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INTRODUCTION

Open science, open access as one of its important platform and instrument and altmetrics (i.e., alternative metrics), as its possible assessment tool, have gained huge importance since their emergence during the last decade. Priem and Hemminger (2010) have outlined this new concept, compiled a comprehensive list of relevant services and provided a critical look at uses, limita-

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tions and future challenges. In their article they also heralded the emergence of a new paradigmatic "Scientometrics 2.0" model. The expectations of the new metrics are enormous and so is the enthusiasm for their use. Unfortunately, their use is, at present, even less critical (and sometimes careless) than it was about three decades before in the case of the emergence of their predecessor metrics. Bibliometricians have already raised their voice (e.g., Wouters and Costas, 2012; Gumpenberger at al., 2016) to admonish of latent and real challenges and dangers in the use of the new metrics. Before we give a short summary of the recent discussion, we briefly review the development from scientometrics till its recent opening towards a possible broader discipline called 'scientometrics 2.0'.

SCIENTOMETRICS 1.X – A HISTORICAL SKETCH

From the historical viewpoint, scientometrics expresses the development of methods, indicators (metrics) for monitoring and measuring quantitative aspects of *scholarly communication*. It was originally developed for application to the basic sciences, first within the framework of scientific information. With time elapsing, the increasing demand for indicators in research evaluation resulted in a '*perspective shift*' (Glänzel, 2006). The main field of application of the metrics was now laid in evaluation and assessment of scientific research. As the first consequence of this shift, both scientometricians and users were faced with a change in application contexts and interpretation of indicators. Indicators became gradually used in contexts for which they never were designed (cf. journal Impact Factors) and measures of scholars' communication patterns (cf. author self-citations) were, in the light of the new focus, re-interpreted. Inevitably, first limitations became apparent, uninformed use occurred and earned the attention of both researchers and users. – This was the era of scientometrics 1.0.

Following the pioneering days of the field and its coming of age, a new challenge was issued to the meanwhile established discipline: the necessary extension towards applied sciences, and later on also to the social sciences and humanities (SSH) and technology. The extension of data sources and partially broadening the scope of scientometrics resulted in what can be considered scientometrics 1.x versions. It has two main characteristics: on one hand the already mentioned "perspective shift" and the trend to the applications to lower levels of aggregation, away from the macro level down to the meso level and increasingly to the evaluation of individual scientists (challenges of individual-level bibliometrics – cf. Wouters et al., 2013). In short, the changes are not only shown in the shift of different targeted samples but also in the scale of scientometric analyses.

The advanced features of Scientometrics 1.x and the challenges from them involve in several issues. The opening and inclusion of new data sources has become an essential prerequisite to meet these challenges. New data sources including proceedings, books, national sources and the web became integrated in the traditional foundation of bibliometrics. Hence also data-related issues arose, including big-data related issues, such as data cleaning, name disambiguation and coping with redundancies. Other issues arising from this broadening the scope of scientometrics were of more conceptual and methodological nature as being closely related to specific cultures in scholarly communication of various fields, notably in the applied, social sciences and the humanities, but also meso- and micro-level specific issues like individual co-authorship, gender, publication in OA require new qualities of data processing and a higher granularity of information.

Beyond doubt, the traditional scientometric 1.x model had undeniable *strengths*. First, as to data sources it was based on a dynamic but closed universe: unique, mostly multidisciplinary bibliographic databases such as The ISI Science Citation Index, later on, its successor, Thomson Reuters Web of

Science, or Elsevier's Scopus. This offered a great potential for standardisation and integration of indicators, which, in turn, facilitates comparability of scientometric result. Since it was restricted to the measurement of *scholarly communication*, it furthermore provides clear definitions of actors, impact and the users of information within this framework (i.e., scholars themselves) and this facilitates the interpretation of scientometric results. Third, because of the general availability of the mostly proprietary data products it shows high level of reproducibility and documentability. Fourth, it proved to work at any level of aggregation and useful in combination with peer review system also at lower levels of aggregation. Finally, mathematical-statistical models for a variety of processes (publication activity, citation impact, co-authorship, citation-based networks, literature growth and evolution, etc.) could successfully be applied to the empirical results.

The other side of the coin are the *limitations* of the scientometrics 1.x model that should not be ignored. Various opportunities and limitations have been discussed among others by Glänzel and Debackere (2003). Most of those are of methodological or technical nature and concern the use and application of results and indicators. Apart from these, perhaps the most general and conceptual limitation is due to the focus on scholarly communication. However, web-based data sources go, at least in part, already beyond this framework (cf. Google Scholar, web[o]metrics). As an example shown in a small-scale study, Hoffmann et al. (2014) observed no correlation of online communication activity with any of the more established impact measures.

SCIENTOMETRICS 2.0 – PROMISES, CHALLENGES AND LIMITATIONS

Recently, the conception of Scientometrics 2.0 was proposed to embrace a big step towards the measurement of societal impact and "broader impacts" of research and to cover "open science" – 'social media metrics' or 'alternative metrics' as groundwork and components for a "Scientometrics 2.0" (Priem and Hemminger, 2010). As possible sources Priem and Hemminger recommended to include bookmarking, reference managers, recommendation systems, comments on articles, microblogging, Wikipedia, blogging, and other sources such as social networks, video, and open data repositories.

PROMISES

One of the most important promises is, of course, to overcome a number of limitations of the scientometrics 1.x model, above all, the restriction to the measurement of scholarly communication and impact. Within this broader scope of new version of Scientometrics 2.0, in general, and altmetrics, in particular, a number of important features and promises have been addressed. Thus Sugimoto (2016) pointed to the increasing demand for showing impact of research beyond academia, and democratising the impact by giving greater voice and vote, e.g., to underrepresented groups (gender, ethnicity, disability, geographic etc.) in determining impact. The other main promises of Scientometrics 2.0 is from social networks. Network-based approaches based on social media data may also contribute to a more diversified system of scientific impact assessment by adding a relational and social capital-based perspective (Hoffman et al., 2014).

CHALLENGES AND LIMITATIONS

The promises are contrasted by a number of challenges and limitations have been summarised by Wouters and Costas (2012), Sugimoto (2016) and Gumpenberger et al. (2016), including:

- Analyses are usually conducted at the individual (micro) level and most benefits

of Scientometrics 2.0 are at the micro level. However, the aggregation at higher levels is questionable, so that the validly, reliability and feasibility of the large scale studies are one of the main challenges.

- A number of assumptions not yet validated and tested but the high dynamics and rapid development of online and electronic communications (Web 2.0 – and beyond?) would increase the difficulties for altmetrics to keep pace with this development once validated and implemented.

- More transparency and clarity in the data covered is needed. There is not yet any clear definition of actors on both sides. Thus if we talk about impact – impact upon whom is meant? And what are the potential biases in terms of actor and user profiles? Without clarification the standardization and normalization of measures is hardly conceivable.

- Data quality: Automated processes produce errors and influence social media metrics.

- In contrast to the previous scientometrics model, altmetrics still lacks mathematical background and proper models, which impede the clear interpretation of indicators. Issues caused by the use of composite indicators and the arbitrariness of their construction make their interpretation and comparability even more difficult. One of the goals of the altmetrics movement was to overcome the flaws of the traditional citation-based indicators but instead new 'all-in-one' indicators are created ("old habits die hard").

To conclude, we refer to van Noorden's (2014, p. 129) statement: "Some analysts argue that despite their millions of users, massive social academic networking sites have not yet proven their essential worth." What the future will bring for scientometrics 2.0 thus remains to be seen.

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ASSOCIATION FOR INFORMATION SCIENCE AND TECHNOLOGY (ASIS&T):

THE AWARD OF MERIT

This most prestigious award in ASIST, at the annual conference in Copenhagen on October 18, 2016, has been given to Professor Peter Ingwersen. The Award is a beautiful silver bowl.

He served for many years as Professor of Information Science at RSLIS and, in 2010 he became a Professor Emeritus of the University of Copenhagen. He is also Affiliate Professor and Honoris Causa at universities in Finland and Spain.

Dr. Ingwersen's research encompasses two chief domains (1) information retrieval, and (2) bibliometrics and especially, webometrics.

He is known for development of the *Cognitive Theory of Information Retrieval*, as an attempt to globalize IR through the representation of all components in an integrated approach. Dr. Ingwersen also contributed a global model called *poly-representation*, based on inferential logic which indicates that the more overlapping evidence one has from representation of documents and the relationship between them, the more likely that the retrieval results will resemble the information situation of the user.

Dr. Ingwersen, with Almind, was the first to analyze in 1997, the web with bibliometric techniques. He is considered the *"father of webometrics"*, in this area, he also designed the so-called Web Indicators for measuring the Web Impact – a theory and a school followed by many researchers.

In the nomination it was strongly emphasized his mentorship and support to many colleagues and students all over the world.

IDENTIFICATION, LOCATION AND TEMPORAL EVOLUTION OF TOPICS DATA AND ALGORITHM—COMPARISON OF APPROACHES

CONFERENCE SUMMARY

LIBRARY AND INFORMATION CENTRE OF THE
HUNGARIAN ACADEMY OF SCIENCES, BUDAPEST, HUNGARY
29–30 AUGUST 2016

SÁNDOR SOÓS
Dept. Science Policy & Scientometrics,
Library and Information Centre of the Hungarian Academy of Sciences
Budapest, Hungary

THE TIMELY PROBLEM

From science studies to research evaluation to science policy, there is an increasing need for trustworthy information on how the science system is organized and evolving, where research fronts are located etc. The branch of scientometrics called *science mapping* has developed a wide variety of methods to address such issues. In fact, it reached a point where a next generation of questions naturally arised: How to identify the most suitable methods? What benchmarks to use for validating

results of topic detection and for delineating fields of science? How field experts and expertise should be engaged? How, and to what extent, can research evaluation or science policy utilize, or even be built upon the results of science mapping? The workshop in Budapest, co-funded by the *Knowescape* Cost Action and the IMPACT EV FP7 project, and following a series of workshops in Berlin, Amsterdam, Istanbul (at ISSI 2015), was organized to address these problems, stated in the title of the corresponding special issue of *Scientometrics* as "*Same data, different results*".

BIBLIOMETRIC ADVANCEMENTS AND COMPETING METHODOLOGIES

Demonstrating the core concept of the workshop, **Theresa Velden** exposed the fundamental challenge stemming from the rich variety of bibliometric methods available for scientific topic detection. Based on a large-scale publication dataset on astrophysics, both citation-and-reference-based and text mining solutions, implemented in a joint exercise by expert groups worldwide (CWTS, ECOOM, SciTech Inc, OCLC, etc.), were confronted. A systematic comparison between methods and the resulting topical structures for the field of astrophysics revealed that both the choice on data models (making use of citation links as direct citations, for bibliographic coupling or co-citation measurement) and extraction (clustering) algorithms significantly affect the topical landscape. It points towards the importance of selecting the method most tightly fitting the research or policy question at hand, which is probably both the solution and the main challenge behind topic identification. Beyond testing up-to-date variants of now-conventional methods acting on metadata, elaborating on (full)text mining approaches in bibliometric settings was also an extensive branch of communication. **Wolfgang Glänzel** proposed statistically re(de)fined methods of mining the topical composition of scholarly corpuses, borrowed from quantitative linguistics and tagged as "nano-level" scientometrics for evaluative purposes. **Haluk Bingol** was focusing on citation analysis being sensitive to the textual context of citation, while **George Kampis** presented a "blindfolded" solution of uncovering topical dynamics within large-scale on-line textual data. As a corollary, the combination of citation- and text-based methods was presented by **Edgar Schiebel**, who presented a sophisticated hybrid workflow of detecting research fronts based on various recent developments.

ALGORITHMS: THE PHYSICS OF BIBLIOMETRICS

Beyond data models (link- or text-based) and associated infoscience methods, another salient direction of the two-day discourse was the interplay and methodological overlap between bibliometrics and various scientific domains, regarding topic detection. Most prominently, expert from physics, the study of complex systems and complex networks presented valuable insights on how the advancements in network science could better be utilized in science mapping. **Tim Evans** introduced a rather unconventional approach of remodelling document citation networks within the framework of space-time geometry ("netometry"), to uncover topics and their evolution in a natural way. At the heart of **Péter Pollner**'s approach lied the succesful "cfinder" algorithm developed for complex networks to uncover overlapping communities (hence, topics) and their relations, grounding also the identification of changing roles for publications throughout their citation

history; **Gergely Tibély**, from the same Hungarian research group, continued with a set of models tailored towards detecting hierarchies in complex networks, used in constructing a science map on the organization of disciplines via hierarchical ordering of scientific journals by citation relations.

OUTREACH: INTERFACES WITH SCIENCE POLICY

Being of outstanding importance, the issues and methods of mapping the science system (e.g. the delineation of fields) as a science policy tool played an important role in the workshop. **Kevin Boyack** triggered great interest by highlighting the findings of their recent research on hitherto neglected factors behind the research focus of nations, namely altruistic vs. economic motives, which study was utilizing their proposed high precision global science map. **Petra Ahrweiler** introduced a new project that utilizes knowledge mapping techniques and visual analytics to reveal the relations between societal expectations and European policies (such as New and Emerging Technologies, NEST and Responsible Research and Innovation, RRI). The interplay between science policy and science mapping was articulated by **Sándor Soós** while exposing the work done under the IMPACT EV FP7 project, the latter focusing on the impact of European SSH research. Science mapping, in this case, served as a tool for comparing the evolution and aspects of multidisciplinarity within social vs. natural sciences, in order to inform research evaluation practices targeting the outcome of EU funded SSH projects.

LESSONS TO LEARN

Complemented by a series of theme-oriented discussions and author panels, the workshop offered quite a lot to learn, in terms of both novel technical solutions and long-needed conceptual insights. Fundamental is the consensus that emerged from various discussions (including an author panel on an upcoming special issue of *Scientometrics* entitled *Same data, different results*, or a roundtable discussion on validation methods and future challenges, led by **Andrea Scharnhorst**, **Jochen Gläser** and **Theresa Velden**), that bibliometrics is a fast evolving field utilizing diverse methods, analytic frameworks, techniques from various scientific domains (cf. theory of complex networks), therefore, a smooth and more fruitful communication should take place between these domains. It would be necessary for avoiding the "black box" effect of transdisciplinary applications (as **Jochen Gläser** put it), that is to gain full awareness of built-in assumptions and scope of methods, of what is artifactual vs. real in mapping results. Also, better communication would assure that state-of-the-art methods infiltrated sooner into applications. Synergies between the workshop and the IMPACT EV project were also discussed to assist the characterization of SSH research with the aid of science mapping.

ESSS 2016: NOT A BIT OF A SEVEN-YEAR ITCH


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Commemorating our seventh anniversary, the European Summer School for Scientometrics (esss) did not take place at one of the well-tried locations Berlin, Leuven and Vienna. As an exceptional treat the esss organizers brought the event to the beautiful city of Granada and joined forces with the local university this year. Due to the success story of the esss during the last years, several collaboration requests were repeatedly addressed to the esss steering committee. Among them was the proposal of the EC3metrics group, a University of Granada spin-off, to host this year's esss. With their research focuses on alternative metrics and data sources, the Spanish research group emerged as the perfect fit for this year's focus topic "New Metrics".

The six-days event, which took place from 04 to 09 September 2016, was fully booked within only a few weeks after registration opened, thus many requestors had to be waitlisted again like in the previous years[1,2,3,4,5,6].

The kick-off session of the esss 2016 on Sunday, September 4th, traditionally start-

Picture 1: Group photo of the esss 2016, Granada. Photo courtesy of the © esss office.

Picture 2. Bibliometric Crash Course with Wolfgang Glänzel. Photo courtesy of the © esss office.

ed with the "Bibliometric Crash Course" in the Conference Room "Sacromonte" at the Hotel Granada Center. The members of the esss steering committee Wolfgang Glänzel (KU Leuven), Sybille Hinze (DZHW) and Juan Gorraiz (University of Vienna) provided this first glimpse, which was particularly addressed to attendees short on experience who could familiarise themselves with the main terms and concepts of bibliometrics.

The theoretical part of the crash course was followed by an introduction to the most renowned citation databases. Massimiliano Carloni, the representative of Thomson Reuters, demonstrated how to navigate across the different content sets in the Web of Science Core Collection (WoS CC), while Tomaso Benedet and Susanne Steiginga, both representatives from Elsevier, co- guided the audience through the most recent version of Scopus. In agreement with the focus topic "New Metrics", the first day was concluded by Stephan Büttgen from EBSCO who gave a very clear and vivid introduction to Plum Analytics, a tool gathering different altmetrics for scholarly research output.

On Monday, September 5th, the venue was switched to the "Salón de Actos" of the Facultad de Ciencias del Trabajo (University of Granada), where Evaristo Jiménez-Contreras, Director of EC3metrics, Enrique Herrera Viedma, Vice-Rector for Research and Transfer and Pedro Antonio Garcia López, Dean of the Faculty of Labour Sciences, both representing the University of Granada, officially opened the esss 2016 and gave a warm welcome to the attendees of this year's event.

The lectures day started with a concise overview of the history, institutionalisation and concepts of bibliometrics given by Stefan Hornbostel (DZHW), followed by Wolfgang Glänzel and Juan Gorraiz, providing a brief introduction to the most important bibliometric data sources. Then Sybille Hinze shed light on the most relevant scientometric indicators, their construction, their potential applications and not least their limitations, before Juan Gorraiz took over again to focus on the academic point of view. Based on his long-lasting experience at the University of Vienna, he presented the tailor-made Viennese services for both academic and administrative university staff, particularly considering individual evaluation.

In the afternoon session the time was right to switch from theoretical considerations to practical aspects of applying bibliometrics both as an explorative as well as evalua-

tive tool. A prestigious group of international speakers, well known in the field of bibliometrics impressively reflected on how bibliometrics can be put into action. Anthony van Raan, founder of CWTS at Leiden University (Netherlands), one of the leading institutions with focus on bibliometrics, started off with his presentation on the role of citation- and concept-networks as a basis for the construction of performance indicators and science maps. Afterwards, Koenraad Debackere (KU Leuven) demonstrated how modern science and innovation policies are making use of bibliometric data and indicators to assess the scientific performance of research institutions, research groups and even individual researchers. The central topic of the following talk was to enlighten the assessment methodologies in research management and policy, which Henk F. Moed (independent researcher and scientific advisor) excellently worked out by giving various examples. Although lagging behind the time schedule, Stephan Gauch (DZHW) once again caught the audience's attention in his inimitable way to demonstrate how effective queries can be designed by uncovering common mistakes and hidden pitfalls.

The following days were characterised by theoretical lectures in the morning and hands-on sessions with practical exercises in the afternoon. Tuesday, September 6th, dedicated to "Data Handling", was started by Christine Rimmert (Bielefeld University, Germany) who clearly illustrated that accurate data cleaning and processing is the linchpin and an essential precondition of any bibliometric analysis.

The next two lectures reflected Wolfgang Glänzel's professional experience. He provided an understanding of "Subject Normalisation", which is a fundamental requirement for citation analysis in a multidisciplinary environment due to discipline-specific publication and citation behaviour. Discussing advantages and disadvantages of the two fundamental approaches, the so-called source- and citing-side normalisation, or, using another terminology, the a priori and a posteriori normalisation, was the main focus of his first talk.

With his second talk "Journal Impact Measures", jointly presented by Juan Gorraiz, Wolfgang Glänzel concluded the morning session by focusing on the strengths and weaknesses of the infamous and highly controversial "Journal Impact Factor", whereas alternative impact measures like Eigenfactor metrics, SJR and SNIP were highlighted by his co-presenter.

The exercises in the afternoon reflected these issues and participants had the opportunity to consolidate theoretically imparted knowledge.

Based on a given institution the participants were guided to develop a small case study by processing the different steps of three major tasks common in many bibliometrics approaches: data retrieval & cleaning, visualization and citation analysis. In contrast to previous years, the time schedule was modified to give participants even more time to get into the practical aspects of bibliometrics. Turning knowledge into skills certainly requires sufficient time and after all: Practice makes perfect.

After some busy hours in the computer labs the day was concluded by an entertaining introduction to the visualization and reporting tools of Thomson Reuter's InCites, given by Massimiliano Carloni.

Picture 3. Welcome and opening remarks at the University of Granada. Photo courtesy of the © esss office.

Picture 4: Audience at the esss in Granada. Photo courtesy of the © esss office.

Subsequently, "Collaboration and Networks" was the main theme of the lectures and practical exercises on Wednesday. Bart Thijs (KU Leuven) eloquently demonstrated how network analysis can be applied to uncover relations, structures and developments among different actors in science. Wolfgang Glänzel then focused on co-authorship, which is used as a proxy for research collaboration on institutional as well as on international level. This approach reveals important information about main actors and their role in the network of scholarly communication.

As visualisation of network relations within science is an important aspect of explorative bibliometrics, esss attendees were given the opportunity to practice the newly acquired knowledge and to create maps on their own by using different visualisation tools such as Gephi, Bibexcel and Pajek in the following hands-on sessions.

Similar to Tuesday the programme was concluded by a short product presentation. This time Tomaso Benedet presented SciVal, a tool that supports evaluation and benchmarking processes.

Thursday was reserved for sessions on this year's focus topic: "New Metrics", a topic that received an increasing amount of attention both within the bibliometrics community and in the sphere of science policy.

Juan Gorraiz prepared the ground by giving a witty introduction proposing the dawn of a new metrics era. Why new metrics found their way to the forefront was subsequently addressed by Rodrigo Costas (CWTS, Leiden University, Netherlands), who on the other hand emphasized that the actual meaning, validity and usefulness of these recently developed metrics and related tracking tools are still open questions.

Afterwards Nicolás Robinson-Garcia and Daniel Torres-Salinas (Universidad de Granada) focused on questions of societal impact, a topic closely related to altmetrics, as these new indicators are nowadays used to trace social engagement.

The lectures should be concluded by Ulrike Felt (University of Vienna), who unfortunately had to cancel her participation at short notice. Luckily Esteban Romero Frias (University of Granada) stepped in and presented a highly interesting talk about "Social Knowledge in Digital Society: the case of Medialab-UGR", thereby revealing new ways of multi-directional knowledge transfer. Finally, Daniel Torres-Salinas gave an insight into "Livemetrics", a live bibliometric visualization site for science communication at the University of Granada and "Knowmetrics", measuring knowledge in the digital society.

The afternoon was again dedicated to the practical exercises with "Citation Analysis" as the major topic. With the "bibliometric agora", a discussion forum that has become a popular and valuable feature of the esss course structure within the last years, the programme on Thursday was concluded.

Moderated by Juan Gorraiz, the agora in Granada featuring Rodrigo Costas, Stephan Gauch and Daniel Torres-Salinas picked out some pending discussion points mentioned

Picture 5: Practical exercises at the computer labs. Photo courtesy of the © esss office.

earlier this morning, demonstrating that altmetrics has become both a hot and controversial topic in bibliometrics not at least due to the lack of generally accepted definitions and terms. A vivid and lively dispute developed quickly among the panel members and the audience, and the agora again proved to be an excellent forum to promote the exchange of ideas and opinions.

The last day of the esss was opened by Isidro F. Aguillo (IPP-CSIC, Spain). His overview of Google Scholar with a special focus on the metrics characteristics of this data source perfectly followed the focus topic discussed on Thursday and was additionally enriched by a current case study. Last, but not least, Éric Archambault (Science-Metrix, Canada) finally grabbed the audience's attention by addressing the intricacies of the Open Access (OA) publishing concept and the potential relevance and consequences for bibliometric analysis. His presentation examined the results of recent studies assessing the free availability of scholarly publications including best practice recommendations for institutional repository management.

This year's esss was concluded with a dedicated hands-on session, where the participants were asked to present their results to the audience and provide feedback about achievements, challenges and problems. The esss staff who permanently supported the group works, namely Wolfgang Glänzel, Bart Thijs, Pei Shan Chi and Sarah Heeffer (KU Leuven), Sybille Hinze and Stephan Gauch (DZHW), Juan Gorraiz (University of Vienna) and Nicola De Bellis (Medical Library, University of Modena and Reggio Emilia, Italy) as well as Daniel Torres-Salinas and Nicolás Robinson-Garcia (Universidad de Granada) were deeply impressed with the high quality of some presentations that strikingly illustrated the great dedication of the attendees.

Finally, the organisers were happy to answer any remaining open questions after a demanding week before officially closing the event in the late afternoon.

esss 2016 was once again an international event beyond European borders with participants from 21 countries from four continents (Austria, Belgium, Canada, Colombia, Czech Republic, Denmark, Finland, France, Germany, Iran, Israel, Italy, Poland, Portugal, Russian Federation, South Korea, Spain, Sweden, Switzerland, United Kingdom and the USA).

The overall feedback gained from personal encounters and conversations, mail contacts as well as from the evaluation of an online participants survey, was very positive and inspiring. Besides the overwhelming comments regarding Granada as an outstanding venue, the friendly atmosphere throughout the whole course and the high quality of all lectures made the esss 2016 a great experience for attendees, lectures and staff likewise.

Apart from the official programme the social events were quite some additional highlights: The Alhambra Night visit left the visitors deeply impressed with this unique Moorish palace and UNESCO World Heritage. Moreover, we have experienced real Spanish hospitality at the restaurant La Chumbera, located at Sacromonte, a legend-

Picture 6: Q & A session at the esss 2016. Photo courtesy of the © esss office.

ary hill with exotic country houses and gardens, where the esss Gala Dinner took place. This special evening with the dining space set up on a patio overlooking the Alhambra as the sun set, ended with a fascinating private flamenco show and an unforgettable walk through the night life of Granada.

The esss organisers are therefore encouraged to maintain and continuously improve this learning opportunity, which seems to be high in demand with no signs of fatigue even after seven years.

The esss steering committee is already looking forward to next year's event, which will be held at the Humboldt University Berlin, Germany, September 17-22. Again participants can expect a well-established mix of theory and hands-on training, which obviously results in this proven and tested learning experience.

As usual further announcements will be made via the esss website (www.scientometrics-school.eu) and via the esss mailing list (to register please send an informal email to office@scientometrics-school.eu).

ACKNOWLEDGEMENTS

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SCIENTOMETRIC RESEARCH ASSESSMENT IN THE DEVELOPING WORLD: A TRIBUTE TO MICHAEL J. MORAVCSIK FROM THE PERSPECTIVE OF THE 21st CENTURY

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1. INTRODUCTION

This note is based on excerpts from a paper to be presented at the *VIII. International Seminar on the Quantitative and Qualitative Study of Science and Technology "Prof. Gilberto Sotolongo Aguilar"* (Havana, Cuba, 2–3 November 2016). The idea underlying this piece is to honour Michael J. Moravcsik's contribution as advocate of science in the developing countries and to add, from the viewpoint of the 21st century, some new aspects to his roadmap and agenda for a practicable method for assessing the impact of science and technology in the developing countries. In this context we also consider implications for scientometric practice. The examples prepared for the Havana Seminar

are not included in this note, but will be published as well and availability will be announced in this newsletter later on.

2. THE MORAVCSIK LEGACY: SCIENCE AND RESEARCH EVALUATION IN DEVELOPING COUNTRIES

Michael J. Moravcsik (1928–1989) was among the first scientometricians to advocate science and research assessment in developing countries. Garfield and Small (1991) called him "hero of third world science". Moravcsik, a skilled physicist but also acknowledged music critic, has become an ambassador of science, in general, and of science in developing countries, in particular. He has formulated a concept for the advancement of science and the assessment of research in these countries. As early as in 1981, he published important principles and recommendations for the development of sustainable national science systems (Moravcsik, 1981). But one of best known scientometric programmes is perhaps the roadmap and agenda for a practicable method for *assessing the impact of science and technology in the developing countries* (Moravcsik, 1985). In the framework of this UN funded project, he addressed the goals of science and technology and a number of elements and their interrelationship to be considered in this context. He also formulated guidelines and specific recommendations for its practical implementation. His recommendations did also extend to sketching specific types of relevant qualitative and quantitative indicators to measure input and output of scientific research. His views were visionary and sustainable and science policy and bibliometrics have made his vision come reality. Yet his ideas were formulated in the context of "prime human aspirations in the 20th century" (Moracvsik, 1985). The 21th century has confronted society, science and technology with new challenges. And also the world's political landscape and economic balance has changed. The world in the 1980s and most regional developments were still determined by the cold war and the subdivision into two large blocks resulting in various and sometimes changing dependencies among the non-aligned countries as well. This situation had strong effect on science and technology in developing countries which are often perceptible even today. Science and technology systems in several developing countries even showed neo-colonial features. This made it even more difficult to build own indigenous capability for science and technology after the crash of the Soviet system. The second important aspect is the change of economic balance in the world. The spectacular rise of the emerging economies such as the BRICKS and N-11 countries (e.g., O'Neill, 2005) and their new role in science and technology has become a favourite topic of the recent literature. The centre of gravity has gradually moved away from the US and Japan and the European Union towards Asia, and most notably China (e.g., Zhou and Leydesdorff, 2005; Glänzel et al., 2008; Rousseau, 2008). Somewhat overshadowed by the breath-taking growth of the economies in the Far East, countries of other world regions are undergoing dramatic growth and thus contributing to the global changes as well. Bibliometric literature reports impressive developments in South America (e.g., Zanotto, 2002, Glänzel et al., 2006, Leta et al., 2006, Zitt et al., 2006), but also in the EU's direct neighbourhood, above all, in Turkey (cf., Yurtsever and Gulgoz, 1999; Uzun, 2006; Glänzel, 2011). Finally, also the global development of science and technology itself has brought crucial changes to the research and innovation landscape: These changes form challenges to science systems in the developed countries in North-America and the European Union as well, but are even more relevant in countries in transition in the 1990 and thereafter (i.e., the former countries of the socialist block in Europe) and in developing countries. We will discuss this briefly further below. On the other hand, such changes also helped developing countries to conduct research in emerging topics and to keep pace

with the leading countries in research fronts. Computer science, information technology and nano-science and -technology, once the domain of privileged institutes in developed countries, have become important research fields also in emerging economies and developing countries. Therefore it is time to revisit and update the Movacsik agenda *from the viewpoint of scientometrics*; the fundamentals of his agenda, as being much more general, still hold and will serve as useful guidelines in the future as well. However, during the last three decades scientometrics has evolved to a versatile means in service of science policy and research management, so that we are able to formulate several more specific items that might be considered particularly in the context of science and technology in emerging economies and developing countries.

The first issue, where bibliometricians can and do contribute, has already been raised by Moravcsik (1981): the development of *advanced information systems*. Of course, the contemporary version must be considered in the framework of big overarching systems, whereof the institutional and national Current Research Information Systems (CRIS) might serve as an example. These systems require a high degree of data integration and harmonisation for multiple use by different types of organisations (e.g., research institutions, funding organisations, governments) for various purposes (cf. Daraio and Glänzel, 2016). This is a complex task reaching far beyond creating electronic databases and providing and maintaining the corresponding IT platforms and services.

The following issues are more related to the monitoring and measurement of the output and performance in research and technology. In this context we also stress that output measurement and research evaluation are two different, however, not independent issues: both tasks require different quality and granularity of data and performance assessment implies the possibility of benchmarking. The second issue, we would therefore like to mention in this context is the effect of *structural and administrative changes* which might be regional or national. Such changes might occur in all countries (e.g., independence of former medical faculties in Austria in 2004), but are more perceptible (and measurable) in small countries, in economies in tradition (e.g., the restructuring of the Estonian Academy of Sciences in the 1990s, see Martinson, 1995) and in emerging economies (e.g., profile shift in Brazil, reported by Leta et al., 2006).

The third issue is the most straightforward: Monitoring of the *dynamics and evolution* of research output and impact at various levels of aggregation. This is and remains a fundamental scientometric task in all countries and regions of the world and provides starting point and baseline for further investigation.

Think regional—think global. The fourth point is a duality principle, not a contradiction. Moravcsik's notion of building indigenous capability and sustainable science systems in developing countries requires, of course, a focus on regional and national needs, resources and capabilities. This does not suffice, notably in the age of globalisation, and research needs to reach out for global visibility and to strive for catching up with more advanced and possibly the leading nations. Traditional publication in national or regional journals or in books/proceedings with regional publishers, mostly in the authors' or journal's national language proved a severe hindrance to global scholarly communication. The large databases Web of Science and Scopus have already extended journal coverage, above all, towards South American and Chinese journals and thus improved information services, but this cannot resolve the issue of language barriers. The effect of the low impact of publications in national language can also be observed in developed countries like France and Germany, where documents in fields dealing with national issues (e.g., law), or addressed to local practitioners (e.g., clinical medicine, engineering) attract distinctly fewer citations than internationally more visible publications. Another issue is building and maintaining peculiar national/regional research profiles with ap-

propriate specialisation in research, technology and innovation (cf. OECD "Smart Specialisation", Andries et al., 2013). This might be of importance for the implementation of national and regional science and innovation policies in developing countries as well.

Also the fifth aspect is a duality principle: *competition—collaboration.* Both phenomena are integral part of scientific activities and particularly of research. Beaver (2001) reported 18 purposes for which people collaborate. These comprise reasons which might, in the context of international collaboration, be essential for countries in transition (cf. Braun and Glänzel, 1996) and emerging economies. But (international) collaboration might also contribute to build research excellence. Bibliometrics has developed tools to measure important quantitative aspects of collaboration and excellence and to provide this information to be used along with qualitative methods in research assessment.

The sixth and last point refers to the *contribution to emerging fields*. Glänzel and Thijs (2011) observed that emerging economies and developing countries play an important part and gain international visibility in emerging research topics. This contribution might help developing countries catch up with the newest scientific advancement and build a strong position in research front areas.

3. IMPLEMENTATIONS FOR SCIENTOMETRICS

Studies on research performance in developing countries has already become established in the scientometric literature. Scientometricians have published important, but mainly specialised articles on topics like Cuban or Colombian publications in databases (Ruiz et al., 2005 and Anduckia et al., 2000), scientometric analysis of certain subject fields (Torricella-Morales et al., 2000, Macias-Chapula et al., 1999, Guzman et al., 1998; Wainer et al., 2009) and even the dynamics of research profiles (Requena, 2005), but broader, comparative studies of complete regions such as the study by Schlemmer and Glänzel (2008) have remained relatively unrevealed till these days. Traditionally more attention was paid to larger countries in South America, e.g., Brazil (Glänzel et al., 2006; Leta et al., 2006) or in the context of research in BRICS countries (Zitt et al., 2006; Bouabid et al., 2016). Specific indicators such as publication potential and co-authorship patterns have been studied along with other scientometric indicators in the context socio-economic context as early as in 1992 (Schubert and Braun, 1992).

Walking in the footsteps of Michael J. Moravcsik, we attempted to focus on the scientometric analysis of research output in emerging economies and developing countries. As pars pro toto we have selected 16 countries from three world regions, Latin America, Asia and Africa to have a closer look at three important aspects in research strategies considered relevant, even crucial for developing countries as these aspects might help contribute to building capability for science and technology in the 21th century.

On the basis of the six aspects listed in the previous section, we have selected three of those, namely international collaboration, outstanding citation impact and contribution to emerging research topics. As already mentioned in the introduction, the results are available from the proceedings or, on request, from the authors. We will summarise the main findings in a nutshell. Applying some advanced scientometric methods to the selected countries, we found interesting and partially promising patterns in their publication output. We actually observed that these countries have published or contributed to highly cited papers, some of those countries have attracted even more citations than the world's reference standard. We have also seen that mainly international collaboration was responsible for the success. Coming back to the paradigms and recommendations formulated by Mike Moravcsik, one of the first and foremost

tasks in developing countries is to build indigenous capability and sustainable science systems. In the age of globalisation this is not feasible without international partners. We have therefore reconsidered Moravcsik's ideas in more pragmatic scientometric terms, the not quite independent dualities of *regionality—globality* and *competition—collaboration.* Of course, the question arises of very strong international co-authorship (e.g., of about 90% of the national output)—as we have experienced indeed—might really contribute to a sustainable and independent science system with the necessary national research structures. Of course, coping (almost) without international partners might work on the long run, if there is a sufficiently large economic potential and power as the backbone behind the research (e.g., India), but this is a path of trial and tribulation and certainly the slower way.

We have also observed remarkable contribution to research in emerging topics, which is important to keep pace with the advancement of science and technology. Identifying top research and competitive specialisation profiles might assist national stakeholders in science policy and research management in their decision-making and together with proper national research information systems for measurement, information and assessment of research might indeed help implement Moravcsik's idea of growing science in developing countries.

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