*
- **Research Gate** Share and discover research, get stats, ask questions, connect with colleagues. *researchgate.net*
- **Academia.edu (free online paper sharing)/Mendeley (managing , sharing research papers and processing Readership Data) *mendeley.com***
- **Zotero** is the only research software that provides full and seamless access to a comprehensive range of open and gated resources. *zotero.org* /**Vivonet.com (Solution to Hospitality Sectors – Data)/Blogs and Media**
- *15th International Conference on “Webometrics, Informetrics and Scientometrics(WIS)”.Nov2019.China*

- **Mathematical Foundation of Bibliometrics**
 - **Samuel Clement Bradford** (10-1-1878 London -13-11-1948) was a British mathematician, librarian and documentalist at the Science Museum in London. He developed “ **Bradford’s Law (Law of Scattering)**” regarding differences in demand for scientific journals
 - Samuel Clement Bradford, Margaret Elizabeth Egan and Jesse Hauk Shera. *Documentation*. London: C.Lockwood. 1948.

- **Alfred James Lotka** (2-3-1880 US – 5-12-1949) was a US mathematician, physical chemist and statistician, famous for his work in population dynamics in ecology. He developed “ **Lotka’s Law (Authorship Productivity)**”.
- Lotka A.J. The Frequency Distribution of Scientific Productivity. *Journal of the Washington Academy of Sciences*. 16; 317-23.1926

- **George Kingsley Zipf** (7-1-1902 Illinois – 25-09-1950) was an American linguist and philologist who studied statistical occurrences in different languages.
- **“Zipf’s Law(Law of Words Frequency)”** states that while only a few words are used very often, many or most are used rarely. 1935 published in 1949.




- **Measuring Research Output**

- **Usage of Research Work** of researcher always pays importance and value to the author and also to the work.
- **Work** in the form of article, patents and notes in the subject **get its impact when it got cited in the literature of importance.**



- **Citation Index**

- The creation of reliable source in the area of science was carried by **Eugene Garfield in the year 1964. The first publication of Science Citation Index was published by ISI in 5 volumes (Jeremy 1964).**
- **Social Science Citation Index**
- **Arts and Humanities Citation Index**

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- **Web citation index** in web environment has very composite structure whose components are based primarily on the printed manual structure of citation index which is later used as data files in the database on internet or CD-ROM. These online databases are available as:
 - **Web of Science** (Thomson ISI 2003),
 - **Scopus** (Burnham,J.F. 2006)
 - **Google Scholar** (Crawley,L. & Nadimi,Z. 2008)



- **Ranking and Mapping Research**

- Ranking of Authors
- Ranking of Institutions
- Location of Authors
- Location of Institutions
- Research Atlas




- **Research Indicators and Performance**

- Articles/Patents/Monographs
- Job Performance(Time Spent)
- Research Guidance
- Research Facilities Provided
- Research Facilities Created
- Administrative Controls



- **Content Analysis**

- Subject Identification of Current Research
- Subject Gap Areas
- Subject Trends

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- **Citation Analysis**
 - Article Citations
 - Institution Citations
 - Subject Citations



- **Cluster Analysis**

- Identification of Similar Concepts to form Cluster
- Identification of Similar Research
- Identification of Unique Concepts to form Area
- Identification of Latest Research Trends



- **Research Relevance**

- Relevance to the Country Needs
- Theoretical Advancements in Relevance
- Practical Development in Relevance
- **Research Space and Time**
 - Geographical Area
 - Validity in the Current Time

● **Applications of Metric Studies**

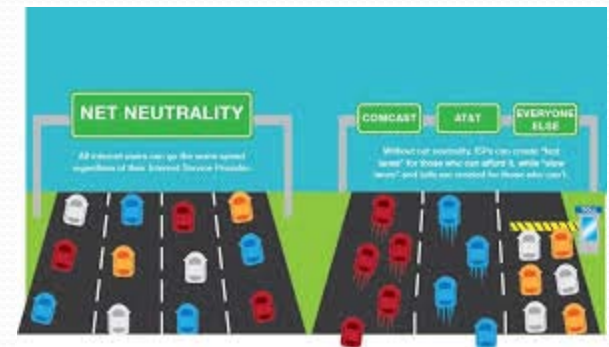
- CSIR Research Output Analysis **1986/1987/1988/1989/1990** for Bhatnagar Awards
- Worked with Prof T Braun (Chief Editor: Scientometric), Hungarian Academy of Sciences, Budapest, Hungary. **1989**
- UGC Department Grants in Universities
- Indian Institute of Immunology: Recruitment of Scientists
- Non-SCI Journals: IF
- Physics Citation Index: A Model
- Study of Research Output of Jamia Milia Islamia in the Field of Natural Sciences (1971-2004). **2010**

- Performance Measurement in Select Academic and R&D Libraries. Gujarat University. **2011**
- Scientometric Study of Research Output in Computer Science of Select Universities in Delhi(1995-2009). **2015**
- A Scientometric Study of Research Output in Physics in Select Institutions of Delhi. **2016**
- Expert Member Meeting on Project “An Assessment of DRDO’s Research Publication Output. **2017/2018/2019.**
- Women Physicists in India: A Scientometrics Study **2016-2019**



- **Examiner:**

- Evaluation of College Libraries in Meghalaya: A Case Study. By Medalda Challam. North Eastern Hill University, Shillong. **2007.**
- Growth of Ethnobotanical Journal Literature and Citation Pattern of Ethnobotanist in India: A Bibliometric Study., School of Studies in Library and Information Science, Jiwaji University, Gwalior. **2010.**
- Research Output on Genetic Engineering Using Scopus Database: A Scientometric Study. Bharathiar University, Coimbatore. **2016.**
- Comparative Study of Google Scholar and Web of Science from Users' Perspective. Banaras Hindu University. **2017.**
- Mapping of Literature on Gynaecological Cancers Research During 2000-2009: A Scientometric Analysis. Jiwaji University. **2017.**



Thanks

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