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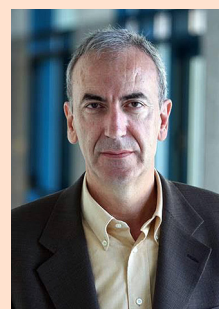
## IBERIAN EDICIC AND THE CHALLENGE OF OPEN SCIENCE

### CONFERENCE REPORT

The *Asociación de Educación y Investigación en Ciencia de la Información de Iberoamérica y el Caribe* was born in September of 1996 in the city of San Juan, Puerto Rico, as a result of a series of meetings of professors and researchers in Information Science with the aim to exchange ideas, experiences and resources to promote the cooperation between the different actors in this geographic area. In this sense, UNESCO



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Fig. 1 Opening Session at the Auditorium of the University of Coimbra (From left to right: Elias Sanz Casado, Fernanda Rollo, Joaquim Ramos de Carvalho, José Pedro Paiva, Carlos Ávila Araújo, Maria Manuel Borges)

considers this Association as a useful forum for the promotion of international collaboration among the Schools through intraregional collaboration in Latin America and the Caribbean and interregional with Europe (<http://www.edicic.org>).

EDICIC is currently divided into several regional chapters. The Iberian Chapter, that integrates Spain and Portugal, has held biennial meetings since 2003. The last Iberian EDICIC Meeting in November 2017, which took place at the University of Coimbra, Portugal, was titled “*Open Science: The Contribution of Information Science*”. It was a contribution to the discussion of the current demand to open science to society, that has been installed at the centre of the debate in Europe. The ambition to make the European space more innovative and competitive – Open Innovation, Open Science & Open to the World – such as it was enunciated by Carlos Moedas, European Commissioner for Research, Science and Innovation, converges in a complete and complex objective, that of achieving an Open Science to the scientists themselves and to society in general. As organizers of

the VIII Iberian Encounter EDICIC 2017, we wanted to recognize the need to open the borders to a new way of understanding the research activity, more open and participatory, which underlines in a very particular way the social role of science. In this sense, science has to permeate society and be seen and understood as a creative activity of society as a whole, and not just a small part of it, isolated and working on issues closed to citizen collaboration.

At the VIII Iberian Encounter EDICIC 2017, attendees from six countries (Portugal, Spain, Brazil, Colombia, Cuba and United Kingdom) participated in a three days programme, which was packed with highly informative lectures, practical hands-on sessions, and live discussions between the 20th and 22nd of November, 2017. The event was opened by the Vice-Rector International Relations of the University of Coimbra, Joaquim Ramos de Carvalho, and the Secretary of State of the Ministry of Science, Technology and Higher Education of Portugal, Fernanda Rollo.

The keynote speaker was Wolfgang Glänzel with the talk entitled “*Scientometrics 2.0* –





Fig. 2 Keynote speaker: Wolfgang Glänzel

*and beyond? Background, promises, challenges and limitations of alternative metrics “.*

In this Meeting, we also counted with the inclusion of new elements that enriched the vision of science with the perspective of new researchers who join the scientific system. In the first place, we had the participation of the doctoral students, since in the Doctoral Consortium the research projects of 14 students of doctoral programs that presented the latest advances of their theses were discussed.

Likewise, the Luis de Camões Chair Prize of the Carlos III University of Madrid

was awarded for the first time to reward the best contribution of a Young Researcher to the Encounter.

On the other hand, in order to disseminate the research results presented at the Meeting, a significant number of journals published in Portugal, Spain and Brazil undertook to publish revised and extended versions of the best communications.

The Scientific Committee, who undertook the arduous task of evaluating the high number of proposals presented to the VIII Iberian Meeting, composed by 63 leading researchers evaluated more than 200 submissions. Likewise, there were 27 moderators of the sessions and a large team of researchers and students who formed the Local Committee and who helped us to prepare this Meeting and without which it would not have been possible to hold it. The total number of authors of the accepted papers, 332, are from Brazil, 204 (61,4%), Portugal, 44 (13,2%), Spain, 34 (10,2%), Cuba, United Kingdom and Colombia with 1 (0,3%) paper each. The remaining 60 authors did not add to the database elements that allow their identification.

The next Iberian Encounter EDICIC 2019 will be held at the University of Barcelona, Spain, in the month of July 2019.



Fig. 3 Doctoral Consortium: students from PhD programs from Portugal, Spain and Brazil



# SPECIAL ISSUE OF SCIENTOMETRICS: SELECTED PAPERS FROM THE EIGHTH EDITION OF THE INTERNATIONAL SEMINAR ON THE QUANTITATIVE AND QUALITATIVE STUDY OF SCIENCE AND TECHNOLOGY “PROF. GILBERTO SOTOLONGO AGUILAR”



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Over recent decades bibliometric studies have become of increasing interest to academics and science administrators all over the world and Latin America is no exception. While in other countries and regions research groups and institutions have been developed to fill the need for specialized

studies, the process has been slower in Latin America with limited formal and informal contact between professionals. To compensate in some measure for this omission, the *International Seminar on the Quantitative and Qualitative Study of Science and Technology* “Prof. Gilberto Sotolongo Agui-



lar” was created by researchers from Cuba and Mexico in 2002 and has since become an integral part of the Cuban international information forum held in Havana every two years. The Seminar celebrated its ninth edition last March with presentations from a range of countries in Latin America and from the Iberian Peninsula. Evidence of a widespread interest in the event is the presence in the Organizing Committee of researchers not only from Cuba and Mexico but also from Brazil, Colombia and Spain.

The Spanish journal, *Revista Española de Documentación Científica* and the Brazilian journal *Transinformação* published papers from two previous editions of the Seminar but this year marks a first with the publication of a special issue of *Scientometrics* in

who gave their time to review and suggest important improvements to the papers.

Two keynote papers are included in this issue. The first is co-authored by Professor Glänzel and Lin Zhang “*Scientometric research assessment in the developing world: A tribute to Michael J. Moravcsik from the perspective of the twenty-first century*”. The authors measured certain fundamental aspects of science activity using advanced scientometric techniques, in a group of developing nations and emerging economies taking as a basis for their study Michael Moravcsik’s theories on how to build science in developing countries. Preliminary results show that international collaboration was frequently responsible for the publication and/or contribution to highly cited



the June 2018 (115/3) issue featuring selected papers from the eighth edition of the Seminar. The opportunity to publish in English via a top specialist mainstream journal was at the invitation of its editor, Dr. Wolfgang Glänzel, a regular presence at the Seminars. We also acknowledge the contribution made by regional and international experts

papers and also that international partnerships are needed to develop scientific capacity and sustainability in developing nations.

Drs. Jaime Aboites and Claudia Díaz from Mexico in their keynote paper “*Inventors’ mobility in Mexico in the context of globalization*” looked at the patterns of patent production in a group of Mexican inventors





and academics. They report a growth in the mobility of Mexican inventors working for foreign companies, universities, and R&D institutes, particularly from the US. Other results found that more Mexican inventors are part of foreign organizations than those from Brazil or Argentina. Therefore, future research should look into geographic factors, as well as directed towards shedding light on other important questions such as the unfavourable conditions existing for inventors in Mexico.

A recent feature of the Seminar has been increasing collaboration between researchers in different countries of the region and with colleagues from other parts of the world. Among the regional institutions that have expanded their co-authorship network is the Cuban Finlay Institute of Vaccines (IFV). Their paper in co-authorship with two Mexican institutions “*Characterization of the Cuban pharmaceutical industry from collaborative networks*”, is a case study of this successful high-tech sector in the context of a “Third World” with a distinctive political framework. The study of the factors responsible for this success could lead to a deeper understanding of the phenomenon and provide clues to the knowledge structures and links that are established in science, especially under the special developmental conditions, as is the case with Cuba. The second entitled “*Glob-*

*al and Latin American scientific production related to pneumococcal vaccines*” examines a specific field of the biopharmaceutical sector, namely research and vaccine development. The study showed increasing activity in this research field as well as the diversity of specific topics and little contribution from Latin America.

The paper “*Medical scientific output and specialization in Latin American countries*” is also the result of collaboration of Cuban specialists but this time with two Spanish institutions. Scientific output and specialization of the most productive Latin American countries focusing on international collaboration and impact using data from SCImago, were studied. Results showed the most productive and visible fields are related to major global health problems involving chronic and emerging diseases. Latin America is particularly productive in the areas of Infectious Diseases and Microbiology with papers published in top specialist journals, but that much work has to be done to reach output classified by the authors as being of excellence.

Other papers on the biomedical field also feature in the special edition, namely “*Emerging roles of regional journals in the accreditation of knowledge in tropical medicine. Biomédica and Memorias do Instituto Oswaldo Cruz, 2007-2015*” and “*Diseases and vector: a 10 years view of scientific literature on*







*Aedes aegypti*". The first co-authored by two Mexican institutions explores how international leadership in the field has influenced the communication patterns of two of the regional journals from Colombia and Brazil, respectively, that have been instrumental in the construction of this prestige. The second paper characterizes recent scientific research on the mosquito *Aedes aegypti*, which transmits several diseases worldwide, using the co-occurrence of terms in the title of papers. The VOS algorithm is used for grouping and mapping of the results which allowed the authors not only to identify an increasing number of papers on the subject but also relevant research areas related to vector control and management.

Also included is an exploratory study of invisible colleges in the field of intellectual property using Web of Science data. The article "*Developmental tendencies in the academic field of intellectual property through the identification of invisible colleges*" which is the result of a collaboration between Mexico and Colombia, demonstrates the levels of cohesion in the field of study and the generation of emerging issues in the global literature with the greatest visibility and impact. Another paper written by Mexican colleagues "*Determinants of the emergence of modern scientific knowledge in mineralogy (Mexico, 1975-1849): a geohisto-*

*riometric approach*", analyzes the formation of a thematic field through historical bibliometrics. The aim is to study the emergence of the scientific text and the formation of author profiles in America, to provide argument in support of an alternative narrative of the history of science to that of the Eurocentric conception.

The use of bibliometrics to analyze the evolution of scientific disciplines associated with technological observatories is the subject of a contribution from Spain. The main findings of the paper "*Bibliometric analysis to identify an emerging research area: Public Relations Intelligence—a challenge to strengthen technological observatories in the network society*" suggest that there is an already potential emerging research field between strategic intelligence and public relations which is highlighting common topics such as strategy, issue management, reputation with the American countries-territories forming the dominant literature.

The influence of external factors on the structural formation of science is analyzed in the article "*Dependencies and autonomy in research performance: examining nanoscience and nanotechnology in emerging countries*" co-authored by Spain, Argentina and the United States. International collaboration in the creation of knowledge is changing the structural stratification of





science, with implications for science policy. Analyses of collaboration in developing and emergent countries are of particular significance because initiatives are often the result of “research-for-aid” arrangements, generally based on North–South asymmetries. However, collaboration for mutual benefit and excellence has gained increasing acceptance, with “partner” selection becoming a strategic priority.

A further paper from Cuba *“Indicator system for managing science, technology and innovation in universities”* proposes a detailed system of indicators with their definitions and applications, adjusted to the characteristics of university institutions and current trends in the Latin American region. The methodology used groups the

individual indicators into categories each dealing with one important aspect of university performance.

The paper *“Has hosting on Science Direct improved the visibility of Latin American scholarly journals? A preliminary analysis of data quality”* from Mexico takes a preliminary look at the tendencies in the coverage in international databases of a sample of open access Latin American journals hosted on Science Direct in June 2016 and their metadata, to typify the most common errors which can affect the use of performance indicators in individual and institutional evaluations and the integration of authors into scholarly reputation systems. A significant level of errors was found suggesting that present strategies have yet to deliver the expected results.

Finally, this special edition is made up of thirteen papers described briefly above, with authors representing nine different countries spanning three continents.

We are optimistic about the future of the Seminar and plans are in place to hold the event annually and in different countries (Mexico 2019 and Colombia 2021) but keeping the venue in Cuba every second year. In this way, we hope to attract a wider spectrum of participants from both Latin America and from outside the region with common interests or merely wishing to interact with regional specialists in the various areas of the metric studies of information.





# 23<sup>rd</sup> NORDIC WORKSHOP ON BIBLIOMETRICS AND RESEARCH POLICY

## CALL FOR PRESENTATIONS

7–9 NOVEMBER 2018  
BORÅS, SWEDEN

[www.hb.se/nwb2018](http://www.hb.se/nwb2018)  
Twitter: #nwb2018



Borås, Sweden.

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You are invited to participate in the 23rd Nordic Workshop on Bibliometrics and Research Policy, November 8-9 with an adjoining pre-workshop on the theme of 'Bibliometrics in the Library' taking place on 7 November at the University of Borås, Borås, Sweden.

Participants who wish to present a research paper or a poster are kindly asked to submit a 250-word ab-

stract of their presentation. We welcome novel ideas or work-in-progress of interest to a Nordic audience and this year we especially encourage papers with a research policy perspective. You can offer either a paper or a poster. Due to limitations in the program the scientific committee may suggest that paper submissions should be given as posters. Papers will be presented orally at the work-



University of Borås.

Photo copyright © Suss Wilén



shop (ca. 20 min.), while posters will be showcased in a poster booster session followed by a free-form discussion. The posters will be on display in the hallways of the workshop site.

We also welcome scholarly and professional papers on the pre-workshop topic 'Bibliometrics in the Library'. Please indicate if you are interested in presenting at the thematic workshop.

## IMPORTANT DATES

Deadline for submission of abstracts: **01 September 2018**

Notification of acceptance: **30 September 2018**

## SUBMISSION & EXPENSES

Send your abstracts (in word or rtf format) to: [nwb2018@hb.se](mailto:nwb2018@hb.se).

**Participation to the workshop is free.** Travel and accommodation have to be arranged and financed by the participants themselves.

## ABOUT THE WORKSHOP

### KEYNOTE SPEAKERS

- ▶ Thematic-workshop: "*Libraries and bibliometrics: institutional and professional perspectives*" Fredrik Åström, Associate professor and bibliometric specialist at Lund University Library
- ▶ Main workshop: Merle Jacob, Professor in Research Policy, Lund University

### LOCATION

Borås is located in the western part of Sweden about 60 kilometres east of Gothenburg. The university of Borås is a modern

university with a campus in the middle of the city (The Allégatan 1, Borås). The auditorium, Sparbankssalen is located in the adjoining building at Järnvägsgatan 1.

### ORGANIZATION

The workshop is organized by Swedish School of Library and Information Science (SSLIS), University of Borås, in collaboration with the university libraries at Chalmers University of Technology and University of Borås.

### WORKSHOP CHAIRS

- ▶ **Björn Hammarfelt**,  
*SSLIS, University of Borås*
- ▶ **Gustaf Nelhans**,  
*SSLIS, University of Borås*

The event is organised with support from the workshop series steering group:

- ▶ **Birger Larsen**,  
*Aalborg University*
- ▶ **Camilla Hertil Lindelöw**,  
*National Library of Sweden*
- ▶ **Susanna Nykyri**,  
*University of Helsinki*
- ▶ **Sigurður Óli Sigurðsson**,  
*RANNIS, The Icelandic Center for Research*
- ▶ **Gunnar Sivertsen**,  
*NIFU*
- ▶ **Daniel Wadskog**,  
*Uppsala University Library*

### CONTACT

**Björn Hammarfelt**, PhD  
*Swedish School of Library and Information Science, University of Borås*  
[www.bibliometri.net](http://www.bibliometri.net)



# ASIST2018 WORKSHOP: BIG METADATA ANALYTICS (BMA2018): SETTING AN AGENDA FOR A DATA- INTENSIVE FUTURE

## CALL FOR PAPERS AND PRESENTATIONS

14 NOVEMBER 2018

HYATT REGENCY VANCOUVER, VANCOUVER, CANADA

Big metadata exists in bibliographic, indexing, and research data repositories and is an important part of the cyberinfrastructure supporting information and data management, discovery, sharing, and reuse. Its other role – as a data source for data/text mining

been labeled as bibliometrics, citation analysis, scientometrics, and informetrics. New family members of big metadata such as Linked Data are also gaining momentum.

As big metadata is pivotal for the data-intensive research, learning, health, and busi-



Vancouver, Lion's Gate Bridge

Photo courtesy of © James Wheeler. (Published under Creative Commons CC0).

and knowledge discovery – is less visible compared to the one for management, discovery, sharing, and reuse of information and data. Research in big metadata analytics has been dynamic and encompasses a wide range of topics, methods, and applications that have

ness, there has been a lack of discussion on what big metadata analytics encompasses, what theoretical, methodological, and computational issues need to be addressed, and how it might be applied to support decision making at team, organizational, and even



national levels. Although using bibliographic metadata as the data source in research has a long history, using big metadata in data repositories is still a new area waiting to be explored. The purpose of this workshop is to bring current researchers who have used or are using big metadata in their projects to share their challenges, methods, datasets, and findings, through which we hope to produce a research agenda for a new research area – big metadata analytics.

## SUBMISSION GUIDELINES

All papers must be original and not simultaneously submitted to another journal or conference. The following paper categories are welcome:

- ▶ **Full papers:** should be completed research on one or more of the topics listed below. A full paper should be no more than 10 pages, including figures, tables, and references.
- ▶ **Presentation abstracts:** may be used to report an ongoing research project with a focus on any of the topics listed below, with approximately 500 words.

The format for both papers and presentation abstracts should follow the template specified at the ASIST2018 website: AM18 Proposal Template (<https://www.asist.org/ami8/wp-content/uploads/2018/01/Proposal-Template.docx>). All papers and abstracts should be submitted to: <https://easychair.org/conferences/?conf=bma2018>. If you do not have an account with EasyChair, you will need to register first to be able to submit your paper/presentation abstract.

All submissions will be reviewed by the program committee. Full papers accepted for the workshop will be invited to contribute extended versions to a special issue, known as a Research Topic (RT), in *Frontiers in Research Metrics and Analytics*. (<https://www.frontiersin.org/journals/research-metrics-and-analytics>).

We are soliciting papers and presentation abstracts on the following topics (but not limited to):

- ▶ **Theories and models:**
  - ▶ Complex network models
  - ▶ Classic bibliometric models
  - ▶ Theories in big metadata analytics and/or from adjacent fields of studies, e.g. SciTech Human Capital theory
- ▶ **Methodologies and metrics**
  - ▶ Data processing, transformation, integration
  - ▶ Workflows in big metadata analytics
  - ▶ Predictive and evaluative metrics
  - ▶ Traditional methods applied to big metadata (e.g. how statistics might be used)
- ▶ **Application of big metadata analytics in subject/disciplinary domains**
  - ▶ Research impact assessment
  - ▶ Use in other social sciences (e.g. communication or sociology)

The workshop website is located at <http://metadataetc.org/BMA2018/bma2018.html>. Information about the workshop program will be updated as it becomes available.

## IMPORTANT DATES

- Jul 30:** Deadline for submitting papers and presentation abstracts
- Aug 30:** Notification to authors
- Sep 30:** Final papers and abstract submission
- Nov 14:** Workshop date

## ORGANIZING & PROGRAM COMMITTEE

- ▶ **Jian Qin**  
*Syracuse University*  
jqin@syr.edu
- ▶ **Chaomei Chen**  
*Drexel University*  
chaomei.chen@drexel.edu
- ▶ **Jeff Hemsley**  
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- ▶ **Dietmar Wolfram**  
*University of Wisconsin at Milwaukee*  
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# 14<sup>th</sup> INTERNATIONAL CONFERENCE ON WEBOMETRICS, INFORMETRICS AND SCIENTOMETRICS (WIS) & 19<sup>th</sup> COLLNET MEETING

## CALL FOR PAPERS — 1<sup>st</sup> ANNOUNCEMENT

5–8 DECEMBER 2018

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE,  
FACULTY OF SCIENCE AND TECHNOLOGY, UNIVERSITY OF MACAU  
MACAU, CHINA

<http://socio.org.uk/collnet2018/>

### SCOPE

The broad focus of the conference is on collaboration and communication in science and technology; science policy; quantitative aspects of science; and combination and integration of qualitative and quantitative approaches in study of scientific practices. The conference thus aims to contribute to evidence-based and informed knowledge about scientific research and practices which in turn may further provide input to institutional, regional, national and international research and innovation policy

making. Theoretical, methodological and applied aspects, for example:

- ▶ Emerging issues in Scientometrics / Informetrics / webometrics and history
- ▶ Science Policy and collaboration
- ▶ New Metrics (Altmetrics), their Potential Value and their Relationship to Established Measures
- ▶ Collaboration Studies for Science & Society
- ▶ Collaboration, Knowledge Management & Industrial Partnership
- ▶ Collaborative Bridge between Academic Research and Industry





Macao (China).

Photo courtesy of © Jimmy Lau. (Published under Creative Commons CC0).

## IMPORTANT DATES

### 15 Jul 2018 Extended abstract for oral presentation (2 pages)

Please send your extended abstracts to Hildrun Kretschmer (kretschmer.h@onlinehome.de). Please send also a copy to Bernd Markscheffel (bernd.markscheffel@tu-ilmenau.de). The extended abstracts will be peer reviewed by the Programme Committee. The accepted full papers will be published in the proceedings.

### 15 Sep 2018 Notification of acceptance

### 15 Nov 2018 Full Paper

Camera-ready version, max. 10 pages including tables, figures, references

- ▶ Techniques for Collaboration Studies
- ▶ Visualization Techniques in Collaboration Studies
- ▶ Quantitative Analysis of S&T Innovations
- ▶ Informetrics Laws and Distributions, Mathematical Models of Communication and Collaboration
- ▶ Nature and Growth of Science and of Collaboration in Science and its Relation with Technological Output
- ▶ Evaluation Indicators
- ▶ Collaboration in Science and in Technology from both Quantitative and Qualitative Points of View



## REGISTRATION & FEES

	Early Bird (till October 31, 2018)	Late Registration (from November 01, till December 01, 2018)
Author	\$ 300	\$ 325
Author from developing countries	\$ 250	\$ 270
Non-author participant	\$ 250	\$ 270
Student author	\$ 250	\$ 270
Accompanying person	\$ 250	\$ 270
Co-author	\$ 250	\$ 270

Please, note that these examples listed above give a broad outline of the scope of the workshop theme but do not limit it.

### COLLNET AND WIS HISTORY (WIS: WEBOMETRICS, INFORMETRICS, SCIENTOMETRICS), 2000-2017

COLLNET is a global interdisciplinary research network of scholars who are concerned to study aspects of collaboration in science and in technology (see COLLNET website at <http://www.collnet.de/>). This network of interdisciplinary scholars was established in January 2000 in Berlin with Hildrun Kretschmer as coordinator. Since that time there have been thirteen meetings:

- ▶ 1st in Berlin, September 2000,
- ▶ 2nd in New Delhi, February 2001,
- ▶ 3rd in Sydney (in association with the 8th ISSI Conference), July 2001,
- ▶ 4th COLLNET Meeting took place on August 29th in 2003 in Beijing in conjunction with the 9th International ISSI Conference; the 1st International

Workshop on Webometrics, Informetrics and Scientometrics (WIS),

- ▶ 5th COLLNET Meeting in Roorkee, India, in March 2004,
- ▶ 6th COLLNET Meeting took place in association with the 10th ISSI Conference in Stockholm, Sweden, in July 2005,
- ▶ 2nd International Workshop on Webometrics, Informetrics and Scientometrics (WIS) & 7th COLLNET. Meeting was organized in Nancy, France, in May 2006,
- ▶ 3rd International Conference on WIS and Science and Society & 8th COLLNET. Meeting took place in New Delhi, India, in March 2007 (<http://www.collnet-delhi.de>),
- ▶ 4th International Conference on WIS & 9th COLLNET Meeting in Berlin, Germany in July 2008 (<http://www.collnet-berlin.de>)
- ▶ 5th International Conference on WIS & 10th COLLNET Meeting in Dalian, China, in September 2009,
- ▶ 6th International Conference on WIS & 11th COLLNET Meeting took place in Mysore, India, in October 2010,
- ▶ 7th International Conference on WIS & 12th COLLNET Meeting in Istanbul, Turkey, in September 2011,





Macao (China). Photo courtesy of © Svea Freiberg.  
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- ▶ 8th International Conference on WIS & 13th COLLNET Meeting in Seoul, Korea, October, 2012, <http://collnet2012.ndsl.kr>,
- ▶ 9th International Conference on WIS & 14th COLLNET Meeting, August, 2013 in Tartu, Estonia,
- ▶ 10th International Conference on WIS & 15th COLLNET Meeting in September 3-5, 2014 in Ilmenau, Germany, <http://www.tu-ilmenau.de/collnet2014>,
- ▶ 11th International Conference on WIS & 16th COLLNET Meeting in November 26-28, 2015 in New Delhi, India, <http://www.slp.org.in/collnet2015/>,
- ▶ 12th International Conference on WIS & 17th COLLNET Meeting in December 12-15, 2016 in Nancy, France, <http://www.slp.org.in/collnet2016>,
- ▶ 13th International Conference on WIS & 18th COLLNET Meeting in November 9-11, 2017 in Kent, UK, <http://bit.ly/2kTUQEC>

## COLLNET 2018

### General Chair:

Hiltrun Kretschmer (Germany)

### General Co-Chair:

Bernd Markscheffel (Germany)

### Steering Committee Chair:

Pit Pichappan (India & UK)

### Technical Program Chair:

Bernd Markscheffel (Germany)

### Organizing Chair:

Simon Fong, University of Macau, Macau (China)

### Organizing Committee:

Theo Kretschmer, Germany,  
Daniela Büttner, Germany  
N.K. Wadhwa, India,  
Daisy Jacobs, South Africa  
J.K. Vijayakumar, Saudi Arabia

### Programme Committee:

COLLNET Members <http://www.collnet.de/>

### Regional Chairs:

*Regional Chair of Africa, America, Australia and Europe:*

Valentina Markusova (Russia)

*Regional Chair of China:*

Liang Liming (China)

*Regional Chair of India:*

P.K. Jain (India)

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# RELATIVE INDICATORS REVISITED



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## INTRODUCTION

Present-day indicator design in scientometrics/bibliometrics seeks to provide advanced and versatile tools for the application in evaluative contexts with the capability for the use at practically any level of aggregation. In the foreground are more complex, non-linear and tailor-made solutions that are developed to respond to the challenges of bibliometrics-aided research assessment at the institutional, departmental, research-group or even individual level (e.g., Wouters et al., 2013). New options that have been introduced use performance classes on the basis of, for instance, percentiles or Characteristic Scores and Scales. This trend does not imply that versions of traditional mean- and share-based indicators were completely abandoned or lost

their relevance. Even the journal Impact Factor – as evaluation tool otherwise highly disputed – has been rehabilitated (Waltman and Traag, 2017). With the continued use of mean-value based indicators, the question arose of how to correctly relate them to given reference standards or base-line values of the various aggregation levels. In 2010, Leydesdorff and Opthof expressed their concerns regarding methodology and practice of the previously used (journal- and subject-normalised) *relative indicators*. This debate has become known as the “averages-of-ratios vs. ratios-of-averages” debate (see, e.g., Larivière, 2011). Yet, this debate is not a typical bibliometric one. Analysing residential mortgages Formente (2013) found that the ratio of means has a lower statistical uncertainty, in other words, a higher statistical reliability. This result, which might



be used as *pars pro toto* for application outside our field, is most notably interesting in the context of certain preconditions for building relative indicators in different subject fields. In a recent note, Schubert (2012) further analysed the general relationship between averages of ratios (AoR) and ratios of averages (RoA), where he found that though a proper weighting procedure averages of ratios can be transformed into ratios of averages and he came to the conclusion that AoR overemphasises items with low expected value, most notably if the expectation is close to zero. We therefore will not resume the debate but attempt to shed some light on the premises and the context of indicator design in the mirror of the rules of mathematical statistics.

### **SOME (THEORETICAL AND PRACTICAL) CONSIDERATIONS BEFORE**

The basic idea of this paradigmatic shift (first “normalising” observations, then calculating statistics) is plausible and assumes that the underlying distribution is non-negative and continuous. As a premise of this approach, it is correct as well. For instance, if we take a random variable that has an exponential, gamma or lognormal distribution and divide it by its assumingly positive expectation, we obtain a (partially) normalised distribution with expectation 1. The reason is that the type of distribution does not change: If one divides the variable with continuous distributions by any positive number, it will still obtain an exponential, gamma or lognormal distribution, respectively. The limitation to non-negative random variables does not form any challenge to scientometric models and application as negative productivity or citation impact would hardly be imaginable. As long as statistics are built, this approach could be acceptable since the usual statistical theorems still apply, provided the underlying sample size permits any valid inference.

As Mephistopheles said to Faust in his study room, “All theory is grey, my friend. But forever green is the tree of life” (Johann Wolfgang von Goethe, *Faust: First part*). Citation counts do not fit into the above model as they can only be natural numbers and, of course, zero in the case if the paper is not cited, that is, citations have non-negative integer-valued distributions. As a consequence, dividing integer-valued variables by a positive number will not result in a normalised version of the same distribution type. Unlike in the continuous case, for instance, dividing a Poisson-distributed random variable by its expected value does not result in a normalised Poisson distribution and the same applies to all other discrete distributions including, Lotka-type, negative binomial and Waring distribution as well, because the support of the “normalised” variable, that is, the domain of values it may take, is not standardised anymore. This is much more than a merely abstract theoretical argument. If the variables are deprived of their common support, they are not comparable in terms of range percentiles and other details of their distributions anymore. And exactly multi-faceted solutions is what state-of-the-art indicator approaches are aiming at. At this point, one could argue that then the approximation by continuous distribution would resolve this issue. Among others, Pareto and lognormal distribution are some of the models most commonly in use today. In other fields, for instance in economics and physics, to name just two, this solution is quite popular and successful. But here we have to point to crucial structural differences between these applications and scientometrics.

There are certainly interesting arguments in favour of the approximation by continuous distributions. The continuous model considerably simplifies dealing with densities and calculating moments and other functions underlying the most common empirical statistics. Furthermore, for the most interesting part of bibliometric distributions, the high-end of productivity and citation im-



pact, this approximation is both theoretically sound and empirically proven. Regarding the more general statistical properties, we have however to distinguish between the peculiarities of scientometrics and those of other fields. For instance, if we compare citation rates with income distributions, mortgage loans in economics, or fatigue of devices after a certain number of operations, one can observe that even if the distributions are discrete (currency, number of operations), their expectation and medians are so large that any deviation by, say, one euro or one operation could be considered an almost infinitesimal change and therefore the continuous model is acceptable. Yet, in scientometrics, where means are extremely low, any deviation from their actual value seems to be more than just quantitative. If, for instance, the citation mean is about 3, then an observed citation rate of 2 or 4 already indicates a more qualitative change. This property can hardly be reflected by a continuous approach. There is a second argument that is sometimes used to bridge this gap between the discrete and continuous world in Scientometrics, namely fractionation. If one would fractionate citation counts by the numbers of co-authors or institutes involved, continuous models could also theoretically be applied. Fractional approaches are, however, secondary models and thus more complex as they also incorporate author-productivity aspects (cf. Glänzel et al., 2016). The primary and finally decisive model is based on unique paper-to-paper citation links, which are of Boolean nature and thus result in non-negative integer-valued variables. This is what we have to assume as the primary basic model in citation analysis.

## BACK TO THE ROOTS: INFERENCE FROM RELATIVE INDICATORS

Once we have assumed the above-mentioned model on the basis of unique and Boolean assignment of citing papers to source items and we further proceed from

a stochastic interpretation of citation processes, we can readily apply standard statistical methods. The rudiments and consequences of this approach have been discussed in two opinion papers by Glänzel (2010) and Glänzel and Moed (2013). In the following, we will briefly summarise and further elaborate these findings. The foremost conclusion is the Gaussian property of citation statistics despite the often extreme skewness of the underlying discrete distributions. In order to meet this property, it is sufficient that the citation distribution belongs to the domain of attraction of the normal distribution, which is satisfied if at least the second moment is finite. Then, according to the central limit theorem (CLT), the normalised sum of any sequence of independent and identically distributed random variables will converge weakly to the standard normal distribution  $N(0,1)$ . The requirement that all variables have identical distribution is even not required to assume an approximate normal distribution of means and shares (Glänzel, 2010). Under certain (e.g., Lindeberg or Lyapunov) conditions still a weaker form of the central limit theorem (CLT) holds (cf. Rényi, 1962 or more recently, Gut, 2009). Further generalisations of the CLT allow even specific types of weak dependence. As a consequence we can apply the following proposition.

*Proposition:* Let  $X_1, X_2, \dots, X_n$  be a sequence of  $n$  independent random variables with finite expectations  $\mu_i$  and variances  $\sigma_i^2 > 0$ . Then

$$(\sum X_i - \sum \mu_i) / \sqrt{\sum \sigma_i^2}$$

has a limiting distribution function which approaches a normal distribution.

From the above proposition we can conclude that the sample mean of random variables

$$\bar{x} = \sum x_i / n$$

with any distribution belonging to the attraction domain of the normal distribution is approximately normally distributed. In a



second opinion paper by Glänzel and Moed (2013), some empirical evidence of this property was given. In their study, the authors have drawn 20 independent random sub-samples from the total Belgian publication output of a selected year, resulting in twenty disjoint Belgian publication sets. They observed that the sample means as well as the shares of uncited papers in each sample were normally distributed around the joint expectation. This means that the mean values and relative frequencies do (approximately) follow a normal distribution although the underlying citation distributions are discrete and skewed and as such far from being normal.

Now we are going to apply these observed properties to scientometric indicators, in particular to *relative citation rates*. Traditional relative citation rates are defined as the ratio of mean observed citation rates and the average of the individual expectations of the observed citations. These expectations may be based, for instance, on journal- (Schubert and Braun, 1986) or subject-based (Braun and Glänzel, 1989) reference standards. Here it does not matter that the respective reference standards are conditional expectations (cf. Schubert and Glänzel, 1983). However, it is of supreme importance that both observed and expected values are calculated for exactly the same publication year and citation window, respectively. Now we will show that the definition of relative indicators of the type Mean Observed Citation Rate divided by a Mean Expected Citation Rate (both journal or subject based, i.e., according to the terminology used in the two above-mentioned studies,  $RCR = MOCR / MECR$  or  $NMCR = MOCR / FECR$ ) will result in valid statistics with some interesting properties. We still have to notice that the standard deviation of the sample mean equals the standard deviation of the common distribution of the sample elements divided by the square root of the sample size, which is a consequence of the proposition above (cf. Glänzel, 2010). Hence we

can derive the following two properties of the ratio of the means of observed and expected values. The first equation applies to the case when all variables are identically distributed, the second, more general case, does not require this property. The mean observed citation rate is denoted by  $\bar{x}$  of the  $n$  observations, while  $\bar{m}$  stands for the mean expected citation rate.

$$1) \frac{\sum (X_i - EX_i)}{\sqrt{\sum D^2 X_i}} = \frac{\sum \left( \frac{X_i}{n} - EX \right)}{\sqrt{\sum \frac{D^2 X_i}{n^2}}} = \frac{\sum \left( \frac{X_i}{n} - EX \right)}{\frac{DX}{\sqrt{n}}} =$$

$$= \frac{\bar{x} - \mu}{\frac{DX}{\sqrt{n}}} = \frac{\bar{x} - \mu}{\frac{D\bar{x}}{\mu}} \approx N(0, CV_{\bar{x}})$$

$$2) \frac{\sum (X_i - EX_i)}{\sqrt{\sum D^2 X_i}} = \frac{\sum \left( \frac{X_i}{n} - \frac{EX_i}{n} \right)}{\sqrt{\sum \frac{D^2 X_i}{n^2}}} = \frac{\sum \left( \frac{X_i}{n} - \frac{EX_i}{n} \right)}{\frac{\sqrt{\sum \frac{D^2 X_i}{n^2}}}{\sqrt{n}}} =$$

$$= \frac{\bar{x} - \bar{m}}{\frac{D\bar{x}}{\bar{m}}} \approx N(0, CV_{\bar{x}})$$

The two equations show that whether identical distributions are assumed or not, relative citations rate, if properly built, are approximately normally distributed with expectation 1, which is, otherwise, the “neutral” value of these indicators. If we subtract the value 1 from the relative indicator, their expected value will be shifted to 0. The formulas point to another interesting property. The standard deviation of relative citation rates is the coefficient of correlation of the underlying mean observed citation rate ( $CV_{\bar{x}}$ ), which is a *relative standard deviation*, and a valid measure since all relative citation rates takes their values in the same domain of non-negative real numbers and which provides a supplementary normalised *scale indicator* to the relative citation rate.



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