

POLITECNICO DI TORINO
Repository ISTITUZIONALE

The citer-success-index: an indicator to select a subset of elite papers, based on citers

Original

The citer-success-index: an indicator to select a subset of elite papers, based on citers / Franceschini, Fiorenzo; Maisano, DOMENICO AUGUSTO FRANCESCO; Mastrogiacomo, Luca. - STAMPA. - 1:(2013), pp. 300-315. (14th International Society of Scientometrics and Informetrics (ISSI) Conference Vienna, Austria 15th-19th July 2013).

Availability:

This version is available at: 11583/2510684 since:

Publisher:

Juan Gorraiz, Edgar Schiebel, Christian Gumpenberger, Marianne Hörlesberger, Henk Moed

Published

DOI:

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)



2013

SCIENTOMETRICS

**14th International
Society of Scientometrics
and Informetrics Conference**
15th - 19th July 2013
Vienna, Austria

PROCEEDINGS Volume I

**PROCEEDINGS OF
ISSI 2013
Vienna**

VOLUME 1

14th International Society of
Scientometrics and Informetrics Conference

Vienna, Austria
15th to 20th July 2013

Editors

Juan Gorraiz, Edgar Schiebel, Christian Gumpenberger, Marianne Hörlesberger,
Henk Moed

Sponsors

ASIS&T, USA

Elsevier B.V.

EBSCO Information Services, USA

Federal Ministry for Science and Research, Austria

Federal Ministry for Transport, Innovation and Technology, Austria

Information Assistant, Verein für Informationsmanagement, Vienna

ORCID, Inc.

Science-Metrix/R&D Reports

Swets Information Services

Thomson Reuters

ZSI - Centre for Social Innovation, Vienna

All rights reserved.

© AIT Austrian Institute of Technology GmbH Vienna 2013

Printed by Facultas Verlags- und Buchhandels AG,
Stolbergasse 26, A-1050 Wien

ISBN: 978-3-200-03135-7

ISSN: 2175-1935

ORGANISATION AND COMMITTEES

Conference Chairs

Juan Gorraiz
Edgar Schiebel

Programme Chairs

Christian Gumpenberger
Marianne Hörlesberger
Henk Moed

Poster Chairs

Jacqueline Leta
Wolfgang Mayer

COMMITTEES

Local Committee

Doctoral Forum Chairs:

Ivana Roche and Christian Schlögl

Local Organising Committee:

Ulrike Felt
Peer Vries
Wolfgang Claudius Müller
Martin Fieder
Johannes Sorz
Bernard Wallner
Wolfgang Mayer
Martin Wieland

Ambros Wernisch
Manuela Kienegger
Manuela Korber
Beatrix Wepner
Maria-Elisabeth Züger
Beatrice Rath
Silvia Steinbrunner

Scientific Committee

Jonathan Adams	Blaise Cronin	Evaristo Jimenez-Contreras
Isidro Aguillo	Hans-Dieter Daniel	Milos Jovanovic
Per Ahlgren	Cinzia Daraio	Yuya Kajikawa
Isola Ajiferuke	Hamid Darvish	Sylvan Katz
Dag W Aksnes	Prabir Dastidar	Dick Klavans
Jens-Peter Andersen	Koenraad Debackere	Manuel Krauskopf
Eric Archambault	Gernot Deinzer	Hildrun Kretschmer
Clément Arsenault	Ying Ding	J P S Kumaravel
Joaquin Azagra-Caro	Sandhya Diwakar	Vincent Lariviere
Tomas Baiget	Leo Egghe	Birger Larsen
Rafael Ball	Tim Engels	Karl-Heinz Leitner
Judit Bar-Ilan	Martin Fieder	Benedetto Lepori
Tomaz Bartol	Claire François	Jacqueline Leta
Aparna Basu	Jonathan Furner	Jonathan Levitt
Guntram Bauer	Antonio Garcia	Loet Leydesdorff
Donald Beaver	Aldo Geuna	Yang Li Ying
Nicola Bellis	Elea R. Giménez Toledo	Liming Liang
Sada Bihari-Sahu	Yves Gingras	Judith Licea
Johan Bollen	Wolfgang Glänzel	Deming Lin
Andrea Bonaccorsi	Isabel Gomez	Yuxian Liu
Maria Bordons	Alicia Gomez	Szu-Chia Lo
Katy Börner	Juan Gorraiz	Carmen Lopez Illesca
Lutz Bornmann	Jiancheng Guan	Bob Losee
Hamid Bouabid	Christian Gumpenberger	Terttu Luukkonen
Kevin W. Boyack	Raf Guns	Marc Luwel
Barry Bozeman	Stefanie Haustein	Domenico Maisano
Tibor Braun	Sybille Hinze	Valentina Markusova
Quentin Burrell	Michael Hofer	Werner Marx
Guillaume Cabanac	Marianne Hörlesberger	Wolfgang Mayer
Alvaro Cabezas	Stefan Hornbostel	Kate McCain
Juan Miguel Campanario	Xiaojun Hu	Eustache Megnigbeto
David Campbell	Mu-Hsuan Huang	Lokman Meho
Neeraj Chaurasia	Sven Hug	Raul Mendez-Vasquez
Dar-Zen Chen	Masatsura Igami	Henk Moed
Chaomei Chen	Peter Ingwersen	Alexis Michel
Alexander Chervyakov	Ludmila Ivancheva	Mugabushaka
Rodrigo Costas	Siladitya Jana	Rogério Mugnaini
Grégoire Côté	Margriet Jansz	Wolfgang Müller

Francis Narin
Anton Nederhof
Pentti Nieminen
Ed Noyons
Michael Ochsner
H. Peter Ohly
Carlos Olmeda-Gómez
José Luis Ortega
Maria Antonia Ovalle-
Perandones
Manfred Paier
Andres Pandiella
Antonio Perianes-
Rodríguez
Bluma C. Peritz
Olle Persson
Fernanda Peset
Alan Porter
Anastassios Pouris
Gangan Prathap
Junping Qiu
Luc Quoniam
Ismael Rafols
Ravichandra Rao
Emanuela Reale
Steve Reding
Ralph Reimann
John Rigby
Nicolás Robinson
Ivana Roche

Jürgen Roth
Ronald Rousseau
Jane Russell
Victor Rybachuk
Bibhuti Sahoo
Ulf Sandström
Shivappa Sangam
Elias Sanz
Kate Sapir
Andrea Scharnhorst
Edgar Schiebel
Christian Schloegl
Ulrich Schmoch
Jesper Schneider
Antoine Schoen
Torben Schubert
András Schubert
Philip Shapira
Robert Shelton
Gunnar Sivertsen
Stig Slipersæter
Henry Small
Johannes Sorz
Divya Srivastava
Marie Strahle
Cassidy Sugimoto
Yuan Sun
Mike Thelwall
Bart Thijs
Robert Tijssen

Yasar Tonta
Daniel Torres-Salinas
Metin Tunc
Peter van Den Besselaar
Nees Jan Van Eck
Thed Van Leeuwen
Bart Van Looy
Anthony Van Raan
Benjamin Vargas-Quesada
Liwen Vaughan
Peter Vinkler
Martijn Visser
Bernard Wallner
Ludo Waltman
Xianwen Wang
Beatrix Wepner
Ambros Wernisch
Howard White
Jos Winnink
Matthias Winterhager
Dietmar Wolfram
Yishan Wu
Erjia Yan
Ying Ye
Lin Zhang
Yajuan Zhao
Dangzhi Zhao
Michel Zitt
Alesia Zuccala

PREFACE

The 14th International Society of Scientometrics and Informetrics Conference takes place at the University of Vienna 15-19 July 2013 and is jointly organised by the University of Vienna and the Austrian Institute of Technology (AIT) under the auspices of ISSI – the International Society for Scientometrics and Informetrics.

This conference provides an international open forum for scientists, research managers, authorities and information professionals to debate the current status and advancements of informetric and scientometric theories, concepts and indicators. In addition to the traditional evaluative focus, participants will discuss practical applications in related fields such as library and information science, history of science, philosophy of science, R&D-management, etc.

This conference raises particularly the issues of new metrics (usage metrics and altmetrics) as complement to the classical citation metrics and opens the floor to discuss manifold aspects: what can really be measured with them as proxies, which could turn out to be adequate and robust indicators, and finally which reliable data sources are available to retrieve them?

The importance of this topic is underpinned by two plenary sessions. In the first one keynote speaker Johan Bollen provides an overview of social network services and analyses. In the second one old metrics are contrasted with new ones in short introductions by experts (Henk Moed, Juan Gorraiz, Victor Henning) and followed by a panel discussion with representatives from research, research management and information industry, who will shed light on the pros and cons of these indicators from their specific point of view.

The third plenary session deals with an evergreen as much as cumbersome topic, namely the methodological and ethical problems of individual-level evaluative bibliometrics. Wolfgang Glänzel and Paul Wouters will present "10 things one must not do with individual-level bibliometrics" followed by "10 things one can do with individual-level bibliometrics", both commented by Henk Moed and Gunnar Sivertsen.

The ISSI conference is certainly one of the world's largest international conferences devoted to this field, as is illustrated by the large number of 338 submissions received this year. 912 authors are affiliated to organisations located in 42 countries from all over the world. The top three contributing countries are China (149), Spain (129) and the USA (101). Chile, Cuba, Malaysia, Sri Lanka and Ukraine are represented by at least one author, too.

All contributions were evaluated by at least three reviewers of the International and Local Committees. Thereof only 145 (107 full papers and 38 research in progress papers) could be accepted for oral presentations. 36 sessions run in parallel thrice a day in groups of four covering the gamut from “citation analysis” to “open access”. In addition, 107 posters are shown in two dedicated poster sessions.

All oral presentations and posters can be found in the conference proceedings.

Moreover, four tutorials either deal with several mapping tools (like e.g. “Sci2” and “Citespace”) or address the unification issue of organizations, whereas four pre-conference workshops focus on information retrieval, topic extraction methods, standards for classifications, and bibliometric analysis for funding agencies. The pre-conference day is complemented by a doctoral forum.

By organising the 14th International Conference in Vienna we hope not only to extend the tradition of the ISSI conferences as one of the most important international meeting points for the scientometric and bibliometric community, but also to promote the respective on-going activities in Austria.

Our thanks go to the ISSI board for their trust and their constant support, all the contributors for their submissions, the members of the Local and International Committee for their reviewing effort as well as the sponsors for their generous financial support.

We are particularly grateful for the engagement of Heike Faustmann, Alfred Kerschenbauer, Nikolaus Ortner, Johannes Sorz, Silvia Steinbrunner, and Maria-Elisabeth Züger.

Last but not least each conference should also be a feast for all senses. Every endeavour has been made to not only put together an outstanding scientific programme, but also to organize interesting and diverse social events, which will allow you to embrace the beauty and cultural richness of Vienna and its surroundings.

We wish you a great time at the 14th International Society of Scientometrics and Informetrics Conference!

*Juan Gorraiz, Edgar Schiebel, Christian Gumpenberger,
Marianne Hörlesberger, and Henk Moed*

INDEX

KEYNOTE	1
SOCIAL NETWORK ANALYSIS.....	3
ORAL PRESENTATIONS.....	5
ACADEMIC CAREER STRUCTURES – HISTORICAL OVERVIEW GERMANY 1850-2013	7
ACADEMIC RESEARCH PERFORMANCE EVALUATION IN BUSINESS AND MANAGEMENT USING JOURNAL QUALITY CITING METHODOLOGIES.....	22
ACCESS TO UNIVERSITIES’ PUBLIC KNOWLEDGE: WHO’S MORE REGIONALIST?.....	36
ADVANTAGES OF EVALUATING JOURNALS THROUGH ACCA - LIS JOURNALS (RIP ¹).....	58
ANALYSIS OF JOURNAL IMPACT FACTOR RESEARCH IN TIME: DEVELOPMENT OF A SPECIALTY?	66
THE ANALYSIS OF RESEARCH THEMES OF OPEN ACCESS IN CHINA: IN THE PERSPECTIVE OF STRATEGIC DIAGRAM (RIP).....	77
ANALYSIS OF THE WEB OF SCIENCE FUNDING ACKNOWLEDGEMENT INFORMATION FOR THE DESIGN OF INDICATORS ON ‘EXTERNAL FUNDING ATTRACTION’	84
ANALYZING THE CITATION CHARACTERISTICS OF BOOKS: EDITED BOOKS, BOOK SERIES AND TYPES OF PUBLISHERS IN THE BOOK CITATION INDEX	96
THE APPLICATION OF CITATION-BASED PERFORMANCE CLASSES TO THE DISCIPLINARY AND MULTIDISCIPLINARY ASSESSMENT IN NATIONAL COMPARISON	109
APPROACH TO IDENTIFY SCI COVERED PUBLICATIONS WITHIN NON-PATENT REFERENCES IN PATENTS.....	123
ARE CITATIONS A COMPLETE MEASURE FOR THE IMPACT OF E- RESEARCH INFRASTRUCTURES?.....	136
ARE LARGER EFFECT SIZES IN EXPERIMENTAL STUDIES GOOD PREDICTORS OF HIGHER CITATION RATES? A BAYESIAN EXAMINATION.	152

¹ Research in progress paper

ARE THERE INTER-GENDER DIFFERENCES IN THE PRESENCE OF AUTHORS, COLLABORATION PATTERNS AND IMPACT? (RIP)	167
ASSESSING INTERNATIONAL COOPERATION IN S&T THROUGH BIBLIOMETRIC METHODS (RIP)	175
ASSESSING OBLITERATION BY INCORPORATION IN A FULL-TEXT DATABASE: JSTOR AND THE CONCEPT OF “BOUNDED RATIONALITY.”	185
ASSESSING THE MENDELEY READERSHIP OF SOCIAL SCIENCES AND HUMANITIES RESEARCH	200
ASSOCIATION BETWEEN QUALITY OF CLINICAL PRACTICE GUIDELINES AND CITATIONS GIVEN TO THEIR REFERENCES	215
AUTHOR NAME CO-MENTION ANALYSIS: TESTING A POOR MAN'S AUTHOR CO-CITATION ANALYSIS METHOD (RIP)	229
BIBLIOGRAPHIC COUPLING AND HIERARCHICAL CLUSTERING FOR THE VALIDATION AND IMPROVEMENT OF SUBJECT-CLASSIFICATION SCHEMES	237
BUILDING A MULTI-PERSPECTIVE SCIENTOMETRIC APPROACH ON TENTATIVE GOVERNANCE OF EMERGING TECHNOLOGIES.....	251
CAREER AGING AND COHORT SUCCESSION IN THE SCHOLARLY ACTIVITIES OF SOCIOLOGISTS: A PRELIMINARY ANALYSIS (RIP)	264
CITATION IMPACT PREDICTION OF SCIENTIFIC PAPERS BASED ON FEATURES	272
CITATION IMPACTS REVISITED: HOW NOVEL IMPACT MEASURES REFLECT INTERDISCIPLINARITY AND STRUCTURAL CHANGE AT THE LOCAL AND GLOBAL LEVEL	285
THE <i>CITER-SUCCESS-INDEX</i> : AN INDICATOR TO SELECT A SUBSET OF ELITE PAPERS, BASED ON CITERS	300
COLLABORATION IN AFRICA: NETWORKS OR CLUSTERS?	316
COLLABORATIVE INNOVATIVE NETWORKS: INFLUENCE AND PERFORMANCE	328
COMPARATIVE STUDY ON STRUCTURE AND CORRELATION AMONG BIBLIOMETRICS CO-OCCURRENCE NETWORKS AT AUTHOR-LEVEL	339
COMPARING BOOK CITATIONS IN HUMANITIES JOURNALS TO LIBRARY HOLDINGS: SCHOLARLY USE VERSUS 'PERCEIVED CULTURAL BENEFIT' (RIP)	353
A COMPARISON OF TWO HIGHLY DETAILED, DYNAMIC, GLOBAL MODELS AND MAPS OF SCIENCE	361

A COMPREHENSIVE INDEX TO ASSESS A SINGLE ACADEMIC PAPER IN THE CONTEXT OF CITATION NETWORK (RIP)	377
THE CONSTRUCTION OF THE ACADEMIC WORLD-SYSTEM: REGRESSION AND SOCIAL NETWORK APPROACHES TO ANALYSIS OF INTERNATIONAL ACADEMIC TIES.....	389
CONSTRUCTION OF TYPOLOGY OF SUB-DISCIPLINES BASED ON KNOWLEDGE INTEGRATION	404
CONTRIBUTION AND INFLUENCE OF PROCEEDINGS PAPERS TO CITATION IMPACT IN SEVEN CONFERENCE AND JOURNAL-DRIVEN SUB-FIELDS OF ENERGY RESEARCH 2005-11 (RIP).....	418
CORE-PERIPHERY STRUCTURES IN NATIONAL HIGHER EDUCATION SYSTEMS. A CROSS-COUNTRY ANALYSIS USING INTERLINKING DATA	426
CORRELATION AMONG THE SCIENTIFIC PRODUCTION, SUPERVISIONS AND PARTICIPATION IN DEFENSE EXAMINATION COMMITTEES IN THE BRAZILIAN PHYSICISTS COMMUNITY (RIP)	447
COUNTING PUBLICATIONS AND CITATIONS: IS MORE ALWAYS BETTER?.....	455
COVERAGE AND ADOPTION OF ALTMETRICS SOURCES IN THE BIBLIOMETRIC COMMUNITY	468
CROWDSOURCING THE NAMES-GAME: A PROTOTYPE FOR NAME DISAMBIGUATION OF AUTHOR-INVENTORS (RIP)	484
DETECTING THE HISTORICAL ROOTS OF RESEARCH FIELDS BY REFERENCE PUBLICATION YEAR SPECTROSCOPY (RPYS)	493
DETECTION OF NEXT RESEARCHES USING TIME TRANSITION IN FLUORESCENT PROTEINS	507
DIFFERENCES AND SIMILARITIES IN USAGE VERSUS CITATION BEHAVIOURS OBSERVED FOR FIVE SUBJECT AREAS	519
DIFFERENCES IN CITATION IMPACT ACROSS COUNTRIES	536
DIRECTIONAL RETURNS TO SCALE OF BIOLOGICAL INSTITUTES IN CHINESE ACADEMY OF SCIENCES.....	551
DISCIPLINARY DIFFERENCES IN TWITTER SCHOLARLY COMMUNICATION.....	567
THE DISCOVERY OF ‘THE UBIQUITIN-MEDIATED PROTEOLYTIC SYSTEM’: AN EXAMPLE OF REVOLUTIONARY SCIENCE? (RIP).....	583
THE DISTRIBUTION OF REFERENCES IN SCIENTIFIC PAPERS: AN ANALYSIS OF THE IMRAD STRUCTURE.....	591

DO BLOG CITATIONS CORRELATE WITH A HIGHER NUMBER OF FUTURE CITATIONS? (RIP)	604
DO NON-SOURCE ITEMS MAKE A DIFFERENCE IN THE SOCIAL SCIENCES?	612
DOWNLOAD VS. CITATION VS. READERSHIP DATA: THE CASE OF AN INFORMATION SYSTEMS JOURNAL	626
DYNAMICS OF SCIENCE AND TECHNOLOGY CATCH-UP BY SELECTED ASIAN ECONOMIES: A COMPOSITE ANALYSIS COMBINING SCIENTIFIC PUBLICATIONS AND PATENTING DATA	635
THE EFFECT OF BOOMING COUNTRIES ON CHANGES IN THE RELATIVE SPECIALIZATION INDEX (RSI) ON COUNTRY LEVEL ...	654
THE EFFECT OF FUNDING MODES ON THE QUALITY OF KNOWLEDGE PRODUCTION.....	664
EFFECTS OF RESEARCH FUNDING, GENDER AND TYPE OF POSITION ON RESEARCH COLLABORATION NETWORKS: A MICRO-LEVEL STUDY OF CANCER RESEARCH AT LUND UNIVERSITY	677
EVALUATING KNOWLEDGE PRODUCTION SYSTEMS: MULTIDISCIPLINARITY AND HETEROGENEITY IN HEALTH SCIENCES RESEARCH	690
EVALUATING THE WEB RESEARCH DISSEMINATION OF EU ACADEMICS: A MULTI-DISCIPLINE OUTLINK ANALYSIS OF ONLINE CVS.....	705
AN EXAMINATION OF THE POSSIBILITIES THAT ALTMETRIC METHODS OFFER IN THE CASE OF THE HUMANITIES (RIP)	720
EXPLORING QUANTITATIVE CHARACTERISTICS OF PATENTABLE APPLICATIONS USING RANDOM FORESTS	728
EXTENDING AUTHOR CO-CITATION ANALYSIS TO USER INTERACTION ANALYSIS: A CASE STUDY ON INSTANT MESSAGING GROUPS	742
EXTENDING CITER-BASED ANALYSIS TO JOURNAL IMPACT EVALUATION.....	755
FIELD-NORMALIZATION OF IMPACT FACTORS: RESCALING <i>VERSUS</i> FRACTIONALLY COUNTED	769
FUNDING ACKNOWLEDGEMENTS FOR THE GERMAN RESEARCH FOUNDATION (DFG). THE DIRTY DATA OF THE WEB OF SCIENCE DATABASE AND HOW TO CLEAN IT UP.....	784
GENDER AND ACADEMIC ROLES IN GRADUATE PROGRAMS: ANALYSES OF BRAZILIAN GOVERNMENT DATA	796

GENDER INEQUALITY IN SCIENTIFIC PRODUCTION (RIP).....	811
GENETICALLY MODIFIED FOOD RESEARCH IN CHINA: INTERACTIONS BETWEEN AUTHORS FROM SOCIAL SCIENCES AND NATURAL SCIENCES.....	819
A GLOBAL OVERVIEW OF COMPLEX NETWORKS RESEARCH ACTIVITIES.....	831
HOW ARE COLLABORATION AND PRODUCTIVITY CORRELATED AT VARIOUS CAREER STAGES OF SCIENTISTS?	847
HOW TO COMBINE TERM CLUMPING AND TECHNOLOGY ROADMAPPING FOR NEWLY EMERGING SCIENCE & TECHNOLOGY COMPETITIVE INTELLIGENCE: THE SEMANTIC TRIZ TOOL AND CASE STUDY	861
HOW WELL DEVELOPED ARE ALTMETRICS? CROSS-DISCIPLINARY ANALYSIS OF THE PRESENCE OF ‘ALTERNATIVE METRICS’ IN SCIENTIFIC PUBLICATIONS (RIP).....	876
INTERMEDIATE-CLASS UNIVERSITY RANKING SYSTEM: APPLICATION TO MAGHREB UNIVERSITIES (RIP)	885
IDENTIFYING EMERGING RESEARCH FIELDS WITH PRACTICAL APPLICATIONS VIA ANALYSIS OF SCIENTIFIC AND TECHNICAL DOCUMENTS.....	896
IDENTIFYING EMERGING TECHNOLOGIES: AN APPLICATION TO NANOTECHNOLOGY	912
IDENTIFYING EMERGING TOPICS BY COMBINING DIRECT CITATION AND CO-CITATION.....	928
IDENTIFYING LONGITUDINAL DEVELOPMENT AND EMERGING TOPICS IN WIND ENERGY FIELD	941
THE IMPACT OF CORE DOCUMENTS: A CITATION ANALYSIS OF THE 2003 SCIENCE CITATION INDEX CORE-DOCUMENT POPULATION.....	955
IMPACT OF META-ANALYTICAL STUDIES, STANDARD ARTICLES AND REVIEWS: SIMILARITIES AND DIFFERENCES	966
THE IMPACT OF R&D ACTIVITIES ON HOSPITAL OUTCOMES (RIP)	978
INDUSTRY RESEARCH PRODUCTION AND LINKAGES WITH ACADEMIA: EVIDENCE FROM UK SCIENCE PARKS.....	985
INFLUENCE OF UNIVERSITY MERGERS AND THE NORWEGIAN PERFORMANCE INDICATOR ON OVERALL DANISH CITATION IMPACT 2000-12	1003

INFORMATION AND LIBRARY SCIENCE, CHANGES THAT INFLUENCED IT'S NEW CHARACTER, DIRECTION AND RESEARCH: A BIBLIOMETRIC STUDY, 1985-2006	1019
AN INFORMETRIC STUDY OF KNOWLEDGE FLOW AMONG SCIENTIFIC FIELDS (RIP).....	1030
INTERACTIVE OVERLAYS OF JOURNALS AND THE MEASUREMENT OF INTERDISCIPLINARITY	1037
INTERDISCIPLINARY RESEARCH AND THE PRODUCTION OF LOCAL KNOWLEDGE: EVIDENCE FROM A DEVELOPING COUNTRY.....	1053
INTERNATIONAL COMPARATIVE STUDY ON NANOFILTRATION MEMBRANE TECHNOLOGY BASED ON RELEVANT PUBLICATIONS AND PATENTS.....	1069
IN-TEXT AUTHOR CITATION ANALYSIS: AN INITIAL TEST (RIP)	1082
KNOWLEDGE CAPTURE MECHANISMS IN BIOVENTURE CORPORATIONS: A CASE STUDY	1090
LEAD-LAG TOPIC EVOLUTION ANALYSIS: PREPRINTS VS. PAPERS (RIP).....	1106
LITERATURE RETRIEVAL BASED ON CITATION CONTEXT.....	1114
MAPPING THE EVOLVING PATTERNS OF PATENT ASSIGNEES' COLLABORATION NETWORK AND IDENTIFYING THE COLLABORATION POTENTIAL	1135
MATCHING BIBLIOGRAPHIC DATA FROM PUBLICATION LISTS WITH LARGE DATABASES USING N-GRAMS (RIP)	1151
MATHEMATICAL CHARACTERIZATIONS OF THE WU- AND HIRSCH-INDICES USING TWO TYPES OF MINIMAL INCREMENTS	1159
MEASURING INTERNATIONALISATION OF BOOK PUBLISHING IN THE SOCIAL SCIENCES AND HUMANITIES USING THE BARYCENTRE METHOD (RIP)	1170
MEASURING THE ACADEMIC IMPACT OF RESEARCHERS BY COMBINED CITATION AND COLLABORATION IMPACT	1177
MEASURING THE EXTENT TO WHICH A RESEARCH DOMAIN IS SELF-CONTAINED.....	1188
A METHOD FOR TEXT NETWORK ANALYSIS: TESTING, DEVELOPMENT AND APPLICATION TO THE INVESTIGATION OF PATENT PORTFOLIOS (RIP)	1202
MISFITS? RESEARCH CLASSIFICATION IN RESEARCH EVALUATION: VISUALIZING JOURNAL CONTENT WITHIN FIELDS OF RESEARCH CODES.....	1210

MODEL TO SUPPORT THE INFORMATION RETRIEVAL PROCESS OF THE SCIENTIFIC PRODUCTION AT DEPARTMENTAL-LEVEL OR FACULTY-LEVEL OF UNIVERSITIES	1225
MOST BORROWED IS MOST CITED? LIBRARY LOAN STATISTICS AS A PROXY FOR MONOGRAPH SELECTION IN CITATION INDEXES (RIP).....	1237
MOTIVATION FOR HYPERLINK CREATION USING INTER-PAGE RELATIONSHIPS	1253
MOVING FROM PERIPHERY TO CORE IN SCIENTIFIC NETWORKS: EVIDENCE FROM EUROPEAN INTER-REGIONAL COLLABORATIONS, 1999-2007 (RIP).....	1270
NANO-ENHANCED DRUG DELIVERY (NEDD) RESEARCH PATTERN FOR TWO LEADING COUNTRIES: US AND CHINA	1278
NANOTECHNOLOGY AS GENERAL PURPOSE TECHNOLOGY.....	1291
NEVIEWER: A NEW SOFTWARE FOR ANALYZING THE EVOLUTION OF RESEARCH TOPICS	1307
THE NUANCED NATURE OF E-PRINT USE: A CASE STUDY OF ARXIV	1321
ON THE DETERMINANTS OF RESEARCH PERFORMANCE: EVIDENCE FROM ECONOMIC DEPARTMENTS OF FOUR EUROPEAN COUNTRIES (RIP).....	1334
OPEN DATA AND OPEN CODE FOR BIG SCIENCE OF SCIENCE STUDIES	1342
OPTIMIZING RESEARCH IMPACT BY ALLOCATING FUNDING TO RESEARCHER GRANT PORTFOLIOS: SOME EVIDENCE ON A POLICY OPTION (RIP)	1357
PATENTS IN NANOTECHNOLOGY: AN ANALYSIS USING MACRO-INDICATORS AND FORECASTING CURVES.....	1363
THE PATTERNS OF INDUSTRY-UNIVERSITY-GOVERNMENT COLLABORATION IN PHOTOVOLTAIC TECHNOLOGY	1379
PERFORMING INFORMETRIC ANALYSIS ON INFORMATION RETRIEVAL TEST COLLECTIONS: PRELIMINARY EXPERIMENTS IN THE PHYSICS DOMAIN (RIP)	1392
POSSIBILITIES OF FUNDING ACKNOWLEDGEMENT ANALYSIS FOR THE BIBLIOMETRIC STUDY OF RESEARCH FUNDING ORGANIZATIONS: CASE STUDY OF THE <i>AUSTRIAN SCIENCE FUND (FWF)</i>	1401

PREDICTING AND RECOMMENDING POTENTIAL RESEARCH COLLABORATIONS.....	1409
PUBLICATION BIAS IN MEDICAL RESEARCH: ISSUES AND COMMUNITIES.....	1419
QUANTITATIVE EVALUATION OF ALTERNATIVE FIELD NORMALIZATION PROCEDURES	1431
A RELATION BETWEEN POWER LAW DISTRIBUTIONS AND HEAPS' LAW.....	1445
THE RELATIONSHIP BETWEEN COLLABORATION AND PRODUCTIVITY FOR LONG-TERM INFORMATION SCIENCE RESEARCHERS (RIP).....	1461
RELATIONSHIP BETWEEN DOWNLOADS AND CITATION AND THE INFLUENCE OF LANGUAGE	1469
RELEVANCE AND FOCUS SHIFT: NEW METRICS FOR THE GRANT EVALUATION PROCESS PILOT TESTED ON NIH GRANT APPLICATIONS (RIP)	1485
RELEVANCE DISTRIBUTIONS ACROSS BRADFORD ZONES: CAN BRADFORDIZING IMPROVE SEARCH?.....	1493
RESEARCH COLLABORATION AND PRODUCTION OF EXCELLENCE: FINLAND 1995-2009	1506
RESEARCH PERFORMANCE ASSESSMENT USING NORMALIZATION METHOD BASED ON SCI DATABASE (RIP)	1528
RETHINKING RESEARCH EVALUATION INDICATORS AND METHODS FROM AN ECONOMIC PERSPECTIVE: THE FSS INDICATOR AS A PROXY OF PRODUCTIVITY	1536
THE ROLE OF NATIONAL UNIVERSITY RANKINGS IN AN INTERNATIONAL CONTEXT: THE CASE OF THE I-UGR RANKINGS OF SPANISH UNIVERSITIES.....	1550
SCIENCE DYNAMICS: NORMALIZED GROWTH CURVES, SHARPE RATIOS, AND SCALING EXPONENTS	1566
SCIENTIFIC POLICY IN BRAZIL: EXPLORATORY ANALYSIS OF ASSESSMENT CRITERIA (RIP).....	1578
'SEED+EXPAND': A VALIDATED METHODOLOGY FOR CREATING HIGH QUALITY PUBLICATION OEUVRES OF INDIVIDUAL RESEARCHERS.....	1587
THE SHORTFALL IN COVERAGE OF COUNTRIES' PAPERS IN THE SOCIAL SCIENCES CITATION INDEX COMPARED WITH THE SCIENCE CITATION INDEX.....	1601

SOCIAL DYNAMICS OF RESEARCH COLLABORATION: NORMS, PRACTICES, AND ETHICAL ISSUES IN DETERMINING CO-AUTHORSHIP RIGHTS (RIP)	1613
SOFTWARE PATENTING IN ASIA	1622
SUPPLY AND DEMAND IN SCHOLARLY PUBLISHING: AN ANALYSIS OF FACTORS ASSOCIATED WITH JOURNAL ACCEPTANCE RATES (RIP).....	1640
A SYSTEMATIC EMPIRICAL COMPARISON OF DIFFERENT APPROACHES FOR NORMALIZING CITATION IMPACT INDICATORS	1649
THE TIPPING POINT – OPEN ACCESS COMES OF AGE	1665
TO WHAT EXTENT CAN RESEARCHERS’ INTERNATIONAL MOVEMENT BE GRASPED FROM PUBLISHED DATA SOURCES? .	1681
TO WHAT EXTENT IS THE H-INDEX INCONSISTENT? IS STRICT CONSISTENCY A REASONABLE REQUIREMENT FOR A SCIENTOMETRIC INDICATOR?	1696
TOWARD A TIME-SENSITIVE MESOSCOPIC ANALYSIS OF CO-AUTHOR NETWORKS: A CASE STUDY OF TWO RESEARCH SPECIALTIES	1711
TOWARDS THE DEVELOPMENT OF AN INDICATOR OF CONFORMITY	1726
TRACING RESEARCH PATHS OF SCIENTISTS BY MEANS OF CITATIONS.....	1738
TRACKING ACADEMIC REGIONAL WORKFORCE RETENTION THROUGH AUTHOR AFFILIATION DATA.....	1746
TRENDS OF INTELLECTUAL AND COGNITIVE STRUCTURES OF STEM CELL RESEARCH: A STUDY OF BRAZILIAN SCIENTIFIC PUBLICATIONS	1759
USE OF ELECTRONIC JOURNALS IN UNIVERSITY LIBRARIES: AN ANALYSIS OF OBSOLESCENCE REGARDING CITATIONS AND ACCESS.....	1772
USING MONTE CARLO SIMULATIONS TO ASSESS THE IMPACT OF AUTHOR NAME DISAMBIGUATION QUALITY ON DIFFERENT BIBLIOMETRIC ANALYSES.	1784
VISUALIZING AND COMPARING THE DEVELOPMENT OF SCIENTIFIC INSTRUMENTATION VS ENGINEERING INSTRUMENTATION.....	1792

WEB BASED IMPACT MEASURES FOR INSTITUTIONAL REPOSITORIES	1806
WHAT IS THE IMPACT OF SCALE AND SPECIALIZATION ON THE RESEARCH EFFICIENCY OF EUROPEAN UNIVERSITIES?.....	1817
WHICH FACTORS HELP TO PRODUCE HIGH IMPACT RESEARCH? A COMBINED STATISTICAL MODELLING APPROACH	1830
POSTERS.....	1845
THE 2-YEAR MAXIMUM JOURNAL IMPACT FACTOR	1847
ACCURACY ASSESSMENT FOR BIBLIOGRAPHIC DATA	1850
ANALYSIS OF SEARCH RESULTS FOR THE CLARIFICATION AND IDENTIFICATION OF TECHNOLOGY EMERGENCE (AR-CITE).....	1854
APPLICATIONS AND RESEARCHES OF GIS TECHNOLOGIES IN BIBLIOMETRICS	1857
APPROPRIATE COVERAGE OF SCHOLARLY PUBLISHING IN THE SOCIAL SCIENCES AND HUMANITIES - A EUROPEAN OVERVIEW	1861
ARE REGISTERED AUTHORS MORE PRODUCTIVE?.....	1864
ARE THE BRIC AND MITS COUNTRIES IMPROVING THEIR PRESENCE IN THE INTERNATIONAL SCIENCE?	1868
JOURNAL IMPACT FACTOR, EIGENFACTOR, JOURNAL INFLUENCE AND ARTICLE INFLUENCE	1871
ASEP ANALYTICS. A SOURCE FOR EVALUATION AT THE ACADEMY OF SCIENCES OF THE CR.....	1874
ASSESSING AN INTERVAL OF CONFIDENCE TO COMPILE TIME-DEPENDENT PATENT INDICATORS IN NANOTECHNOLOGY	1877
BIBLIOMETRIC INDICATORS OF YOUNG AUTHORS IN ASTROPHYSICS: CAN LATER STARS BE PREDICTED?.....	1881
BIOLOGICAL SCIENCES PRODUCTION: A COMPARATIVE STUDY ON THE MODALITIES OF FULL PHD IN BRAZIL OR ABROAD.....	1884
A CITATION ANALYSIS ON MONOGRAPHS IN THE FIELD OF SCIENTOMETRICS, INFORMETRICS AND BIBLIOMETRICS IN CHINA (1987-2010).....	1887
CITATION PATTERNS FOR SOCIAL SCIENCES AND HUMANITIES PUBLICATIONS	1891
COLLABORATION IN THE SOCIAL SCIENCES AND HUMANITIES: EDITED BOOKS IN ECONOMICS, HISTORY AND LINGUISTICS.....	1894

THE COLLECTIVE CONSEQUENCES OF SCIENTIFIC FRAUD: AN ANALYSIS OF BIOMEDICAL RESEARCH	1897
COMPARING NATIONAL DISCIPLINARY STRUCTURES: A QUANTITATIVE APPROACH.....	1900
COMPREHENSIVENESS AND ACCURACY OF DOCUMENT TYPES: COMPARISON IN WEB OF SCIENCE AND SCOPUS AGAINST PUBLISHER’S DEFINITION	1905
CONTRIBUTION OF BRAZILIAN SCIENTIFIC PRODUCTION TO MAINSTREAM SCIENCE IN THE FIELD OF MATHEMATICS: A SCIENTOMETRICS ANALYSIS (2002-2011).....	1908
CO-OCCURRENCE BETWEEN AUTHORS’ AFFILIATION AND JOURNAL: ANALYSIS BASED ON 2-MODE NETWORK.....	1912
COST ANALYSIS OF E –JOURNALS, BASED ON THE SCIENTIFIC COMMUNITIES USAGE OF SCIENCE DIRECT ONLINE DATABASE WITH SPECIAL REFERENCE TO BANARAS HINDU UNIVERSITY LIBRARY, INDIA	1915
A COVERAGE OVERLAP STUDY ON CITATION INDEX: COMMERCIAL DATABASES AND OPEN ACCESS SYSTEMS	1918
FACTORS RELATED TO GENDER DIFFERENCES IN SCIENCE: A CO-WORD ANALYSIS	1922
THE CROSSCHECK PLAGIARISM SYSTEM: A BRIEF STUDY FOR SIMILARITY	1925
CUMULATIVE CAPABILITIES IN COLOMBIAN UNIVERSITIES: AN EVALUATION USING SCIENTIFIC PRODUCTIVITY	1928
A DESCRIPTIVE STUDY OF INACCURACY IN ARTICLE TITLES ON BIBLIOMETRICS PUBLISHED IN BIOMEDICAL JOURNALS.....	1932
DIFFUSION OF BRAZILIAN STATISTIC INFORMATION	1935
DISCOVERING AUTHOR IMPACT: A NOVEL INDICATOR BASED ON CITATION IDENTITY	1938
DO NEW SCIENTISTS PREFER COLLABORATING WITH OLD SCIENTISTS? AND VICE VERSA?.....	1941
DO SMALL AND MEDIUM SIZED BUSINESSES CLAIM FOR SMALL ENTITY STATUS? THE CASE OF MIT AND STANFORD UNIVERSITY SPINOFFS	1944
DOES SCIENTIFIC KNOWLEDGE PLAY A ROLE IN PUBLIC POLICIES? A CONTRIBUTION OF SCIENTOMETRICS TO POLITICAL SCIENCE: THE CASE OF HTA.	1947

THE EARLIEST PRIORITY SELECTOR FOR COMPILING PATENT INDICATORS.....	1950
EFFICIENCIES IN NATIONAL SCIENTIFIC PRODUCTIVITY WITH RESPECT TO MANPOWER AND FUNDING IN SCIENCE.....	1954
EMERGENCE OF KEYWORDS IN WEB OF SCIENCE VS. WIKIPEDIA	1957
ENTROPY-BASED DISCIPLINARITY INDICATOR: ROLE TAXONOMY OF JOURNALS IN SCIENTIFIC COMMUNICATION SYSTEMS.....	1960
THE EPIDEMIC OF RENAL DISEASE –AN EVALUATION OF STATUS (2005-2009).....	1963
EUROPEAN HIGHLY CITED SCIENTISTS’ PRESENCE IN THE SOCIAL WEB.....	1966
EVALUATING THE INVENTIVE ACTIVITY OF FOREIGN R&D CENTERS IN ISRAEL: LINKING PATSTAT TO FIRM LEVEL DATA	1970
EVALUATION OF RESEARCH IN SPAIN: BIBLIOMETRIC INDICATORS USED BY MAJOR SPANISH RESEARCH ASSESSMENT AGENCIES	1973
AN EXPERIENCE OF THE INCLUSION A NEW METHODOLOGY IN SELECTING THE REVIEWERS FOR GRANT APPLICATIONS.....	1976
EXPLORING INTERDISCIPLINARITY IN ECONOMICS THROUGH ACADEMIC GENEALOGY: AN EXPLORATORY STUDY	1979
FEATURES OF INDEX TERMS AND NATURAL LANGUAGE WORDS FROM THE PERSPECTIVE OF EXTRACTED TOPICS	1983
FROM CATEGORICAL TO RELATIONAL DIVERSITY – EXPLORING NEW APPROACHES TO MEASURING SCIENTIFIC DIVERSITY	1986
FULLERENE AND COLD FUSION: BIBLIOMETRIC DISCRIMINATION BETWEEN NORMAL AND PATHOLOGICAL SCIENCE	1989
GEOGRAPHICAL ORIENTATION AND IMPACT OF FINLAND’S INTERNATIONAL CO-PUBLICATIONS.....	1992
GLOBAL RESEARCH STATUS IN LEADING NUCLEAR SCIENCE AND TECHNOLOGY JOURNALS DURING 2001–2010: A BIBLIOMETRIC ANALYSIS BASED ON ISI WEB OF SCIENCE.....	1995
GROUPS OF HIGHLY CITED PUBLICATIONS: STABILITY IN CONTENT WITH CITATION WINDOW LENGTH	1998
HEAPS’ LAW: A DYNAMIC PERSPECTIVE FROM SIMON’S MODEL	2001
HOW EFFECTIVE IS THE KNOWLEDGE TRANSFER OF A PUBLIC RESEARCH ORGANIZATION (PRO)? FIRST EMPIRICAL EVIDENCE FROM THE SPANISH NATIONAL RESEARCH COUNCIL	2004

HOW MUCH MATHEMATICS IS IN THE <i>BIG TWO</i> AND WHERE IS IT LOCATED?	2008
IDENTIFICATION METHOD ON LOW QUALITY PATENTS AND APPLICATION IN CHINA.....	2011
IMPACT AND VISIBILITY OF SA'S RESEARCH JOURNALS: ASSESSING THE 2008 EXPANSION IN COVERAGE OF THE THOMSON REUTERS DATABASES	2014
IMPACT OF BRAIN DRAIN ON SCIENCE PRODUCTION: A CASE STUDY OF IRANIAN EDUCATED MIGRANTS IN THE CONTEXT OF SCIENCE PRODUCTION IN CANADA	2017
AN INDEX TO QUALIFY HUMAN RESOURCES OF AN ENTERPRISES CLUSTER.....	2020
AN INTERPRETABLE AXIOMATIZATION OF THE HIRSCH-INDEX.....	2024
INTERPRETING EPISTEMIC AND SOCIAL CULTURAL IDENTITIES OF DISCIPLINES WITH MACHINE LEARNING MODELS OF METADISOURSE	2027
AN INVESTIGATION OF SCIENTIFIC COLLABORATION BETWEEN IRAN AND OTHER MENA COUNTRIES AND ITS RELATIONSHIP WITH ECONOMIC INDICATORS.....	2031
KEYWORD-QUERY EXPANSION USING CITATION CLUSTERS FOR PAPER INFORMATION RETRIEVAL	2034
KNOWLEDGE COMBINATION FORECASTING BETWEEN DIFFERENT TECHNOLOGICAL FIELDS.....	2037
LANGUAGE PREFERENCE IN SOCIOLOGICAL RESEARCH PUBLISHED BY VARIOUS EUROPEAN NATIONALITIES.....	2040
LEADERS AND PARTNERS IN INTERNATIONAL COLLABORATION AND THEIR INFLUENCE ON RESEARCH IMPACT.....	2044
MEASURING INTERDISCIPLINARITY OF RESEARCH GRANT APPLICATIONS. AN INDICATOR DEVELOPED TO MODEL THIS SELECTION CRITERION IN THE ERC'S PEER-REVIEW PROCESS..	2048
MEASURING THE QUALITY OF ACADEMIC MENTORING	2051
A MODEL BASED ON BIBLIOMETRIC INDICATORS: THE PREDICTIVE POWER	2054
MONITORING OF INDIAN RESEARCH PAPERS: ON THE BASIS OF MAJOR GLOBAL SECONDARY SERVICES.....	2057
NANOSCIENCE AND NANOTECHNOLOGY IN SCOPUS: JOURNAL IDENTIFICATION AND VISUALIZATION	2061

A NEW APPROACH FOR AUTOMATED AUTHOR DISCIPLINE CATEGORIZATION AND EVALUATION OF CROSS-DISCIPLINARY COLLABORATIONS FOR GRANT PROGRAMS	2066
NORMALIZED INDICATORS OF THE INTERNATIONAL BRAZILIAN RESEARCH: A SCIENTOMETRIC STUDY OF THE PERIOD BETWEEN 1996 AND 2011	2069
ON THE DEFINITION OF A REVIEW, AND DOES IT MATTER?	2072
AN ONLINE SYSTEM FOR MANAGEMENT AND MONITORING OF EXTRAMURAL PROPOSALS FOR FUNDING BY ICMR – A CASE STUDY	2075
PAPERS PUBLISHED IN PNAS REFLECT THE HIERARCHY OF THE SCIENCES	2080
A RESEARCH PROFILE FOR A PROMISING EMERGING INDUSTRY – NANO-ENABLED DRUG DELIVERY	2083
THE P-INDEX: HIRSCH INDEX OF INDIVIDUAL PUBLICATIONS ..	2086
PRELIMINARY ANALYSIS OF THE FINANCIAL ASSISTANCE TO NON-ICMR BIOMEDICAL SCIENTISTS BY INDIAN COUNCIL OF MEDICAL RESEARCH (ICMR).....	2089
THE PRODUCTIVITY AND IMPACT OF ASTRONOMICAL TELESCOPES – A BIBLIOMETRIC STUDY FOR 2007 – 2011	2092
PROFILES OF PRODUCTION, IMPACT, VISIBILITY AND COLLABORATION OF THE SPANISH UNIVERSITY SYSTEM IN SOCIAL SCIENCES AND HUMANITIES	2095
PROTOTYPICAL STRATEGY FOR HIGH-LEVEL CITATION- ANALYSES: A CASE STUDY ON THE RECEPTION OF ENGLISH- LANGUAGE JOURNAL ARTICLES FROM PSYCHOLOGY IN THE GERMAN-SPEAKING COUNTRIES	2099
A QUANTITATIVE ANALYSIS OF ANTARCTIC RELATED ARTICLES IN HUMANITIES AND SOCIAL SCIENCES APPEARING IN THE WORLD CORE JOURNALS	2102
THE RELATIONSHIP BETWEEN A TOPIC’S INTERDISCIPLINARITY AND ITS INNOVATIVENESS.....	2105
HIERARCHICAL CLUSTERING PHRASED IN GRAPH THEORY: MINIMUM SPANNING TREES, REGIONS OF INFLUENCE, AND DIRECTED TREES.....	2109
RESEARCH SECTORS INVOLVED IN CUBAN SCIENTIFIC OUTPUT 2003-2007	2113

RESEARCH TRENDS IN GENETICS: SCIENTOMETRIC PROFILE OF SELECTED ASIAN COUNTRIES	2117
THE RISE AND FALL OF GREECE'S RESEARCH PUBLICATION RECORD: THE LAST 30 YEARS.....	2120
THE ROLE OF COGNITIVE DISTINCTIVENESS ON CO-AUTHOR SELECTION AND THE INFLUENCE OF CO-AUTHORING ON COGNITIVE STRUCTURE: A MULTI-AGENT SIMULATION APPROACH	2124
SCIENTIFIC PRODUCTION AND INTERNATIONAL COLLABORATION ON SOLAR ENERGY IN SPAIN AND GERMANY (1995-2009)	2126
SCIENTIFIC PRODUCTION OF TOP BRAZILIAN RESEARCHERS IN BIOCHEMISTRY, PHYSIOLOGY, PHARMACOLOGY AND BIOPHYSICS	2129
A SIMPLE METHOD TO ASSESS THE QUALITY OF ANY UNIFICATION PROCESS.....	2132
STRUCTURE ANALYSIS OF SMALL PATENT CITATION NETWORK AND MAPPING TECHNOLOGICAL TRAJECTORIES.....	2136
STRUCTURE OF INTERDISCIPLINARY RESEARCH: COMPARING LM AND LDA.....	2140
THE STUDY AND ASSESSMENT OF RESEARCH PERFORMANCE AT THE MICRO LEVEL: THE AGE PHASE DYNAMICS APPROACH	2143
THE SUBJECT CATEGORIES NORMALIZED IMPACT FACTOR	2146
SUCCESS DETERMINANTS OF FULL-TIME RESEARCHERS AT HOSPITALS. A PERCEPTIONS-BASED STUDY	2149
SURFING THE SEMANTIC WEB.....	2152
TEMPORAL EVOLUTION, STRUCTURAL FEATURES AND IMPACT OF STANDARD ARTICLES AND PROCEEDINGS PAPERS. A CASE STUDY IN BLENDED LEARNING.	2156
TESTING COMPOSITE INDICATORS FOR THE SCIMAGO INSTITUTIONS RANKING	2159
A TEXT MINING APPROACH EXPLORING ACKNOWLEDGEMENTS OF PAPERS	2162
REGULARITY IN THE TIME-DEPENDENT DISTRIBUTION OF THE PERCENTAGE OF UNCITED ARTICLES: AN EMPIRICAL PILOT STUDY BASED ON THE SIX JOURNALS	2165
TOPOLOGICAL TOPIC TRACKING – A COMPARATIVE ANALYSIS	2168

TOWARDS AN AUTHOR-TOPIC-TERM-MODEL VISUALIZATION OF 100 YEARS OF GERMAN SOCIOLOGICAL SOCIETY PROCEEDINGS	2171
USE FREQUENCIES OF NOMINALIZATIONS IN SCIENTIFIC WRITING IN BRAZILIAN PORTUGUESE LANGUAGE AS POLITENESS STRATEGIES AND THEIR INDEX ROLE IN THE SUBJECT INDEXING	2174
A VISUALIZATION TOOL FOR TOPIC EVOLUTION AMONG RESEARCH FIELDS	2178
VISUALIZING THE RESEARCH DOMAIN ON SCIENTOMETRICS (1978- 2012)	2182
WEB 2.0 TOOLS FOR NETWORK MANAGEMENT AND PATENT ANALYSIS FOR HEALTH PUBLIC	2185
WEIGHTING CO-CITATION PROXIMITY BASED ON CITATION CONTEXT	2189
WHAT MEANS, IN NUMBERS, A GOLD STANDARD BIOCHEMISTRY DEPARTMENT TO NATIONAL AGENCIES OF RESEARCH FOMENTATION IN BRAZIL?.....	2193
WHEN INNOVATION INDICATORS MEET SPIN-OFF COMPANIES: A BRIEF REVIEW AND IMPROVEMENT PROPOSAL.....	2196
WHERE NATURAL SCIENCES (PHYSICS) MADE IN THE WORLD AND IN RUSSIA: 3-DECADES DYNAMICS	2200
AUTHOR INDEX	1127

THE *CITER-SUCCESS-INDEX*: AN INDICATOR TO SELECT A SUBSET OF ELITE PAPERS, BASED ON CITERS

Fiorenzo Franceschini¹, Domenico Maisano² and Luca Mastrogiacomo³

¹ fiorenzo.franceschini@polito.it ² domenico.maisano@polito.it

³ luca.mastrogiacomo@polito.it

Politecnico di Torino, DIGEP (Department of Management and Production Engineering),
Corso Duca degli Abruzzi 24, 10129, Torino (Italy)

Abstract

The goal of this paper is introducing the *citer-success-index* (*cs-index*), i.e., an indicator that uses the number of different citers as a proxy for the impact of a generic set of papers. For each of the articles of interest, it is defined a comparison term – which represents the number of citers that, on average, an article published in a certain period and scientific field is expected to “infect” – to be compared with the actual number of citers of the article. Similarly to the recently proposed *success-index* (Franceschini et al., *Scientometrics* 92(3):621-6415, 2011), the *cs-index* allows to select a subset of “elite” papers.

The *cs-index* is analyzed from a conceptual and empirical perspective. Special attention is devoted to the study of the link between the number of citers and cited authors relating to articles from different fields, and the possible correlation between the *cs-* and the *success-index*.

Some advantages of the *cs-index* are that (i) it can be applied to multidisciplinary groups of papers, thanks to the field-normalization that it achieves at the level of individual paper and (ii) it is not significantly affected by self citers and recurrent citers. The main drawback is its computational complexity.

Conference Topic

Scientometrics Indicators: Criticism and new developments, Relevance to Science and Technology (Topic 1).

Introduction and Literature Review

In bibliometrics, one of the main analysis dimensions is the impact of scientific publications, which is commonly estimated by counting the number of citations that they accumulate over time (Egghe and Rousseau, 1990). As an alternative to citations, Dieks et al. (1976) and Braun et al. (1985) suggested to use the total number of different citers (or citing authors), i.e., the members of the scientific community who are “infected” by a certain paper. The number of different citers is a proxy which is harder to compute, but more elegant, as only marginally affected by citations from self citers and recurrent citers.

The idea of citers was recently dug up by Ajiferuke and Wolfram (2010), who proposed and implemented an indicator based on citers, without encountering the computational obstacles of the past, thanks to the current evolution of databases and information management tools. The indicator is the *ch*-index, defined for a generic group of papers (e.g., those of a scientist, journal or entire research institution) as *the number (ch) such that, for a general group of papers, ch papers are cited by at least ch different citers while the other papers are cited by no more than ch different citers*. It can be immediately noticed that this definition is similar to that of the *h*-index, with the only exception that, for each publication, the citations obtained are replaced by the number of different citers (Hirsch, 2005).

The *ch*-index was empirically analyzed by Franceschini et al. (2010). This study showed: (i) the general correlation between *ch* and *h*, and (ii) the potential of *ch* in complementing the information given by *h*. E.g., paradoxical situations in which the number of citations obtained by a paper and the number of different citers do not go hand in hand are not so rare, due to the anomalous incidence of recurrent or self citers. A theoretical interpretation of the correlation between *ch* and *h* was recently provided by Egghe (2012).

In this article we focus the attention on the *success*-index (*s*-index), i.e., a recent indicator that, for a generic set of articles, allows to select an “elite” subset, according to a logic different from that of *h* (Franceschini et al., 2012a). The *s*-index is defined as *the number of papers with a number of citations greater than or equal to CT_i , i.e., a generic comparison term associated to the i -th publication*. CT_i is an estimate of the number of citations that articles of the same scientific context and period of time of that of interest (i.e., the *i*-th publication) are likely to achieve.

With the aim of formalizing this definition, a score is associated to each (*i*-th) of the (*P*) publications of interest:

$$\begin{cases} score_i = 1 & \text{when } c_i \geq CT_i \\ score_i = 0 & \text{when } c_i < CT_i \end{cases}, \quad (1)$$

where c_i are the citations obtained by the *i*-th publication. The *s*-index is therefore given by:

$$s\text{-index} = \sum_{i=1}^P score_i . \quad (2)$$

Apart from *s*, there are other indicators in the literature that allow to select an elite subset, based on the comparison between the number of citations accumulated by each paper and a threshold. E.g., let us consider the selection by $P_{top\ 10\%}$ -indicator (Bornmann, 2013), that by π -indicator (Vinkler, 2011), the characteristic scores and scales (CSS) method (Glänzel, 2011) or the ESI’s Highly Cited Papers method (ISI Web of Knowledge, 2012). We remark that, differently from *s*, the aforementioned methods require that the set of publications examined are preliminarily categorized into scientific (sub-)disciplines.

As regards the s -index, there are several options for constructing the CT_i related to an i -th paper of interest. Generally, three issues are crucial (Franceschini et al., 2012b):

1. Defining the procedure for selecting a reference sample of homologous publications. Possible approaches are: (i) the selection of papers of same age, type (e.g. research article, review, letter, etc.) and published by the same journal of the i -th paper of interest, (ii) the use of superimposed classifications such as ISI subject categories, (iii) the implementation of “adaptive” techniques in which the sample is determined considering the “neighbourhood” of the paper of interest – typically consisting of the set of papers citing or being cited by it.
2. Deciding whether to consider (i) the distribution of the number of references given or (ii) the citations obtained by the publications of the sample.
3. Identifying a suitable (central tendency) indicator for obtaining CT_i from the distribution of interest, e.g., mean, median, harmonic mean, percentiles, etc..

Regarding point (2), Franceschini et al. (2012a, 2012c) state that indicators based on the distribution of references given – rather than citations obtained – have several advantages:

- The number of references is fixed over time, while the number of citations obtained tends to increase and requires a certain accumulation period to stabilize.
- This stability is also derived by the fact that the number of references is likely to be less variable than the number of citations obtained.
- Bibliographic references are less influenced by journal particularities, such as the average citation impact of articles.

Conceptually, the link between references given (by the papers of the reference sample) and citations obtained (by the papers of interest) originates from a simple consideration: focussing on the totality of the scientific literature in a certain field and according to a simplified model configuration of *isolated* fields – i.e., excluding transfers of citations between different disciplines – the following relationship applies:

$$\sum_{i=1}^P c_i = \sum_{i=1}^P r_i, \quad (3)$$

where

P is the total number of articles (that can cite each other) in the isolated field;

c_i is the number of citations obtained by the i -th paper;

r_i is the number of citations given by the i -th paper.

The equality of Eq. 3 can also be expressed in terms of average values:

$$\frac{1}{P} \sum_{i=1}^P c_i = \frac{1}{P} \sum_{i=1}^P r_i \Rightarrow \bar{c} = \bar{r}. \quad (4)$$

For more detailed and rigorous information on the relation between the \bar{c} and \bar{r} values concerning a set of documents, we refer the reader to (Egghe & Rousseau, 1990).

Returning to the s -index, apart from the simplicity of meaning, a great advantage is that it implements a field-normalization at the level of single paper and can therefore be applied to multidisciplinary groups of articles, for instance the whole production output of a research institution.

Another important quality of the s -index is that it is defined on a *ratio* scale. This feature has several practical implications that make this indicator more versatile than others – such as the h -index, which is defined on an *ordinal* scale (Franceschini et al., 2012a):

- The s -index reflects compositions of the input publication sets (with the corresponding citations). In other terms, the union of two groups of publications with s -index of 2 and 5 (with no common publications) will always originate a third group of publications with s -index of $2 + 5 = 7$. This simple property is very useful for extending the use of the s -index to multidisciplinary institutions, e.g., joining groups of publications from different scientific fields.
- The s -index eases normalizations aimed at obtaining the so-called size-independency (Franceschini et al., 2012c). Given a general group of papers and the same capacity of producing successful papers, it is reasonable to assume that the s -index should increase proportionally with the different types of “resources” deployed. In fact, several normalized indicators can be obtained dividing the s -index by the resource unit of interest; e.g, the staff number of a research institution, the age of a researcher, the number of articles of a journal, the amount of funding received in a certain period, etc..

The purpose of the paper is introducing the *citer-success-index* (or cs -index), i.e., a variant of the s -index, which is based on citers instead of citations, according to a logic similar to that of ch . Given a set of articles, the cs -index identifies a subset for which the number of different citers of an i -th article exceeds a specified comparison term cCT_i . Formalizing, a score is associated to each i -th of the (P) publications of interest:

$$\begin{cases} score_i = 1 & \text{when } \gamma_i \geq cCT_i \\ score_i = 0 & \text{when } \gamma_i < cCT_i \end{cases}, \quad (5)$$

where γ_i are the unique citers related to the i -th publication. The word “unique” means that repeated citers are counted only once. The cs -index is therefore given by:

$$cs\text{-index} = \sum_{i=1}^P score_i \quad (6)$$

Figure 1(a) exemplifies the calculation of the s - and cs -index for a fictitious set of papers.

In analogy with CT_i , cCT_i is an estimate of the number of unique citers that articles homologous to that of interest are likely to “infect”.

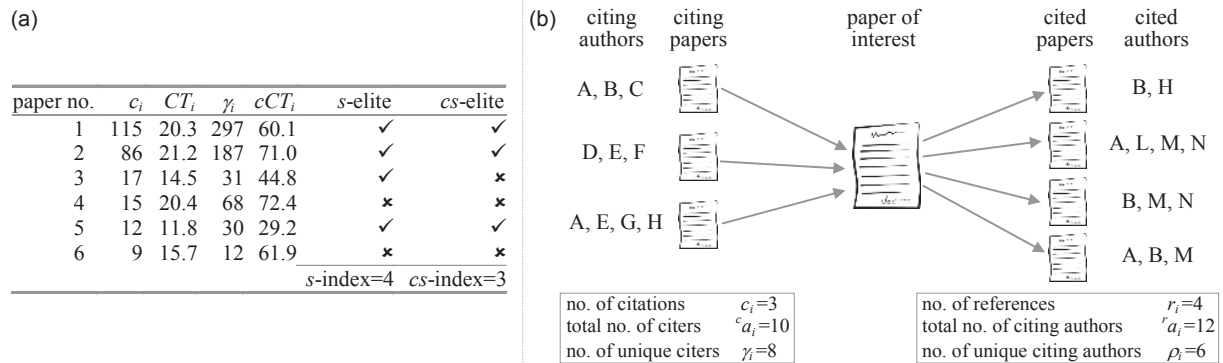


Figure 1. Propaedeutic examples: (a) calculation of the s - and cs -index for a fictitious set of papers, and (b) introduction of some indicators concerning the authors (represented by letters, e.g., A, B, C, etc.) of papers citing/cited by a fictitious paper of interest.

Similarly to CT_i , there are three basic steps when constructing the cCT_i relating to an i -th article of interest:

1. Selecting a sample of articles homologous to that interest.
2. Deciding whether to consider the distribution of (i) unique citers or (ii) unique cited authors, relating to the papers of the sample.
3. Defining cCT_i by an indicator of central tendency, applied to the distribution chosen at point (2).

The choice at point (2) is more delicate than in the case of the s -index. Intuitively, it may appear convenient to use the distribution of unique cited authors for the same reasons for which, in the case of the s -index, it was convenient to use the distribution of references. However, the link between unique citers and unique cited authors is not necessarily similar to that between r_i and c_i values; even in a model configuration of isolated fields:

$$\sum_{i=1}^P \gamma_i \text{ is not necessarily } = \sum_{i=1}^P \rho_i, \quad (7)$$

being

P the total number of papers in the isolated field;

γ_i the number of unique citers of the i -th paper;

ρ_i the number of unique authors cited by the i -th paper.

The reason for this lack of parallelism is twofold and will be examined later in the manuscript.

The rest of the paper is structured in three sections. The section “General link between citers and cited authors” investigates whether it is appropriate to construct the cCT_i by using the distribution of the number of unique authors cited by a sample of papers. The section “Preliminary Empirical analysis of the cs -

index” delves into the issue raised in the previous section, examining a large number of papers from different fields. After defining the cCT_i properly, it is studied the correlation between the s - and the cs -index. Finally, the section “Further remarks” summarizes the original contributions of the paper and the main advantages and disadvantages of the cs -index.

General link between citers and cited authors

Before getting into the problem, Figure 1(b) introduces the reader to the indicators and notation that will be used in the remaining of the paper.

Even modelling a scientific field as isolated and considering the totality of the scientific production in it, there are two possible elements of diversity among citing and cited papers: (i) different average number of authors per paper, and (ii) different percentage of unique authors. Let us clarify this point with simple

mathematical considerations. The quantity $\sum_{i=1}^P \gamma_i$ can be expressed as:

$$\sum_{i=1}^P \gamma_i = \left(\frac{\sum_{i=1}^P \gamma_i}{\sum_{i=1}^P {}^c a_i} \right) \cdot \left(\frac{\sum_{i=1}^P {}^c a_i}{\sum_{i=1}^P c_i} \right) \cdot \sum_{i=1}^P c_i = {}^c p \cdot {}^c app \cdot \sum_{i=1}^P c_i \quad (8)$$

in which

γ_i is the number of unique citers of the i -th paper in the isolated field;

${}^c a_i$ ($\geq \gamma_i$) is the total number of citers (even repeated, in the case that some citing papers are (co-)authored by the same individuals) related to the i -th paper;

c_i is the number of citing papers (or the number of citations obtained) relating to the i -th paper;

P is the total number of articles in the isolated field.

As shown in Eq. 8, the quantity $\sum_{i=1}^P \gamma_i$ can also be seen as the product of three

terms:

${}^c p = \sum \gamma_i / \sum {}^c a_i$ (≤ 1) i.e., the percentage of unique citers;

${}^c app = \sum {}^c a_i / \sum c_i$ (≥ 1) i.e., the average number of authors per citing paper;

$\sum_{i=1}^P c_i$ the total number of citations obtained.

A “decomposition” similar to that of Eq. 8 may apply to the quantity $\sum_{i=1}^P \rho_i$:

$$\sum_{i=1}^P \rho_i = \left(\frac{\sum_{i=1}^P \rho_i}{\sum_{i=1}^P {}^r a_i} \right) \cdot \left(\frac{\sum_{i=1}^P {}^r a_i}{\sum_{i=1}^P r_i} \right) \cdot \sum_{i=1}^P r_i = {}^r p \cdot {}^r app \cdot \sum_{i=1}^P r_i \quad (9)$$

in which

ρ_i is the number of unique authors cited by the i -th paper in the isolated field;

$r a_i$ ($\geq \rho_i$) is the total number of cited authors (even repeated, in the case that some cited papers are (co-)authored by the same individuals) related to the i -th paper;

r_i is the number of papers cited (or the number of bibliographic references) relating to the i -th paper;

P is the total number of articles in the isolated field.

Similarly to $\sum_{i=1}^P \gamma_i$, $\sum_{i=1}^P \rho_i$ can be seen as the product of three terms:

$$r_p = \sum \rho_i / \sum^r a_i (\leq 1) \text{ i.e., the percentage of unique cited authors;}$$

$$c_{app} = \sum^r a_i / \sum r_i (\geq 1) \text{ i.e., the average number of authors per cited paper.}$$

$$\sum_{i=1}^P r_i \text{ the total number of references given.}$$

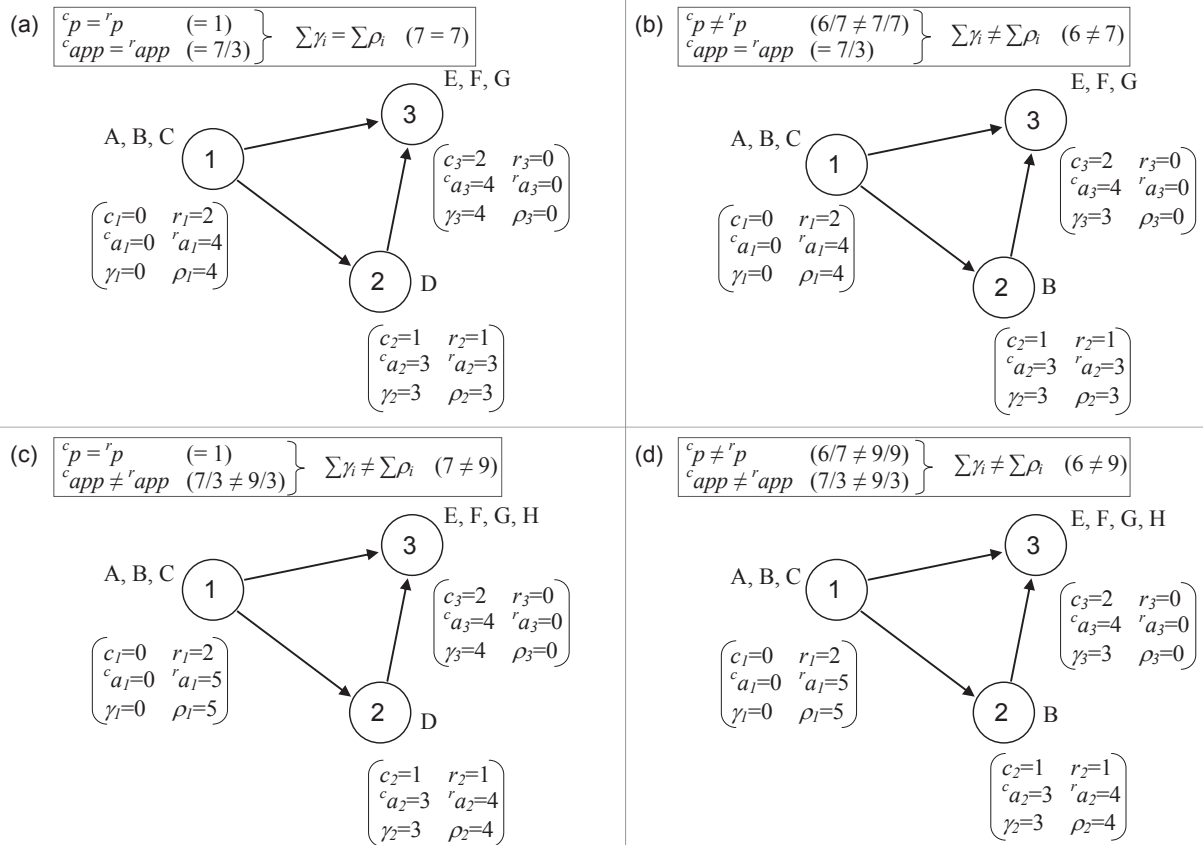


Figure 2. Examples of isolated groups of three papers. Nodes represent the papers (1, 2 and 3), whose authors are A, B, C, D, etc.; arrows represent the citations given by one paper to another. For each paper, it is reported the number of citations obtained (c_i), the number of references given (r_i), the number of total citers ($^c a_i$), the number of total cited authors ($^r a_i$), the number of unique citers (γ_i) and the number of unique cited authors (ρ_i). The equality of Eq. 7 is satisfied in case (a) only, when $c_p = r_p$ and $c_{app} = r_{app}$.

Combining Eqs. 8 and 9 with Eq. 3, it is obtained:

$$\sum_{i=1}^P \gamma_i = \left(\frac{{}^c p}{{}^r p} \cdot \frac{{}^c app}{{}^r app} \right) \cdot \sum_{i=1}^P \rho_i. \quad (10)$$

The “balanced” situation $\sum \gamma_i = \sum \rho_i$ can be achieved in the case the following two (sufficient but not necessary) conditions occur (also see the exemplification in Figure 2):

$$\begin{aligned} {}^c p &= {}^r p \\ {}^c app &= {}^r app \end{aligned} \quad (11)$$

that is to say, (i) equal average percentage of unique authors and (ii) equal average number of authors for the papers citing and being cited by the total P papers in the isolated field.

Eq. 7 could also be met without necessarily satisfying the two conditions in Eq. 11, that is to say in the case the quantity in brackets in Eq. 10 was unitary. However, there is no practical reason that justify the occurrence of this coincidence, which is purely conjectural. On the other hand, the two conditions of Eq. 11 seem reasonable for (citing and cited) papers within the same field. In any case, they will be tested empirically in the next section.

Table 1. List of journals analyzed within seven ISI subject categories (WoS). For each journal, we considered the research papers issued in the three-year period from 2008 to 2010.

Discipline (ISI Subject Category)	Journal and abbreviation	No. of papers			
		2008	2009	2010	Total
Biology	Bio1 - Bioscience	84	65	66	215
	Bio2 - Biology Direct	46	41	65	152
	Bio3 - Journal of Biosciences	60	65	52	177
Chemistry (analytical)	Che1 - Analytical Sciences	264	238	209	711
	Che2 - Journal of Chemometrics	83	68	76	227
	Che3 - Microchemical Journal	85	114	151	350
Engineering (manufacturing)	Eng1 - International J. of Machine Tools & Manufacture	164	139	118	421
	Eng2 - Robotics and Computer-Integrated Manufacturing	77	96	87	260
	Eng3 - Journal of Intelligent Manufacturing	57	62	71	190
Mathematics	Mat1 - Computational Complexity	20	20	21	61
	Mat2 - Constructive Approximation	31	46	38	115
	Mat3 - Advances in Mathematics	169	146	190	505
Medicine (general & internal)	Med1 - American Journal of Medicine	112	98	119	329
	Med2 - Mayo Clinic Proceedings	86	55	74	215
	Med3 - Medicine	33	40	30	103
Physics (applied)	Phy1 - Applied Physics Express	341	339	345	1025
	Phy2 - Current Applied Physics	177	430	436	1043
	Phy3 - Journal of Magnetic Resonance	230	214	241	685
Psychology	Psy1 - Journal of Experimental Psychology: Learning Memory and Cognition	66	94	52	212
	Psy 2 - Cognitive Psychology	18	26	24	68
	Psy 3 - Health Psychology	125	90	73	288

Preliminary empirical analysis of the *cs*-index

Data collection

A preliminary empirical analysis of the *cs*-index is performed by selecting some papers from a set of journals of seven different ISI subject categories (in brackets the total number of journals indexed by Thomson Scientific in each category): Biology (85), Analytical Chemistry (73), Manufacturing Engineering (37), Mathematics (289), General & Internal Medicine (155), Applied Physics (125), Psychology (75). For each discipline, we selected a random sample of three scientific journals. For each journal, we considered as articles of interest those produced in the three-year period from 2008 to 2010, limiting the selection to research papers only (other document types, such as reviews, conference papers or letters, were excluded). Table 1 contains the journal titles and the number of articles examined for each year. Data are retrieved by querying the Web of Science¹ (WoS) database (Thomson Reuters, 2012).

For each *i*-th article of interest, the following operations are performed.

1. Collection of the citation statistics, consisting of:

- c_i the number of citing papers published in 2011 and indexed by the database in use;
- ${}^c a_i$ the total number of authors of the (c_i) citing papers (even repeated, if different citing papers are (co-)authored by the same individuals);
- γ_i the total number of unique citers, obtained by performing the union of the (${}^c a_i$) total citers and removing those repeated.

The choice of a time window for citations accumulation of one year (2011) is to simplify the analysis.

2. Determination of an appropriate cCT_i , which takes into account the propensity to obtain citations from different authors. The construction of cCT_i is based on a sample of S articles that are issued in 2011 by the same journal of the (*i*-th) article of interest.

For each *j*-th of the articles of the sample, we determine:

- r_j the number of cited papers that were published in the three-year period from 2008 to 2010 and are indexed by the database in use. These constraints were introduced to be consistent with the time window described at point (1) (Moed, 2011);
- ${}^r a_j$ the total number of cited authors (even repeated, if different cited papers are authored by the same individuals);
- ρ_j the total number of unique cited authors, obtained by the union of the (${}^r a_j$) total cited authors, removing those repeated.

Next, the distribution of the ρ_j values (relating to the papers of the sample) is constructed and the cCT_i is defined by an appropriate central tendency indicator – e.g., the mean ($\bar{\rho}$) or median ($\tilde{\rho}$). This construction is based on the assumption that, referring to the *i*-th article, the propensity to be cited by

different authors is, on average, reasonably close to the propensity to cite different authors, referring to articles issued by the same journal. According to this construction, articles published in the same journal and in the same year will have the same cCT_i value. Probably, a more rigorous way to estimate the cCT_i – but also computationally more expensive – is to use the distribution of the ρ_j values relating to the articles that cite other articles, issued by the article of interest’s journal. For further information about this point, please refer to (Franceschini et al., 2012c).

Table 2. Summary of the analysis results. For each of the journals (in Table 1), we report the indicators illustrated in the “Data collection” sub-section. Overall indicators are obtained by aggregating the data relating to the three journals examined in each field.

Field	Journ.	c_{app}	r_{app}	c_p	r_p	P	C	CPP	h	ch	S	R	cCT_i				CT_i			
													$\bar{\rho}$	$\tilde{\rho}$	$(\bar{\rho})$	$(\tilde{\rho})$	\bar{r}	\tilde{r}	(\bar{r})	(\tilde{r})
Bio	Bio1	4.6	5.5	0.95	0.91	215	1131	5.3	14	37	76	792	52.3	35.0	25	38	10.4	9.0	30	35
	Bio2	4.9	6.5	0.94	0.86	152	469	3.1	9	26	59	943	89.4	60.0	3	4	16.0	14.0	2	2
	Bio3	5.3	5.9	0.86	0.93	177	274	1.5	7	19	71	382	29.3	18.0	9	20	5.4	4.0	16	17
	overall	4.8	6.0	0.93	0.89	544	1874	3.4	15	45	206	2117	55.0	35.0	31	57	10.3	8.5	37	52
Che	Che1	4.4	4.5	0.89	0.83	711	905	1.3	7	20	191	1076	21.1	17.0	14	30	5.6	5.0	14	14
	Che2	3.9	3.9	0.92	0.86	227	371	1.6	7	17	65	304	15.8	12.0	22	29	4.7	4.0	15	15
	Che3	4.3	4.3	0.92	0.88	350	948	2.7	9	28	185	1274	25.9	22.0	35	50	6.9	5.0	29	51
	overall	4.3	4.3	0.91	0.86	1288	2224	1.7	10	30	441	2654	22.4	17.0	71	128	6.0	5.0	44	78
Eng	Eng1	3.6	3.3	0.86	0.84	421	1148	2.7	9	23	98	392	11.3	9.0	115	142	4.0	3.0	78	126
	Eng2	3.2	3.1	0.93	0.88	260	374	1.4	6	15	101	229	6.2	5.0	74	86	2.3	2.0	57	57
	Eng3	3.0	2.8	0.90	0.93	190	191	1.0	6	10	78	140	4.6	3.0	41	54	1.8	1.0	43	43
	overall	3.4	3.2	0.88	0.87	871	1713	2.0	10	24	277	761	7.6	5.0	261	341	2.7	2.0	266	266
Mat	Mat1	2.2	2.4	0.92	0.86	61	39	0.6	2	6	19	25	2.7	1.0	11	17	1.3	1.0	11	11
	Mat2	2.5	2.1	0.88	0.80	115	178	1.5	4	8	36	87	4.0	3.0	18	26	2.4	1.0	17	31
	Mat3	1.9	2.0	0.88	0.77	687	912	1.3	7	11	290	819	4.3	3.0	113	157	2.8	2.0	126	126
	overall	2.0	2.0	0.88	0.77	863	1129	1.3	7	13	345	931	4.2	3.0	138	190	2.7	2.0	145	145
Med	Med1	5.3	7.5	0.93	0.91	329	533	1.6	6	25	125	946	51.4	36.0	1	7	7.6	6.0	1	4
	Med2	5.3	6.8	0.92	0.89	215	996	4.6	14	37	75	833	66.8	42.0	12	31	11.1	8.0	18	27
	Med3	5.6	7.7	0.92	0.91	103	489	4.7	10	29	48	424	61.8	45.5	7	12	8.8	7.0	17	20
	overall	5.4	7.3	0.92	0.90	647	2018	3.1	15	44	248	2203	58.1	40.0	26	56	8.9	6.0	45	82
Phy	Phy1	5.8	6.1	0.82	0.81	1025	2919	2.8	17	50	418	2483	29.1	24.0	122	147	5.9	5.0	149	149
	Phy2	4.5	4.8	0.89	0.85	1043	1939	1.9	12	34	526	2573	20.1	14.0	99	160	4.9	4.0	111	111
	Phy3	4.4	4.5	0.87	0.79	685	1579	2.3	11	31	243	1671	24.1	19.0	53	80	6.9	6.0	37	37
	overall	5.1	5.2	0.85	0.82	2753	6437	2.3	17	55	1187	6727	24.1	19.0	270	395	5.7	5.0	287	287
Psy	Psy1	2.9	2.7	0.89	0.79	212	545	2.6	10	18	78	596	16.7	15.0	20	23	7.6	7.0	12	12
	Psy2	2.9	2.5	0.88	0.85	68	298	4.4	7	16	17	172	21.3	19.0	10	11	10.1	9.0	5	5
	Psy3	4.3	4.4	0.93	0.89	288	1245	4.3	12	35	90	738	32.4	26.0	43	58	8.2	7.0	32	41
	overall	3.8	3.5	0.92	0.86	568	2088	3.7	15	37	185	1506	24.7	19.0	87	121	8.1	7.0	50	60

The cs -index related to the articles of each journal can be calculated using the cCT_i determined at point (2) (according to Eq. 5). The information at point (2) can also be used to determine the average number of authors (r_{app}) and the percentage of unique authors (r_p) of the articles cited by the (S) articles of the sample (see Eq. 9). Similarly, the information at point (1) can be used to determine the average number of authors (c_{app}) and the percentage of unique authors (c_p) of the articles that cite the (P) articles of interest (see Eq. 8).

The overall c_{app} , r_{app} , c_p and r_p values of the seven fields examined can be estimated by aggregating data related to the three journals considered in each discipline.

Information at point (1) can also be used to build other indicators: C (i.e., total number of citations), CPP (i.e., average citations per paper), h , ch and s . As regards the s -index, we will compare the (c_i) citations obtained by each (i -th) paper with a CT_i represented by the mean or median number of references (\bar{r}_j and \tilde{r}_j respectively) that are given by each (j -th) of the articles of the sample.

Conventionally, all indicators are constructed considering the citations obtained in 2011 and the references given to (cited) articles, issued from 2008 to 2010 and indexed by WoS.

Data analysis

Table 2 summarises the results of the empirical analysis. For each journal, the $C = \sum c_i$ total citing papers are those citing each (i -th) of the P papers of interest, and the $R = \sum r_i$ total cited papers are the ones cited by each (j -th) of the S articles of the sample. All statistics were constructed considering the aforementioned time windows and the papers indexed by WoS.

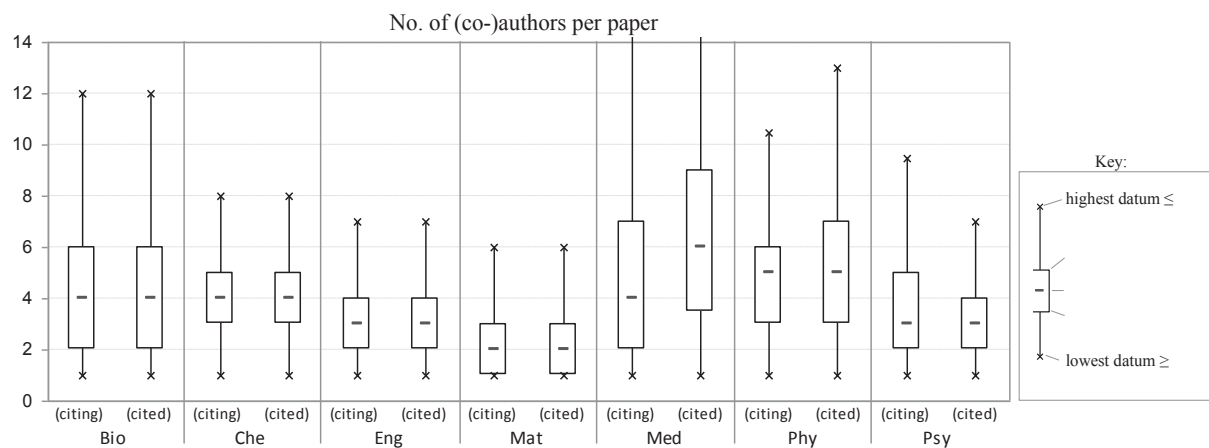


Figure 3. Box-plot of the distribution of the number of (co-)authors relating to the citing and cited papers, concerning the seven fields examined. Citing papers are those that cite the P papers of interest while cited papers are those cited by the S papers of the macro-sample. $Q^{(1)}$, $Q^{(2)}$ and $Q^{(3)}$ are the first, second and the third quartile of the distributions of interest.

For a specific journal, there are marginal differences between citing and cited authors, as regards (i) the average number of authors per paper (i.e., capp and rapp values) and (ii) the percentage of unique authors (i.e., cp and rp values).

Besides, there are relatively small variations among the three journals in a specific field. For this reason, it seems appropriate to calculate some aggregated indicators for the whole disciplines (see “overall” indicators in Table 2). The determination of the overall indicators – by joining the data related to the three journals in each discipline – is extended to all the indicators presented in Table 2. In the case of the cs -index and s -index, overall indicators are constructed using cCT_i and CT_i

values determined on the basis of macro-samples obtained by joining the articles issued in 2011 by the three journals selected for each discipline.

Returning to the comparison between ${}^c app$ and ${}^r app$ values in each field, a simple way to visualize their similarity is through box-plots based on overall statistics. In particular, two distributions are considered; (i) that of the number of authors per paper relating to articles that cite the papers of interest, and (ii) that of the papers cited by the papers of the (macro-)sample (see Figure 3).

It can be seen that, for each discipline, the notches of the two box-plots (respectively for citing and cited papers) almost completely overlap, supporting the view of absence of systematic differences between the two distributions. The same hypothesis can be tested by more rigorous statistical tests, albeit introducing additional assumptions about distributions. On the contrary, when comparing different fields there are systematic differences, confirming what observed in other studies (Glänzel, 2002). For example, let us consider the comparison between the notches relating to Mathematics and Physics.

As regards the comparison between ${}^c p$ and ${}^r p$ values, the question is a bit more complicated: the overall percentages of different authors (respectively citing or cited) can be seen as weighted averages of the same percentages, at the level of individual papers:

$$\begin{aligned} {}^c p &= \left(\sum_{i=1}^P \gamma_i \right) / \left(\sum_{i=1}^P {}^c a_i \right) = \left(\sum_{i=1}^P {}^c p_i \cdot {}^c a_i \right) / \left(\sum_{i=1}^P {}^c a_i \right) \\ {}^r p &= \left(\sum_{j=1}^S \rho_j \right) / \left(\sum_{j=1}^S {}^r a_j \right) = \left(\sum_{j=1}^S {}^r p_j \cdot {}^r a_j \right) / \left(\sum_{j=1}^S {}^r a_j \right), \end{aligned} \quad (13)$$

being

${}^c p_i$ the percentage of unique citers relating to the i -th of the P papers of interest;
 ${}^c a_i$ the “weight” of ${}^c p_i$, i.e., the number of authors (even repeated) citing the i -th paper;

${}^r p_j$ the percentage of unique authors cited by the j -th of the S papers of the sample;

${}^r a_j$ the “weight” of ${}^r p_j$, i.e., the number of authors (even repeated) cited by the j -th paper.

Being ${}^c p$ and ${}^r p$ weighted quantities, one can represent the distributions of ${}^c p_i$ and ${}^r p_j$ values by special box-plots based on *weighted quartiles*, defined as:

- ${}^c Q_w^{(1)}$, ${}^c Q_w^{(2)}$ and ${}^c Q_w^{(3)}$, i.e., the weighted first, second (or weighted median) and third quartile of the ${}^c p_i$ values. These indicators are obtained by ordering in ascending order the ${}^c p_i$ values of the articles of interest and considering the values for which the cumulative of weights is equal to respectively the 25%, 50% and 75% of their sum;
- ${}^r Q_w^{(1)}$, ${}^r Q_w^{(2)}$ and ${}^r Q_w^{(3)}$, i.e., the weighted first, second (i.e., the weighted median) and third quartile of the ${}^r p_j$ values.

The box-plots relating to weighted quartiles are represented in Figure 4. The differences between the ${}^c p_i$ and ${}^r p_j$ distributions within the same field seem insignificant. We also note the absence of significant differences between fields.

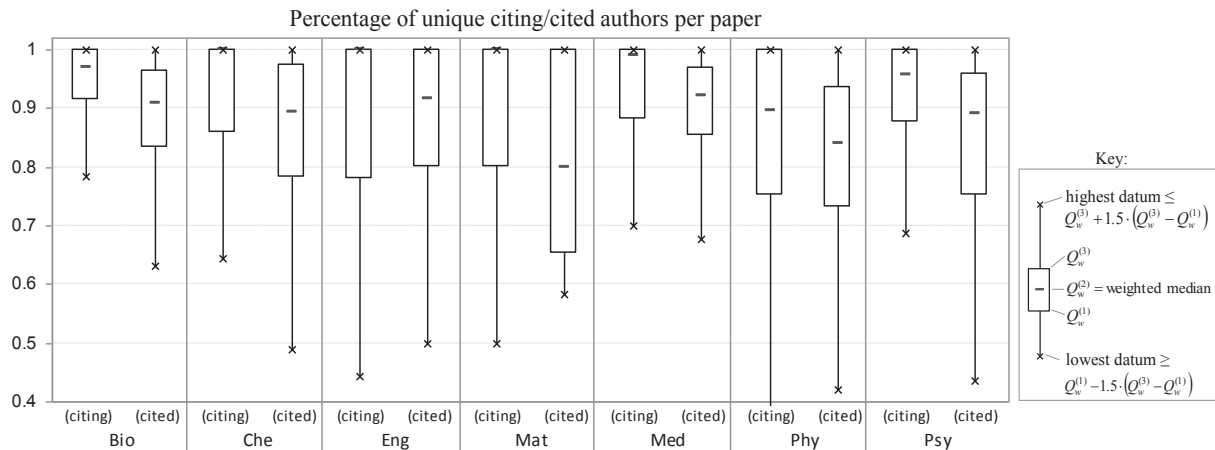


Figure 4. “Weighted” box-plot of the percentage of unique citing (${}^c p_i$) and cited authors (${}^r p_j$), relating to the papers that cite the papers of interest and are cited by the papers of the macro-sample, in the seven fields examined. $Q_w^{(1)}$, $Q_w^{(2)}$ and $Q_w^{(3)}$ are the first, second and the third weighted quartile of the distributions of interest

Returning to Table 2, there are relatively little differences in terms of cCT_i values (i.e., estimators of the propensity to cite different authors), for journals of the same field. Some exceptions are: Bio2 for Biology and Eng1 for Engineering. This incomplete uniformity is probably due to the fact that some journals are influenced by publications of neighbouring fields, with different citation propensity. For a more rigorous estimate, it would probably be appropriate to define cCT_i s using a larger sample of papers/journals.

For each journal, in Table 2 are reported two different cCT_i s: i.e., using $\bar{\rho}$ and $\tilde{\rho}$. In general, the resulting values are higher in the first case. This probably depends on the incidence of papers characterized by hyperauthorship – i.e., literally tens or even hundreds of authors (Cronin, 2001) – which tends to “inflate” $\bar{\rho}$ but not $\tilde{\rho}$, as the latter indicator is only marginally sensitive to the right tail of the distribution of ρ_j values.

Another interesting aspect is the link between cs -index and s -index. The diagram in Figure 5 – which is constructed using $cCT_i = \bar{\rho}$ and $CT_i = \bar{r}$ (in Table 2) – shows a strong correlation ($R^2 \approx 89\%$), similar to that between ch and h (Franceschini et al., 2010; Egghe, 2012). All the points of the graph – although resulting from articles of different scientific fields – tend to be distributed around the same trend line, which is very close to the bisector of the cs - s plane.

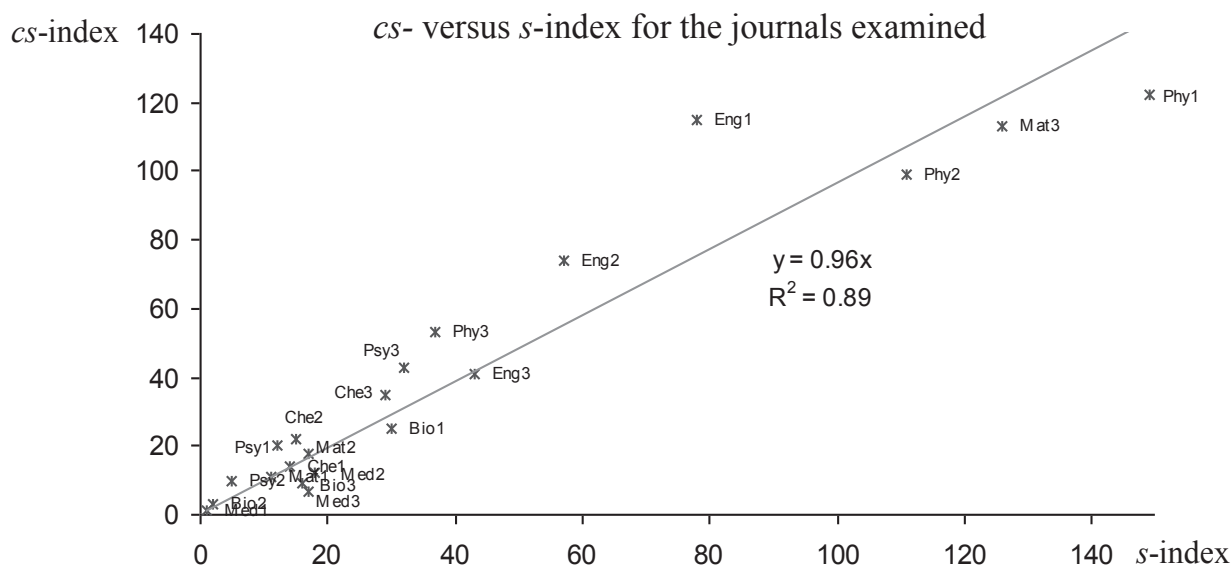


Figure 5. Relationship between the *cs*- and *s*-index for the journals examined. Indicators are calculated considering respectively $cCT_i = \bar{\rho}$ and $CT_i = \bar{r}$ (see Table 2).

In the absence of “anomalies” – e.g., high incidence of self-citations or citations from recurrent citing authors – the *cs*-index and *s*-index should be very close. Therefore, the study of their difference can be useful to highlight abnormal situations. For example, consider the point related to Med3 in Figure 5, which corresponds to a relatively high value of *s*-index, associated to a quite small value of *cs*-index, probably due to a relatively high incidence of self citers and recurrent citing authors. On the contrary, the point related to Eng1 denotes an opposite situation, in which *cs*-index is much larger than *s*-index. probably due to an opposite attitude.

Further remarks

This study revealed some interesting points that it is worth summarizing and developing in the following:

- The analysis suggests that the comparison term (cCT_i) of the *cs*-index can be constructed using the distribution of the ρ_j values related to the papers of a sample. This is justified by the absence of systematic differences between (i) the average number of authors and (ii) the average percentage of unique authors, between citing and cited papers in a certain field. On the other hand, the analysis confirmed some systematic differences between fields, as regards the average number of authors per paper.
- The *cs*-index is an indicator that, although generally correlated with the *s*-index, can complement it, being only marginally affected by self-citations and citations from recurrent citers.
- Similarly to the *s*-index, the *cs*-index has an immediate meaning and is practical for normalizations aimed at obtaining the so-called size-

independency, thanks to the ratio scale property (Franceschini et al., 2012a). For example, scientific journals with a different number (P) of articles could be easily compared by means of the percentage of “successful” papers, i.e., $cs\text{-index}/P$.

- Even if it was not shown directly in this paper, another advantage “inherited” by the s -index is that cs -index can be calculated for a set of multidisciplinary articles, thanks to the field-normalization that it achieves at the level of individual paper. For example, the cs -index can be used as a proxy for synthesizing the productivity and impact of (i) the whole publication output of scientists involved in multiple disciplines (e.g., mathematicians or computer scientists actively involved in bibliometrics), or (ii) that of entire multidisciplinary research institutions.
- A disadvantage of the cs -index is the computational complexity of the cCT_i values. E.g., our data collection and analysis – which was performed by an *ad hoc* application software able to query the WoS database automatically – took about twenty consecutive hours.
- Another potential drawback of cs -index is represented by hyperauthorship, which could lead to inflate cCT_i values. A partial solution to this problem is (i) to determine cCT_i by indicators that are insensitive to the right-hand tail of the distribution of ρ_j (e.g., $\tilde{\rho}$), or (ii) to apply some exclusion criteria, so as to curtail the count of the authors of a certain paper, according to a conventional threshold.

¹ The WoS database configuration included the following resources: Citation Index Expanded (SCI-EXPANDED) from 1970 to present, Social Sciences Citation Index (SSCI) from 1970 to present, Arts & Humanities Citation Index (A&HCI) from 1975 to present, Conference Proceedings Citation Index - Science (CPCI-S) from 1990 to present, Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH) from 1990 to present.

References

- Ajiferuke, I. & Wolfram, D. (2010). Citer analysis as a measure of research impact: Library and information science as a case study. *Scientometrics*, 83(3), 623–638.
- Bornmann, L. (2013). A better alternative to the h index. *Journal of Informetrics*, 7(1), 100.
- Braun, T., Glänzel, W. & Schubert, A. (1985). *Scientometric Indicators: A 32-country comparative evaluation of publishing performance and citation impact*. Philadelphia: World Scientific.
- Cronin, B. (2001). Hyperauthorship: A postmodern perversion or evidence of a structural shift in scholarly communication practices? *Journal of the American Society for Information Science and Technology*, 52(7), 558–569.
- Dieks, D. & Chang, K.H. (1976). Differences in impact of scientific publications: Some indices derived from a citation analysis. *Social Studies of Science*, 6(2), 247–267.

- Egghe, L. & Rousseau, R. (1990). *Introduction to Informetrics: Quantitative Methods in Library, documentation and Information Science*, Amsterdam: Elsevier.
- Egghe, L. (2012). A rationale for the relation between the citer h-index and the classical h-index of a researcher, to appear in *Scientometrics*, DOI 10.1007/s11192-012-0770-1.
- Franceschini, F., Maisano, D., Perotti A. & Proto A. (2010). Analysis of the *ch*-index: an indicator to evaluate the diffusion of scientific research output by citers, *Scientometrics*, 85(1), 203–217.
- Franceschini, F., Galetto, M., Maisano, D. & Mastrogiacomo, L. (2012a). The success-index: an alternative approach to the h-index for evaluating an individual's research output, *Scientometrics*, 92(3), 621-641.
- Franceschini, F., Galetto, M., Maisano, D. & Mastrogiacomo, L. (2012b). Further clarifications about the success-index, *Journal of Informetrics*, 6(4): 669–673.
- Franceschini, F., Maisano, D. & Mastrogiacomo, L. (2012c). Evaluating research institutions: the potential of the success-index, to appear in *Scientometrics*, DOI 10.1007/s11192-012-0887-2.
- Glänzel, W. (2002). Coauthorship patterns and trends in the sciences (1980-1998): A bibliometric study with implications for database indexing and search strategies, *Library Trends*, 50(3), 461–473.
- Glänzel, W. (2011). The application of characteristic scores and scales to the evaluation and ranking of scientific journals, *Journal of Information Science*, 37(1), 40–48.
- Hirsch, J.E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences of the United States of America*, 102, 16569–16572.
- ISI Web of Knowledge (2012). Essential Science Indicators. <http://thomsonreuters.com> [Nov. 2012]
- Moed, H.F. (2011). The Source-Normalized Impact per Paper (SNIP) is a valid and sophisticated indicator of journal citation impact. *Journal of the American Society for Information Science and Technology*, 62(1), 211–213.
- Thomson Reuters (2012) 2011 Journal Citation Reports – Science Edition, www.isiknowledge.com.
- Vinkler, P. (2011). Application of the distribution of citations among publications in scientometric evaluations, *Journal of the American Society for Information Science and Technology*, 62(10), 1963–1978.