

Commentary

*A new theoretical perspective of Bibliometrics based on
the historical dimension and temporal referents*

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The theoretical development to date in the field of Documental Information Metrics Studies has focused on the definition of the diverse metric specializations, as well as the similarities and dissimilarities existing between them resulting from the uniqueness of their respective sub-fields and objects of study.

The emergence of these specialized areas of metrics that include Librametry, Bibliometrics, Archivometrics, Informetrics, as well as others such as Sciencometrics, Webometrics and more recently Altmetrics, share a conceptualization process involving the application of mathematical and statistical methods and models to the activities of librarians, bibliographers, archivists, informative scientists, research scientists and social relationships on the Web and to other social media applications, and to a broad variety of communicative activities carried out online.

Bibliometrics is the oldest of these specialized metrics both in terms of practice and theoretical-conceptual development. As its name suggests, it is devoted to studying and identifying the quantitative regularities of the Documental Information Flow and the associated processes of Production and Scientific Communication. However, this classic or descriptive orientation has had to give way to new dimensions as the field matures, in order to include evaluative and historical processes, in which traditional objects of study are supplanted, thereby complementing an approach determined by securing results.

In view of this dilemma, an important thing to consider as a fundamental object of study is time. Analogous to the results of

demographic analysis, time in bibliometric analysis determines the orientation or dimension of the process of achieving results derived from bibliometric analysis. This shift in the object of study of Bibliometrics arising from the time factor has never been studied. Also pending is the development of a new theoretical perspective of Bibliometrics from the basis of an analysis of time as the central axis integrating the three previously identified dimensions in this metric specialty.

In order to support this change in focus in the theoretical perspective of Bibliometrics, it is important to perform an array of research oriented to such ends. This is why this author is working on a line of research aimed at identifying to what extent the determination of the temporal referents of the bibliographical variables of the documents contributes to the development of a new theoretical perspective of Bibliometrics that is distinct from the approaches that until now have served as the foundation of the specialization's descriptive, or classic, evaluative and historical dimensions.

To this end, the three-dimensional character of Bibliometrics has been undergoing a process of identification and definition across a wide-variety of approaches, leading to the prospect of determining a three-dimensional theoretical model for Bibliometrics.

The three-dimensional nature of Bibliometrics and its temporal referent

Of the metrics areas indicated above, Bibliometrics has undergone the greatest conceptual development as well as enjoying a broader range of practical application. Moreover, Bibliometrics research has been done across a wider variety of subjects, and geographic and temporal spheres than that performed in any other area of informational metrics and scientific knowledge.

Bibliometrics –originally conceived by Otlet in 1934-- was subsequently redefined by Pritchard (1969) as: The application of statistical and mathematical methods to books and other means of communication. This definition is later taken up and expanded by Pritchard and Wiittig (1981), who point out that this specialty metric ...includes all studies that use or discuss statistical analysis of data related to printed communication

(...) studies of individual elements within works (...) the measurement of the process of information transfer and its analysis and control.

In this first stage of development, bibliometric research with this theoretical approach is recognized as descriptive, or classical, because of its use of the classical mathematical models of Lotka, Bradford, Zipf, Price, Brookes, and the like, which serve to model and determine researcher productivity, information concentration-dispersion, word frequency in texts, the exponential growth of science and obsolescence of scientific journals, respectively.

Another theoretical approach of Bibliometrics arises in 1976, when Narin's work introduced Evaluative Bibliometrics as: ...the use of bibliometric techniques, especially the analysis of publications and citations, in the evaluation of scientific activity. From our point of view, this approach focuses on the study of the generation and use of bibliometric indicators oriented to the evaluation of communication and collaboration among groups, communities and scientific institutions. Through the evaluation of institutions, communities, groups and human resources devoted to scientific activity, the results obtained in this dimension provide complementary knowledge for interpreting the sociological behavior of scientific activities.

Finally, a third dimension is highlighted by Hérubel in 1999, when he defines Historical Bibliometrics as: the study of books and journals framed in time and space. However, the use of the temporal and spatial referents contained in this definition are not exclusive features of Historical Bibliometrics, but rather are posited, from our viewpoint, as essential to any research performed in any of the three Bibliometrics dimensions identified, whether descriptive, evaluative or historical.

In this sense, using sources and historical-bibliometric indicators to identify their main regularities, the historical dimension or quality attributed to Bibliometrics should be oriented to identifying patterns of quantitative behavior on the History of Science and to the main facts that describe the scientific development of an era. Its most significant association, in the orientation of its results, identifies with the Philosophy and History of Science.

These three dimensions attributed to Bibliometrics allow the design of an integral model entailing three distinct approaches to obtaining results, and, in turn, the use of different sources, variables, indicators and purposes that can be represented in a new theoretical model of Bibliometrics.

From this three-dimensional vision of Bibliometrics forking into different subjects of study, a new approach arises that proposes integration and consolidation of these three analytical dimensions through the use of the temporal reference. This approach has as its purpose the development of a new theoretical perspective in which the temporal referent constitutes the central axis of bibliometric analysis in a way similar to what is done in demographic analysis of population studies.

Previous conceptual and terminological conclusions regarding the temporal reference of scientific production and communication can serve as a basis for developing a new theoretical perspective of Bibliometrics in which its three dimensions are integrated through the analysis of the temporal referents of production and communication, as well as the argumentation of its historical dimension, oriented to the contribution of new approaches that strengthen its three-dimensional character and its integral analysis.

To build this new approach we employ conceptual comparison and contrast to determine a priori the distinctive aspects of the descriptive, evaluative and historical dimensions of Bibliometrics. This serves to provide theoretical elements that contribute to their redefinitions. We must also revise the definition of Historical Bibliometrics by analyzing the temporal referent in this type of study in order to contribute to new approaches to its conceptual foundations. Taking a cue from demographic analysis models, we must employ the temporal referent as the main unit of measure in the transversal and longitudinal bibliometric analysis of the data.

The construction of a new approach in the theoretical outlook of Bibliometrics must be governed by basic principles including the following: the documents and associated relationships of production and scientific communication are generated at a specific moment and they endure in form and content over a historical period; and --in a way analogous to what happens

with the individuals authors-- they have and fulfill a certain age every year of their lives. For bibliometric analysis, time, from this perspective, constitutes the fundamental unit of measure by which the behavior and regularities of scientific production and communication can be ascertained. The analysis of the temporal referent in these regularities determines in a way that is directly proportional the results obtained in the three dimensions of Bibliometrics; therefore, it modifies the theoretical foundations on which the bibliometric analysis currently rests.

This new approach must begin with the quantitative examination of the effect of time, as the unit of measurement (an aspect has not been used in bibliometric studies) on the bibliographic variables that intervene in the processes of scientific production and communication, in order finally to establish the events that explain a new theoretical perspective in this specialized area of metrics.

To this end, we start with the temporal analysis of each and every one of the events and regularities involved in the processes of scientific production and communication (production, edition, reprint, compilation, productivity, concentration, dispersion, aging, use, disuse, referencing, citation, impact, visibility). This is achieved through transversal design that collects data at a point in time and the longitudinal design consisting of collecting data at different points over time, thereby allowing inferences to be made about the evolution of the causes and their effects on the processes mentioned above.

For this kind of analysis and design, we must use the three systems of variables that are identified in the bibliometric analysis, i.e., 1) the variables of bibliographic entries and records; 2) references and citations, and 3) those associated with authors, groups, communities and institutions.

The analysis of these three systems of variables must be performed in a way similar to that used by Brookes in the study of obsolescence: synchronous, multi-synchronous and diachronic; i.e., retrospective at a point or moment in time, retrospective at multiple points or moments in time, and projective into the future, respectively. To facilitate these types of analyses, it is useful to employ a model frequently used in demographic analysis. This model is a powerful quantitative analytical tool

known as the Lexis Diagram, in which time is used as the determinant unit of measure.

This interaction between bibliometric and demographic analysis once again confirms the general trans-disciplinary nature of Information Metrics and Scientific Knowledge, a nature shared by Bibliometrics, while at the same time allowing us to corroborate the reliability of the use of mathematical models and methods in the determination of the theoretical constructs that underpin research in this field of knowledge.

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