

Consolidation and New Developments in the Five Metrics Sciences Disciplinary System: A Review of the Postprint of *Altmetrics: Theory, Methods and Applications*

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Abstract

[Purpose/Significance] This study evaluates the important academic contributions of the book *Altmetrics: Theory, Methods and Applications* to the improvement and development of the “Five Metrics” disciplinary system. [Method/Process] The core value of the book in perfecting and innovating the “Five Metrics” disciplinary system is analyzed from four dimensions: Altmetrics theory, tools, methods, and applications. [Results/Conclusion] As a volume in the Informetrics Research Series, the book demonstrates the close connection between Altmetrics and the “Five Metrics”, and holds special academic value and significance for promoting the future application and development of Altmetrics.

Full Text

Abstract

[Objective/Significance] This paper evaluates the important academic contribution of the book *Altmetrics: Theory, Method and Application* in perfecting and developing the disciplinary system of “five metrics.” [Method/Process] From four aspects—Altmetrics theory, tools, methods, and applications—the paper analyzes the core value of the book in improving and newly developing the “five metrics” disciplinary system. [Result/Conclusion] As part of the “Metrics Research Series,” the book demonstrates the close relationship between Altmetrics and “five metrics,” and holds special academic value and significance for promoting the future application and development of Altmetrics.

Keywords: Altmetrics; five metrics; disciplinary system; method system; theory system; book review

“Altmetrics,” as a borrowed term, was formally introduced to China through a paper published in *Library and Information Service* in 2012 [1]. After several years of development, it has gradually attracted the attention of experts and scholars in library and information science, management, and journalism and communication in China. It has not only been listed as an important topic in annual calls for papers by core journals but has also seen numerous related national and ministerial-level research projects funded and a large volume of papers published. However, by the end of 2018, China still lacked a monograph or textbook on Altmetrics. This not only hindered daily teaching but also impeded the formal establishment of Altmetrics as a metrics sub-discipline on par with the traditional “five metrics.” The book *Altmetrics: Theory, Method and Application*, authored by Yang Siluo et al. from Wuhan University and published as part of the “Metrics Research Series” in November 2019 [2], addresses this gap. The book comprises three parts covering theory, method, and application.

Chapters 1 and 2 address the theoretical foundations and theoretical system of altmetrics; Chapters 3 through 6 cover the data sources, indicator system, methodological system, and tool system of altmetrics; and Chapters 7 and 8 discuss the application system and case study analysis of altmetrics.

1. Theoretical Contributions to the Development of “Five Metrics”

As an emerging disciplinary field, Altmetrics must draw upon and learn from relevant theories in related disciplines to establish a broad and profound theoretical foundation. The book summarizes these foundations across six areas: mathematics, network science, data science, communication studies, library and information science, and “five metrics.” Specifically, it identifies Web theory, complex network theory, and social network analysis theory as the network science foundations of Altmetrics; open science, data science, and big data technology as its data science foundations; and social media, knowledge exchange, and innovation diffusion theory as its communication studies foundations. The book also draws upon classic theories from Web 2.0 such as long tail theory, six degrees of separation, and self-organization theory, as well as theories on tie strength, social capital, and structural holes in social networks as theoretical sources for Altmetrics. Bibliometrics, scientometrics, informetrics, webometrics, and knowledge metrics are collectively referred to as “five metrics” [3]. As a new research direction in metrics, Altmetrics shares the same research domain as “five metrics” and thus inevitably exhibits certain similarities and overlaps in principles, tools, and research methods. Consequently, Altmetrics theoretically perfects and develops the “five metrics” system.

2. Tool-Level Contributions to the Development of “Five Metrics”

Altmetrics is a metrics science based on academic usage data from social media in the context of open science, intimately related to open data. Data acquisition is a prerequisite and necessary condition for empirical research [4]. Chinese scholars are relatively unfamiliar with foreign social media platforms and use them infrequently, resulting in limited skills in data acquisition. Even for domestic social platforms where awareness is relatively high, researchers still cannot comprehensively and rapidly obtain relevant data in empirical studies due to data not being open or having low levels of open sharing, lack of public APIs, and insufficient data acquisition knowledge and skills [5-6]. The book categorizes Altmetrics data acquisition into three methods: manual browsing, API access, and web scraping, and provides brief explanations on how to call APIs, use open-source tools, and conduct web scraping. In addition to commonly used foreign Altmetrics data sources, the book specifically introduces data acquisition methods for domestic platforms such as WeChat, ScienceNet, Baidu Baike, and institutional repositories, providing important reference and guidance for researchers to conduct further empirical studies.

3. Methodological Contributions to the Development of “Five Metrics”

Since its proposal and subsequent development, scholars have attempted to employ various traditional bibliometric methods [7-8] as well as specialized methods suitable for Altmetrics data collection and analysis [9]. Researchers typically formulate research questions and hypotheses and select appropriate methods accordingly. However, for beginners, systematic introduction to Altmetrics research methods and detailed explanations of their application contexts are needed. The book constructs an Altmetrics methodological system from five aspects: informetric methods, data collection methods, data mining methods, statistical methods, and data visualization methods. By collecting and organizing Altmetrics research methods and hierarchically constructing the methodological system, it organically unifies various independent yet interrelated methods. This not only clarifies how Altmetrics inherits from and innovates upon “five metrics” research methods, enriching and expanding research perspectives and approaches, but also perfects and develops the methodological system of “five metrics” from a methodological standpoint.

4. Application-Level Contributions to the Development of “Five Metrics”

The book systematically discusses the application of Altmetrics in scientific evaluation, information resource management, information retrieval and services, and science and technology management and forecasting. It covers the important stages in the formation of Altmetrics application objects, application fields,

and academic impact, comprehensively demonstrating the application characteristics, advantages, and current status of Altmetrics, and constructs an Altmetrics application system. This perfects and develops the disciplinary system of “five metrics” from an application perspective.

5. Limitations

The book is systematically and logically structured with clear chapter arrangements and distinct layers. However, it reflects little on the developmental changes in Altmetrics over the past two years, specifically in two aspects:

First, regarding the relationship between Altmetrics and “five metrics” indicators in application. Scholars’ understanding of Altmetrics indicators has deepened or changed primarily through the updates and iterations of research tools themselves [10]. For example, Altmetrics aggregator tools now track not only narrow Altmetrics indicators but also webometric indicators (views and downloads) and citation indicators (mentions or citations in news and policy media, citation counts in Web of Science). Furthermore, journal publishers and institutional repositories are integrating traditional citations with Altmetrics indicators to reflect the academic and social attention of papers [4], gradually constructing comprehensive evaluation models for the academic impact and social attention of institutions, scholars, journal articles, and books [11-19].

Second, understanding of the advantages and disadvantages of Altmetrics is also gradually evolving. In the early stages of Altmetrics emergence and development, radicals believed Altmetrics would revolutionize existing research evaluation methods and overcome the limitations of traditional citation analysis [20-21]. However, as research progressed, scholars discovered that Altmetrics indicators are influenced by discipline, geography, publication time, and other factors, and that issues of citation behavior, citation motivation, and citation culture present in traditional citation evaluation indicators also exist in Altmetrics indicators [22-23]. Subsequently, conservatives argued that Altmetrics should not replace traditional citation indicators but rather eliminate the sole reliance on citation as a single metric method in research evaluation [24-25]. The low coverage, susceptibility to manipulation, and heterogeneity of Altmetrics indicators remain challenges to be addressed [23, 26-27]. Scholars’ cognitive process regarding Altmetrics is gradually approaching objectivity but has not yet reached maturity; its advantages and disadvantages should be evaluated objectively.

Conclusion

The development of any discipline cannot be separated from theory, method, and application—theory is the foundation, method is the means, and application is the purpose. As a product of “five metrics” in the emerging network environment, Altmetrics emerged to meet social practice needs. Its related theories and technologies can guide social practice, and social practice is also an

important criterion for testing theory. Existing Altmetrics research often emphasizes academic innovation but neglects its practical application value and ability to solve problems in social practice to a certain extent, hindering Altmetrics' goal of promoting social development and academic progress. This manifests in three main aspects: insufficient integration between research and practical application, inadequate breadth of application, and lack of depth. The publication of *Altmetrics: Theory, Method and Application* is a landmark event in the history of Altmetrics research development in China, providing important impetus for further in-depth exploration of Altmetrics in China. The book systematically constructs the theoretical, methodological, and application systems of Altmetrics, perfecting and developing the disciplinary system of "five metrics" to a certain extent and holding far-reaching significance. The book is not only suitable for undergraduate and graduate teaching but also for scholars to discover high-value research topics through intensive reading. Moreover, as part of the "Metrics Research Series," its publication formally establishes the academic position of Altmetrics in perfecting and developing "five metrics" and holds special academic value and significance for promoting future theoretical research and application practice.

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Author Contributions

Liu Chunli: Designed the paper framework, wrote and revised the manuscript; Sheng Nanhong: Collected and organized relevant materials; Ma Fengmao: Revised the manuscript and finalized the paper.

The Improvement and New Development of “Five Metrics” Disciplinary System: A Book Review of the Theory, Method and Application of Altmetrics

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Abstract: [Purpose/significance] To evaluate the important academic contribution of the book in perfecting and developing the discipline system of “five metrics.” [Method/process] This paper analyzed the core value of the book in the improvement and new development of the “five metrics” discipline system from four aspects of Altmetrics theory, tool, method and application. [Result/conclusion] Published as a series of research books on metrology, the book demonstrates the close relationship between Altmetrics and “five metrics,” and has special academic value and application significance for promoting the future application and development of Altmetrics.

Keywords: Altmetrics; five metrics; disciplinary system; method system; theory system; book review

Note: Figure translations are in progress. See original paper for figures.

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