Book Review

Applied Evaluative Informetrics. by Henk F. Moed. Amsterdam, The Netherlands: Springer, 2017. XXI, 312 p. 35.69 €. ISBN 978-3-319-60522-7 (Print), 978-3-319-60521-0 (Online). DOI 10.1007/978-3-319-60522-7.

The book is written by Henk F. Moed, a distinguished and respected researcher in the field of informetrics. He obtained a Ph.D. degree in Science Studies from the Leiden University. He is a former senior staff and full professor of research assessment methodologies in the Center for Science and Technology Studies at Leiden University. Moed currently works as a visiting professor in Sapienza University of Rome. Publishing numerous papers on different aspects of research assessment, developing new indicators such as SNIP (Source Normalized Impact per Paper) and receiving the Derek de Solla Price Medal in informetrics in 1999 are among his activities. This book presents an introduction to the field of applied evaluative informetrics. The five main topics of the book are as follows: An overview of new informetric tools, often used informetric indicators and their pros and cons, the relationship between the informetric and the policy domain, options for consideration when designing an assessment as well as future research and indicator development.

This book is a part of series, named "*Qualitative and quantitative analysis of scientific and scholarly communications*", edited by Wolfgang Glanzel from Katholieke Universiteit Leuven and Andras Schubert from Hungarian Academy of Science. The book consists of six parts and nineteen chapters. The first part, "*general introduction and synopsis*", presents an introduction to the use of informetrics in research evaluation and consists of two chapters. It begins with an overview of the value and shortcomings of informetrics and quantitative science, technology and innovation (STI) indicators. It continues with a brief history of bibliometrics and scientometrics, recent developments and trends in aforementioned areas, basic assumptions in informetric studies, main topics and terminology used in the book. The second chapter summarizes the main topics and conclusions of each chapter for readers who do not have the time to read the book thoroughly.

The second part, "Informetric *indicators of research performance*", comprises three chapters. Chapter 3, "*Multi-dimensional research performance*", introduces four components of research activity, namely input, output, process and impact. Funding, manpower and research infrastructure are introduced as research inputs. It is mentioned that process focus on research collaboration, performance and efficiency. The most important outputs such as scientific,

educational, technological, economic, social and cultural outputs are discussed. Moreover, two broad types of research impact, namely scholarly and societal, are introduces and important distinctions are explained. The chapter ends with a brief introduction of 28 often used indicators, along with their definitions, potentialities and limits. Indicators are grouped into following categories: publication and citation-based measures, journal-based measures, patent-based measures, altmetric, usage-based and web-based measures, reputation and esteem-based measures, economic measures, measures of research infrastructure as well as measure of collaboration, migration and cross-disciplinarity (scientific-scholarly impact, process indicators). It explains how indicators are used in practice and what benefits and problems they have. Detailed explanations of 28 indicators are presented in chapter 4, "*Informetric tools*". It clarifies common misunderstandings in the interpretation of indicators. This chapter continues with the uses of big data and computational techniques for the visualization, analysis and modeling of research output. Chapter 5, "*Statistical aspects*", focuses on three general issues in statistical analysis of informetric data. Moed discusses the inappropriateness of journal impact factor for assessing the citation performance of individual articles. He also argues the errors and biases in informetric data samples. Some points that should to be considered in interpreting the results of correlation and regression tests in informetric studies are also explained.

The third part, "*The application context*", discusses various models, methods and application contexts in research assessment. This part is comprised of three chapters. Chapter 6, "*Research assessment as an evaluation science*", introduces evaluation science as a research field dealing with quantitative assessment of scholarly outputs. A distinction is made between four domains of intellectual activity in the assessment process: policy and management, evaluation, analytics and data collection. Various definitions of the terms "*evaluation*" and "*assessment*" are provided. Moreover, the differences between summative and formative assessment are presented based on four criteria: time, goal, feedback and frame of reference. The chapter continues with an overview of assessment models and strategies, followed by research assessment costs. "*Non-informetric factors influencing indicator development*" is covered in chapter 7. It discusses how evaluative assumptions shape informetric indicators. Selection of size dependent and size independent indicators, top or bottom of a performance distribution, normalization methods, short-term and long-term perspectives are explained in details. Furthermore, statistical claims, theoretical notions and application contexts of selected indicators are depicted. This chapter ends with socio-political contexts in which highly used indicators were developed. Chapter 8, "*the policy context*", discusses the multi-dimensional nature of research assessment. It illustrates objectives and characteristics of the units of assessment. Two examples are presented to clarify the influence of policy contexts on the use of informetric indicators.

The forth part of the book consists of four chapters on "*The way forward*" in informetrics. "*Major problems in the use of informetric indicators*" in research assessment are explained in chapter 9, including the effect of limited time spans, the difficulty of assessing societal impact, the effects of

the use of indicators upon authors and editors as well as constitutive effects of indicators. Chapter 10, "*The way forward in quantitative research assessment*", presents alternative approaches in the proper use of available measures. It also presents a list of novel features that could be implemented in research assessment. Chapter 11, "*A perspective on altmetrics*", highlights the theoretical foundations, practical implications and current practices in the use of alternative metrics. Next, it explores the potential and limitations of altmetrics. Important distinctions between traditional bibliometric indicators and alternative indicators are also explained. This part ends with the twelfth chapter, "*The way forward in indicator development*". It proposes a series of approaches in the development of new generations of indicators for research assessment. It contains a proposal for new indicators of the manuscript peer-review process, ontology-based informetric data management system and informetric self-assessment tools.

The fifth part of the book, (chapters 13 to 17), presents five lectures on historical overview of informetrics. These lectures are based on doctoral courses presented by the author at the Sapienza University of Rome in 2015. It starts with three visionary lectures about the field's pioneering researchers, Derek de Solla Price, Eugene Garfield, and Francis Narin. Chapters 13, "from Derek Price's network of scientific papers to advanced science mapping", presents his view and contribution on the scientific literature of science mapping and modeling.

Comparative analysis of three multidisciplinary citation indexed include Clarivate Analytics' Web of Science, Elsevier's Scopus and Google Scholar is discussed in chapter 14, "*From Eugene Garfield's citation index to Scopus and Google Scholar*". It also summarizes the pros and cons of aforementioned citation indexes. Chapter 15, "*From Francis Narin's science-technology linkages to double boom cycles in technology*", presents theoretical models on the relationship between science and technology based on the pioneering work of Narin. Chapter 16 presents a series of journal metrics such as Journal Impact Factor, SJR, Eigenfactor, SNIP, Cite Score and usage indicators. It highlights their potential and limits and gives typical examples of their application in research assessment. This part ends with chapter 17, "*From relative citation rates to altmetrics*". Definition and properties of a series of informetric indicators that are discusses in previous chapters are presented, including relative citation rates, h-index, integrated impact indicator, usage-based indicators, social media mentions and research efficiency measures. Part 6 presents two full articles published recently by the author. Chapter 18 includes a paper on "*Comparative study of five world university rankings (ARWU, THE, Leiden, QS, U-Multirank)*". Finally, a comparison of usage-based metrics based on the number of full-text downloads with citation-based metrics is presented in the last chapter of the book (19), "*Comparing full-text downloads and citations*". The book ends with a thorough list of references.

The book pays a lot of attention to the application context of quantitative research assessment. It describes research assessment as an evaluation science, and distinguishes various assessment models. The application of informetric indicators in the assessment of research performance are

discussed in details. Moreover, a comprehensive overview of important citation indexes, methodologies and products used in research assessment is presented. The book uses the term "informetrics" for study all quantitative aspects of information. Therefore, it deals not only with traditional bibliometric indicators based on publications and citation counts, but also with webometrics, altmetrics and usage-based metrics. It is a useful source for anyone interested in trends and issues in research assessment, especially for students, research managers, research funders, informetricians and librarians. Several chapters of the book re-use text fragments from articles published by the author during the past few years. It is worth highlighting that one of the advantages of the book is insightful critical views provided by Moed on fundamental problems in the uses of research performance indicators in research assessment. The only shortcoming of the book is that it does not provide details on technical and statistical aspects of informetric indicators. We suggest readers to study Todeschini and Baccini's "*Handbook of bibliometric indicators: Quantitative tools for studying and evaluating research"* in addition to the current book.

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