

Boshoff & Akanmu

by Nelius Boshoff

Submission date: 10-Sep-2017 10:40AM (UTC+0200)

Submission ID: 690271121

File name: 358_Nelius_Boshoff_Boshoff__Akanmu_284718_563258446.docx (123.81K)

Word count: 7454

Character count: 40211

Scopus or Web of Science for a bibliometric profile of pharmacy research at a Nigerian University?

8

Nelius Boshoff*

e-mail: scb@sun.ac.za

ORCID: 0000-0001-9285-377X

Moses A. Akanmu

e-mail: maoakanmu@yahoo.com

3

Centre for Research on Evaluation, Science and Technology (CREST) and DST-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy (SciSTIP), Stellenbosch University, Private Bag X1, Matieland 7602, South Africa

* Corresponding author

2

Acknowledgement

This research was funded with support from the Development Research Uptake in Sub-Saharan Africa (DRUSSA) programme. The DRUSSA programme ran from 2011 to 2016 and was funded by the Department for International Development (DFID), which is a United Kingdom government department responsible for administering overseas aid.

Scopus or Web of Science for a bibliometric profile of pharmacy research at a Nigerian University?

Abstract

33

Previous comparisons between Scopus and Web of Science (WoS) paid little attention to universities in African countries. This study investigated the effect of using different data sources on the bibliometric profile of Obafemi Awolowo University in Nigeria, focussing on the Faculty of Pharmacy for the period 1990–2013. In addition to data from Scopus and WoS, the analysis included articles from the curriculum vitae (CVs) of the faculty staff. The combined dataset (Scopus, WoS and CV data) provided answers to the central question: What differences can be observed in the bibliometric profile of research when comparing the Scopus and WoS output to the total article output? Although Scopus and WoS differed in size, the results of each showed a similar pattern. Notable differences were found with regard to indicators of research collaboration. WoS in particular appeared to be biased towards international collaboration. Additional sources of articles (beyond WoS and Scopus) are required to assess research performance at faculty level for a university in a developing country adequately. The quality aspect of those additional sources cannot be ignored.

Keywords

Africa; Collaboration; Pharmacy; Research; Scopus; Web of Science

1 Introduction

Bibliometric assessments of university research are increasingly valued by research managers in higher education as a form of strategic input to decision-making. At the same time it is being realised that “there are systemic issues associated with the use of bibliometrics” and that these issues “must be carefully identified and considered before making judgements based on these measures” (University of Waterloo Working Group on Bibliometrics 2016: 4). One such systemic issue is the data source used for bibliometric analysis.

Before 2004, bibliometric profiles of university research were almost exclusively based on an analysis of articles in the three citation indexes of the then Institute for Scientific Information (ISI) in the United States of America (USA). For decades, these citation indexes, now part of the core selection of the Web of Science (WoS) database of Clarivate Analytics, enjoyed a monopoly in the production of bibliometric indicators. Historically, the ISI indexes constituted the only bibliographic source with a number of key features that allowed for the production of citation counts and other bibliometric indicators. Some of the features included multidisciplinaryity, the capture of the names and addresses of all the authors of an article, and the establishment of links between the cited references of an article and all other articles in the indexed journals (Moed 1996).

However, in 2004, Reed Elsevier in Europe launched its own citation database, Scopus, which has since grown into a competitor for WoS because Scopus incorporates all of the other's 'unique' features. Systematic comparisons between WoS and Scopus therefore emerged as a new topic for bibliometric investigation (Bar-Ilan 2008). Despite the growing number of comparative studies on this topic (e.g. Mongeon & Paul-Hus 2016; Sánchez, Del Río Rama & García 2017; Vieira & Gomes 2009), systematic comparisons of the article coverage of Scopus and WoS for countries and institutions in sub-Saharan Africa remain critically absent. One exception is a comparative study of Moi University (Kenia) and the University of Zululand (South Africa), which established that the publications of approximately 70% of academics at the two institutions were not in either Scopus or WoS (Ocholla, Mostert & Rotich 2016).

This study therefore addressed that vacuum by investigating the effect of different data sources on the resultant bibliometric profile for a university in sub-

Saharan Africa. The focus was on ³¹ Obafemi Awolowo University (OAU) in Ile-Ife, Nigeria, and specifically on the article output in the Faculty of Pharmacy at that university for the period 1990–2013. In addition to a comparison between Scopus and WoS, the analysis also utilised article data sourced from the curriculum vitae (CVs) of the academic staff members in that faculty. The main research question was the following: What are the differences in the bibliometric profile of research at the FoP when comparing the Scopus and WoS article output to the total article output of that faculty (where 'total' refers to the CV, Scopus and WoS data combined)?

Before presenting the ⁶ study methodology and results, a discussion of relevant literature (Scopus versus WoS) is provided, together with a brief note on the Faculty of Pharmacy at OAU.

2 Scopus versus WoS: Insights from the relevant literature

According to ³⁰ Torres-Salinas, Lopez-Cózar and Jiménez-Contreras (2009), the two databases have different historical roots and thus reflect diverging philosophies – an important consideration not to ignore. WoS began as a practical implication of the Bradford law (Garfield 1990), which postulates that the majority of scientific output appears ²⁹ in a relatively small number of journals. Scopus, on the other hand, developed within the context of Elsevier's role as a marketer of a large collection of journals, and for that reason includes more journal titles than WoS does.

A journal title overlap study by Gavel and Iselid (2008) showed that Scopus covers 84% of all the WoS journal titles whereas WoS includes only 46% of the Scopus journal titles. Field-specific comparisons of the journal title overlap also illustrate the relative advantage of Scopus compared to WoS. For instance, in oncology, all WoS journals in that subject category were found to be indexed by Scopus; on the other hand, 46% of the Scopus journal titles did not appear in ²⁸ WoS (López-Illescas, De Moya-Aneón & Moed 2008). Sánchez, Del Río Rama and García (2017) established that ²⁷ Scopus covers the area of wine tourism better than WoS does, since it includes a larger number of relevant journals and articles. These authors further note that Scopus “covers almost two thirds of the sources and articles of WoS, even when WoS has an important number of exclusive sources” (Sánchez et al. 2017, p. 13). In another comparative study, Norris and Oppenheim (2007) took the journal article submissions made to the social sciences categories in the 2001

Research Assessment Exercise of the United Kingdom (UK) as their point of departure in order to establish how those journal titles were covered by Scopus and WoS. They found that 51% and 43% of the journal titles were covered by Scopus and WoS respectively. In terms of actual articles (as opposed to journal titles), Vieira and Gomes (2009) ²⁶ found that Scopus provides a better coverage for Portuguese universities ²⁵ than WoS does, based on an analysis of the combined university output in Portugal for the period 2000–2007. Specifically, Scopus included 1.04 times more articles than WoS did. A few more studies also highlighted the advantage of Scopus when it comes to article coverage (e.g. Bartol, Budimir & Dekleva-Smrekar 2014).

There is evidence that Scopus, in its journal coverage, largely practises the quantity/breadth principle whereas WoS is more orientated towards quality/depth (Ball & Tunger 2006). In the abovementioned study of oncology journals (López-Illescas et al. 2008), ¹⁷ for instance, an analysis of the additional (non-WoS) journals in Scopus showed that many of these were low-impact journals. A comparative study in the field of pharmacology and pharmacy further revealed that, although Scopus has some additional journals not indexed by WoS, such journals were not associated with high impact factors (Gorraiz & Schloegl 2008). Vieira and Gomes (2009) also found that the better journal coverage of Scopus, compared to WoS, often implies partial coverage (e.g. not all articles from a particular volume are included). It also needs to be said that, in recent years, WoS has started to expand its coverage of journal titles. According to Michels and Schmoch (2012), the newly added titles do not necessarily reflect new journals but rather existing ones.

Systematic comparisons of Scopus and WoS have also focussed on other dimensions, apart from differences in article and journal coverage. Examples are, for instance, comparisons of citation counts and citation-based rankings (such as the h-index) based on Scopus and WoS data respectively (Adriaanse & Rensleigh 2013; De Groote & Raszewski 2012; Harzing & Alakangas 2016; Meho & Sugimoto 2009; Onyancha & Ocholla 2009). More recent foci include analyses of the database errors in Scopus and WoS (Franceschini, Maisano & Mastrogiacomo 2016a; 2016b; 2016c) ²⁴ and differences in the assignment of Scopus and WoS journals to field categories, i.e. journal classification systems (Wang & Waltman 2016), as well as illustrations of how differences in the assignment of keywords to articles could affect the analysis of research topics (Bartol & Mackiewicz-Talarczyk 2015).

The question whether Scopus or WoS should be used for the bibliometric profiling of research output by countries and institutions in the developing world is a relevant one. Both databases are becoming increasingly accessible to scholars worldwide as many universities in both developed and developing countries are subscribing to either of these databases or both as part of their online library offering. Tailored datasets for analysis can therefore be easily generated and downloaded from the online versions, and to some extent, this contributes to more bibliometric studies on developing countries in the scientometric literature. Examples are, for instance, the study by Mègnigbèto (2013) on the research output of Benin in West Africa (using Scopus) and the studies by Author (2009; 2010) on the extent and nature of research collaboration in Central Africa and the pattern of South–South research collaboration in Southern Africa (using WoS).

Scopus is often seen as the preferred data source for bibliometric analyses of African research, as was the case for the continent-wide studies commissioned by the agencies of the African Union (AOSTI 2014; AU-NEPAD 2010). The WoS has been reported as favouring journals from the Western world in its title coverage, predominantly English language journals, thereby implying that the WoS underrepresents non-Western journals from small and developing countries (Archambault, Vignola-Gagne, Côté, Larivière & Gingras 2006). However, it is not a foregone conclusion that Scopus would always provide a more accurate representation of science in the developing world compared to WoS. In a study by De Moya-Anegón et al. (2007), Scopus was compared against the Ulrich Core directory, the 'gold standard' of reference, which constitutes the most comprehensive representation of peer-reviewed academic journals worldwide. Although De Moya-Anegón et al. (2007: 75) concluded, "the coverage provided by Scopus is balanced in terms of subject areas, languages and editors when compared with Ulrich's Core", the fact remains that Scopus, for instance, includes only about 12% of non-English journals compared to 32% in Ulrich's Core. More recently, Mongeon and Paul-Hus (2016) used Ulrich's extensive periodical directory to determine the nature of the biases that would be introduced in research evaluation exercises should only either Scopus or WoS be used. They found that the two databases share similar biases. These include, for instance, over-representation of the English language and certain author countries (USA, UK and other countries in Western Europe) as well as underrepresentation of certain fields (most notably the social sciences and

humanities). Both databases, according to ²³ Mongeon and Paul-Hus (2016), should be used with caution in the context of comparative research evaluation (and to which one could also add, in the context of developing countries). According to Rafols, Chavarro and Ciarli (2016), both Scopus and WoS significantly underrepresent research from the 'global south'. Their study showed that Scopus covers only about 40% of all research conducted on the topic of rice in Nigeria and Egypt, and the WoS only about 20%.

3 Purpose of the study and research questions

¹⁶ It is against this background that the current study ⁷ investigated the suitability of Scopus versus WoS for the bibliometric analysis of research at Obafemi Awolowo University (OAU) in Nigeria, by focussing on the Faculty of Pharmacy. According to Pouris and Ho (2014), research activity in pharmacology and pharmacy is over-emphasised in the African context. They found that Africa's research effort in that field, given the scientific size of the continent, is about 1.5 times bigger than the world average.

Four questions guided the current analysis:

- Does the contribution of the Faculty of Pharmacy to OAU's research output, relative to that of the other OAU faculties, differ according to the data source that is used (i.e. Scopus, WoS or both combined)?
- Why are some of the faculty's articles only partially covered by Scopus and WoS?
- Do some departments in the faculty show more prominently when different data sources are used (i.e. CVs, Scopus, WoS or all three combined)?
- Do the collaboration indicators for the faculty differ according to the data source used (i.e. CVs, Scopus, WoS or all three combined)?

Some comment is warranted for the emphasis on indicators of research collaboration in this analysis. The African continent suffers from what Pouris and Ho (2014: 2183) call "collaboration dominance". For some African countries, more than 80% of their total article output in WoS is produced in collaboration with international partners (Author 2009; Author 2017; Pouris and Ho 2014). One explanation for this phenomenon is that, in Africa, research collaboration "is not driven by local researchers searching for collaborators, but by the availability of resources and

interests outside the continent” (Pouris & Ho 2014: 2181). Another possible explanation is that, since the WoS comprises a limited set of journals that satisfy stringent selection criteria (quality/depth principle according to Ball & Tunger 2006), researchers from developing countries who publish in WoS journals mainly manage to do so because they collaborate internationally. The argument then is that, should a different data source be used, instances of international collaboration would become less pronounced and other forms of collaboration (e.g. national) would be more visible.

4 Brief note on the Faculty of Pharmacy at OAU

The Faculty of Pharmacy (FoP) is one of 13 faculties at OAU. There are 92 academic departments and units in total. The FoP was first established as a department in the former Nigerian College of Arts, Science and Technology, Ibadan Branch, in 1957. When the University of Ife (now OAU) was established in 1962, Pharmacy remained a department within the Faculty of Science. It however continued to award a Diploma in Pharmacy until June 1965 while, concurrently, a programme for the BPharm degree was started in September 1963. The university senate upgraded the department into a full faculty in October 1969 (OAU 2014). The present-day FoP comprises five academic departments and one research unit: Department of Clinical Pharmacy and Pharmacy Administration; Department of Pharmaceutical Chemistry; Department of Pharmaceutics; Department of Pharmacognosy; Department of Pharmacology; and Drug Research and Production Unit (DRPU). The DRPU is responsible for a local journal – *African Journal of Traditional, Complementary and Alternative Medicines* – that is published three times a year. In 2012/2013, the faculty had 656 undergraduate students and 76 postgraduate students (OAU 2015). During the 2012/2013 academic session, the faculty had 59 academic staff members involved in teaching and research (OAU 2014).

5 Data and method

The WoS data was taken from the database system at the Centre for Research on Evaluation, Science and Technology (CREST) at Stellenbosch University, South Africa. CREST has access to the raw data of journals in the WoS Core Selection

database. In the case of Scopus, the online database was used. Relevant data were obtained by conducting searches in the address fields of both databases. The search criteria included the term 'Nigeria' and different spelling variants of OAU. The search period was from 1990 to 2013. Only two document types, articles and review articles, were retained (both are referred to as 'articles' in the context of this study).

After cleaning the data, a total of 4195 and 2744 articles remained for Scopus and WoS respectively. The two sets of articles were matched on the basis of article and journal titles, and unified in a Microsoft Access database. The process generated a total of 4705 OAU articles. In the consolidated database, Scopus uniquely accounted for 42% of the total OAU output and the WoS for 11%. The overlap was 47%.

A subset of 370 articles was identified as belonging to the FoP at OAU. Of these, 350 appeared in Scopus and 123 appeared only in Scopus. Similarly, 247 articles appeared in WoS and 20 only in WoS. The overlap represented 227 articles. In addition to using Scopus and WoS data, staff from the FoP also submitted their CVs. The CVs were used to capture the details of articles published in journals that are not indexed in Scopus or WoS. This generated 406 articles, of which 218 eventually could not be found in either Scopus or WoS. The 218 articles were then added to the other 370 to produce a final dataset of 588 articles for the FoP.

Given that copies of the 218 'CV articles' were not always available, the final FoP dataset had two shortcomings. Firstly, it could not be established whether all 218 articles were in fact 'articles' or 'review articles'. Secondly, it could also not be established whether all articles obtained through the CVs of FoP staff members in fact listed the FoP affiliation in the author address field. An FoP staff member who completed a postgraduate qualification at a foreign university could have published the postgraduate research under the name of that other university.

Lastly, in order to obtain the addresses of the non-OAU co-authors in the CV articles, a three-fold strategy was followed. Relevant details were captured from copies of the CV articles, where such copies were available, or sourced from author searches in the Scopus and WoS databases (keeping in mind the year of publication). Where all else failed, a Google search of author names was conducted.

20
6 Results

This section presents the results in terms of the four research questions that guided the bibliometric analysis.

6.1 Does the contribution of the FoP to the total OAU research output differ according to the data source used?

The total number of research articles originating from OAU researchers, based on data obtained from Scopus and WoS for the period 1990–2013, was 4195 and 2744 respectively. An annual breakdown is shown in Figure 1. Compared to WoS, Scopus recorded a significantly larger number of articles for all years since 1996 onwards. Around 2002–2003, the number of Scopus articles started to increase at a much faster rate compared to the number of WoS articles. Generally, the annual trend for both Scopus and WoS seems to be the same: a decrease in article production between 1990 and 1995, followed by incremental growth, to reach a sudden peak around 2009. Thereafter, the OAU article production started to decrease again (until 2012), followed by a renewed increase in 2013.

Insert Figure 1

Table 1 provides the answer to the relevant research question. It shows the total article output per OAU faculty over the period 1990–2013, thereby illustrating the relative standing of the FoP. Results are reported for three data sources: the combined set of Scopus and WoS articles, a set of all articles in Scopus and a set of all articles in WoS. It is important to note that the set of Scopus articles also includes some WoS articles, and vice versa, given the overlap between the data sources. As can be seen, the same three faculties emerge as the most productive in all instances, irrespective of the data source used (Science, Clinical Science and Technology – in that order). Compared to Scopus, WoS covers marginally more articles in the case of the Faculty of Science (26% versus 23%). In turn, the Faculty of Agriculture is marginally better represented in Scopus than in WoS (12% versus 9%). The FoP share of article output, relative to the total OAU article output, remains about 8–9%, irrespective of whether Scopus, WoS or both are used. The pattern of OAU's article output per faculty, therefore, does not appear to be markedly influenced by the

choice of data source. The structure of findings remains about the same across the different data sources regardless of the size (and implied coverage) of each data source.

Insert Table 1

6.2 Why are some FoP articles only partially covered by Scopus and WoS?

Figure 2 sets the scene for answering this question. It presents article data for the FoP only, and compares the annual output trends based on CV, Scopus and WoS data. As expected, Scopus produces more articles compared to WoS although, for some years, the differences have been marginal. CV information was available mainly from 1999 onwards. Between 1999 and 2013, the CVs generated, on average, about 27 articles per year compared to 17 and 12 articles per year for Scopus and WoS.

Insert Figure 2

Figure 3 shows the degree of overlap between the three data sources (CVs, Scopus and WoS). The CVs make a unique contribution of 37% to all articles in the FoP over the period 1990–2013. More than a third of the faculty's article output would thus be overlooked if only Scopus and WoS were to be used. Furthermore, 58% of the faculty's output would be overlooked should the faculty rely on WoS data only, while 41% of the faculty's output would be missed if the faculty were to rely on Scopus data only. One reason why some articles only reflect in the CVs of FoP staff could be a tendency to ⁵publish in local journals that are not indexed in either Scopus or WoS. Other explanations also apply. For instance, some authors could have decided not to report their OAU address in the Scopus or WoS article but rather the address of the institution where the research work was carried out

Insert Figure 3

Determination of the top journals in which FoP staff published was subsequently performed. 'Top' in this context refers to the most preferred journals for publication,

⁵ based on the total number of articles in a journal for the period 1990 to 2013. Eight journals produced at least 10 FoP articles each over the relevant period, and three of these are local journals published in Nigeria (Table 2). The three are: the *Nigerian Journal of Natural Products and Medicine* (responsible for 42 of the 588 FoP articles, or 7%), ⁴ the *African Journal of Traditional, Complementary and Alternative Medicines* or *AJTCAM* (5%) and the *Nigerian Journal of Pharmaceutical Research* (2%).

Insert Table 2

Table 2 further shows that some journals are only partially covered in Scopus and WoS, which brings us to the relevant research question. For instance, nine of the 29 articles in *AJTCAM* appear only in the CVs. Three more of the *AJTCAM* articles appear in both Scopus and WoS (but not in the CVs), and six more in the CVs as well as in either Scopus (2) or WoS (4). An additional 11 articles appear in all three data sources. Table 3 gives explanations for five of the affected journals in Table 2, including *AJTCAM*. Reasons for the partial coverage in Scopus and WoS relate to the period of journal coverage in the two databases, the absence of an OAU address in either Scopus or WoS, and differences in the classification of document type (e.g. 'note' in one database and 'article' or 'review' in the other).

Insert Table 3

6.3 Do some departments in the faculty show more prominently when different data sources are used?

Table 4 shows the share of article output, by FoP department, in terms of the four data sources (CVs, Scopus, WoS and the three combined). The percentages in each group (column) do not add to 100% because of inter-departmental co-authorship. In other words, the same article is counted in more than one department where the co-authors are from different departments in the FoP. The analysis reveals that, for five of the six FoP entities in Table 4, the choice of database for bibliometrics does not seem to matter. Any data source will produce more or less the same result. For instance, the contribution of the Department of Pharmacognosy to the total faculty output ranges only between 24% (if only WoS is used) and 26% (if the three data

sources are combined). The exception is the Department of Clinical Pharmacy and Pharmacy Administration. When all data sources are used the department's contribution is estimated at 14%; but when only the WoS database is used the share decreases significantly to 7%.

Insert Table 4

6.4 Do the collaboration indicators for the FoP differ according to the data source used?

A comparison of the shares of co-authored articles by the FoP, across data sources, revealed basically no differences (95–96% over the total study period; Table 5). Thus, irrespective of the data source used, the share of single-authored articles remains consistently low at about 4–5%. Table 5 also reports four more indicators of collaboration. The first reflects collaboration between departments in the FoP (within-FoP co-authorship) and the second collaboration between the FoP and the other faculties at OAU (co-authorship with the rest of OAU). The third indicator represents national collaboration or co-authorship between the FoP and other organisations in Nigeria (co-authorship with the rest of Nigeria), and the fourth, international collaboration

Insert Table 5

When the article data from the CVs are excluded, both the share of within-FoP collaboration and the share of collaboration with the rest of OAU appear to be underestimated. For instance, with CV data included, the share of within-FoP collaboration is 30%. However, without the CV data (using only Scopus and/or WoS), the share decreases to 23–25%. In terms of collaboration with the rest of Nigeria, the relevant share may be underestimated when only Scopus and/or WoS data are used (23–24%) since it increases to 28% when the CV data are included. On the other hand, the share of international collaboration is highest when only WoS data are used (36%). It decreases to 31% when Scopus data are added, and even further to 28% when CV data are incorporated. This means that reliance on WoS data alone

would most likely result in an overestimation of the FoP's share of international collaboration and an underestimation of the different forms of domestic collaboration.

Given that the CV data were available mainly from 1999 onwards (see again Figure 2), it was decided to restrict the indicators of Table 5 to the most recent period under study, namely 2010–2013. Table 6 shows the results. A salient observation is that the percentage of national collaboration is significantly underestimated when the data source only involves WoS data. The share dramatically increases from 20% to 42% when both CV and Scopus data are used together with WoS data to construct the relevant indicator.

Insert Table 6

Table 7 presents a different take on international collaboration, by highlighting the world regions with which the FoP collaborated during the period 1990–2013. The world regions are based on a classification of the addresses of the non-OAU co-authors of articles. Europe is the main region of collaboration in all instances but its influence is less pronounced (although still relatively high) when all three data sources are combined. When only Scopus and/or WoS data are used, Europe's contribution is estimated at about 62–64%. However, this dramatically decreases to 49% when the CV data are incorporated. On the other hand, when the CV data are included, the shares of three more regions (Asia, North America and the rest of Africa) marginally increase. Continental collaboration (i.e. collaboration with the rest of Africa) is also at its lowest in WoS (20%) but at its highest in the combined CV/Scopus/WoS data source (27%).

Insert Table 7

7 Discussion and recommendation

Russell and Rousseau (n.d.: 2) remark, “all evaluations are dependent on the availability of adequate and reliable data relating to the outcome of the activities under scrutiny”. This remark emphasises the necessity to select the most appropriate database for the bibliometric assessment of an institution's research output. The chosen database should produce indicators that reflect the state of affairs of the

entity that is being assessed accurately. This is important since bibliometric indicators are used for a diversity of management and organisation activities at universities – among which strategy formulation, human resource management, quality management, reputation management, and partner selection (Kosten 2016).

This study investigated the relative suitability of Scopus and WoS for a bibliometric analysis of articles produced by the FoP at OAU. It showed a large degree of convergence of indicators for Scopus and WoS even though Scopus contained significantly more articles compared to WoS. Thus, although the two data sources were found to differ in size (i.e. in their collections of articles), the structure of the findings emanating from the data analyses was not that much affected by the size discrepancy. This phenomenon is normally expected at high levels of aggregation (e.g. for an analysis at the level of a country or broad scientific field), where the large volumes of articles compensate for any database omissions. In the current study, the convergence of indicators based on Scopus and WoS, despite the size difference of the databases, was found to be true for a small dataset at a low level of aggregation, namely that of a university faculty.

Still, structural differences between Scopus and WoS did emerge for two indicators of research collaboration: the share of international co-authorship (1990–2013) and the share of national co-authorship (2010–2013). The WoS appears to be biased towards international collaboration, often at the expense of instances of national collaboration. Thus, relying on WoS data alone would misrepresent the true state of affairs at the FoP. In the current analysis, the true state of affairs was constructed as ‘the sum of all data’, i.e. the picture that emerged from combining the article data of Scopus and WoS with the article data of the CVs. This data integration was done to achieve total coverage (quantity) which, although a worthwhile exercise, raises questions concerning quality. For instance, the Nigerian journal *AJTCAM* – whose article details were extracted mainly from the CVs of FoP academic staff – appears in the (then) Beall’s list of “potential, possible, or probable predatory scholarly open-access journals” (Beall’s list 2017). Although additional data sources are considered invaluable in the bibliometric assessment of university research performance in developing countries, the quality dimension cannot be ignored. For the purpose of university performance assessment exercises, it is a matter of finding the right balance between ensuring both the quantity and quality of data sources, and putting the necessary system in place to do so.

One system initiative is having an institutional database for bibliometric analyses that also includes some basic quality criteria. Although some African universities do keep record of their article output in the form of repositories (Ocholla 2011), such institutional repositories often leave much to be desired. Specifically, the meaning of what counts as a research publication for inclusion in a repository remains unchecked. As a result, the contents of some repositories include a hodgepodge of outputs: non-peer-reviewed documents, conference presentations that never develop beyond the original abstract submitted, and peer-reviewed articles in local and international journals, to mention a few. It is therefore imperative that the document type in an institutional repository be defined correctly. This will ensure that peer-reviewed articles are clearly distinguishable from non-peer-reviewed output. For peer-reviewed articles, criteria of journal reputation would also need to be included. This could be as simple as indicating whether an article appears in a journal that is indexed by Scopus or WoS, or in one of the many journals recognised ⁶ by the South African Department of Higher Education and Training.

Additional sets of information to be included in an African institutional research repository are the addresses of all the authors of the peer-reviewed articles submitted by university staff, since this will enable record keeping of what can be described here as the 'hidden articles of Africa'. The latter refers to articles that African researchers publish together with international authors (or on their own) but where a foreign institution rather than the African researcher's own institution is specified in the address. The article is thus never picked up as an African contribution in any bibliometric analysis. However, the research reflected in such articles contributes to the local institutional research capacity through the skills that remain embodied in people, and for that reason needs to be acknowledged in an African-specific bibliometric analysis.

References

- Adriaanse, L.S. and Rensleigh, C. 2013. Web of Science, Scopus and Google Scholar: a content comprehensiveness comparison. *The Electronic Library*, 31(6): 727–744.
- AOSTI. 2014. *Assessment of scientific production in the African Union, 2005–2010*. Malabo: African Observatory of Science, Technology and Innovation.
- Archambault, E., Vignola-Gagne, É., Côté, G., Larivière, V. and Gingras, Y. 2006. Benchmarking scientific outputs in the social sciences and humanities: the limits of existing databases. *Scientometrics*, 68(3), 329–342.
- AU-NEPAD. 2010. *African innovation outlook 2010*. Pretoria: African Union-New Partnership for Africa's Development.
- Author. 2009.
- Author. 2010.
- Author. 2017.
- Ball, R. and Tunger, D. 2006. Science indicators revisited – Science Citation Index versus Scopus. A citation comparison of both citation databases. *Information Services and Use*, 26(4): 293–301.
- Bar-Ilan, J. 2008. Informetrics at the beginning of the 21st century – a review. *Journal of Informetrics*, 2(1): 1–52.
- Bartol, T. and Mackiewicz-Talarczyk, M. 2015. Bibliometric analysis of publishing trends in fiber crops in Google Scholar, Scopus, and Web of Science. *Journal of Natural Fibers*, 12(6): 531–541.
- Bartol, T., Budimir, G. and Dekleva-Smrekar, D. 2014. Assessment of research fields in Scopus and Web of Science in the view of national research evaluation in Slovenia. *Scientometrics*, 98(2): 1491–1504.
- Beall's list. 2017. *Beall's list of predatory journals and publishers*. [Online]. <http://beallslist.weebly.com/standalone-journals.html> (21 August 2017).
- Bharathi, D.G. 2013. Methods employed in the Web of Science and Scopus databases to effect changes in the ranking of the journals. *Current Science*, 105(3): 300–308.
- De Groote S.L. and Raszewski R. 2012. Coverage of Google Scholar, Scopus, and Web of Science: a case study of the h-index in nursing. *Nursing Outlook*, 60(6): 391–400.

- De Moya-Anegón, F., Chinchilla-Rodríguez, Z., Vargas-Quesada, B., Corera-Álvarez, E., Muñoz-Fernández, F. J., González-Molina, A. and Herrero-Solana, V. 2007. Coverage analysis of Scopus: a journal metric approach. *Scientometrics*, 73(1): 53–78.
- Franceschini, F., Maisano, D. and Mastrogiacomo, L. 2016a. Do Scopus and WoS correct 'old' omitted citations? *Scientometrics*, 107(2): 321–335.
- Franceschini, F., Maisano, D. and Mastrogiacomo, L. 2016b. Empirical analysis and classification of database errors in Scopus and Web of Science. *Journal of Informetrics*, 10(4): 933–953.
- Franceschini, F., Maisano, D. and Mastrogiacomo, L. 2016c. The museum of errors/horrors in Scopus. *Journal of Informetrics*, 10(1): 174–182.
- Garfield, E. 1990. How ISI selects journals for coverage: quantitative and qualitative considerations. *Current Contents*, 28(22): 5–13.
- Gavel, Y. and Iselid, L. 2008. Web of Science and Scopus: a journal title overlap study. *Online Information Review*, 32(1): 8–21.
- Gorraiz, J. and Schloegl, C. 2008. A bibliometric analysis of pharmacology and pharmacy journals: Scopus versus Web of Science. *Journal of Information Science*, 34(5): 715–725.
- Harzing, A.-W. and Alakangas, S. 2016. Google Scholar, Scopus and the Web of Science: a longitudinal and cross-disciplinary comparison. *Scientometrics*, 106(2): 787–804.
- Kosten, J. 2016. A classification of the use of research indicators. *Scientometrics*, 108(1): 457–464.
- López-Illescas, C., De Moya-Anegón, F. and Moed, H.F. 2008. Coverage and citation impact of oncological journals in the Web of Science and Scopus. *Journal of Informetrics*, 2(4): 304–316.
- Mêgnigbêto, E. 2013. Scientific publishing in Benin as seen from Scopus. *Scientometrics*, 94(3): 911–928.
- Meho, L.I. and Sugimoto, C.R. 2009. Assessing the scholarly impact of information studies: a tale of two citation databases – Scopus and Web of Science. *Journal of the American Society for Information Science and Technology*, 60(12): 2499–2508.
- Michels, C. and Schmoch, U. 2012. The growth of science and database coverage. *Scientometrics*, 93(3): 831–846.

- Moed, H.F. 1996. Differences in the construction of SCI based bibliometric indicators among various producers: a first overview. *Scientometrics*, 35(2): 177–191.
- Mongeon, P. and Paul-Hus, A. 2016. The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics*, 106(1): 213–228.
- Norris, M. and Oppenheim, C. 2007. Comparing alternatives to the Web of Science for coverage of the social sciences' literature. *Journal of Informetrics*, 1(2): 161–169.
- OAU. 2014. *Faculty of pharmacy handbook 2011–2013*. Ile-Ife: Obafemi Awolowo University.
- OAU. 2015. *University annual report 2013/2014*. Ile-Ife: Obafemi Awolowo University.
- Ocholla, D. 2011. An overview of issues, challenges and opportunities of scholarly publishing in information studies in Africa. *African Journal of Library, Archives and Information Science*, 21(1): 1–16.
- Ocholla, D., Mostert, J. and Rotich, D.C. 2016. Visibility of University of Zululand and Moi University researchers in Web of Science and Scopus from 2003 to 2013. *African Journal of Library, Archives and Information Science*, 26(1): 3–15.
- Onyancha, O.B. and Ocholla, D.N. 2009. Assessing researchers' performance in developing countries: is Google Scholar an alternative? *Mousaion*, 27(1): 43–64.
- Pouris, A. and Ho, Y.-S. 2014. Research emphasis and collaboration in Africa. *Scientometrics*, 98(3): 2169–2184.
- Rafols, I., Chavarro, D. and Ciarli, T. 2016. *Under-representation of research in the global south. Biases in mainstream journal indexing systems*. Paper presented at the International Research Conference on Scientometrics, STI Policy and Science Communication. 31 October – 3 November, Stellenbosch. [Online]. http://www0.sun.ac.za/scistip/wp-content/uploads/2012/10/Rafols_I.pdf (11 August 2017).
- Russell, J.M. and Rousseau, R. No date. *Bibliometrics and institutional evaluation*. [Online]. http://www.vub.ac.be/BIBLIO/itp/lecturers/ronald_rousseau/ronald_rousseau_stim_1_bibliometrics_russell.pdf (30 July 2017).
- Sánchez A.D., Del Río Rama, M. and García, J.Á. 2017. Bibliometric analysis of publications on wine tourism in the databases Scopus and WoS. *European Research on Management and Business Economics*, 23(1): 8–15.

- Torres-Salinas, D., Lopez-Cózar, E.D. and Jiménez-Contreras, E. 2009. Ranking of departments and researchers within a university using two different databases: Web of Science versus Scopus. *Scientometrics*, 80(3): 761–774.
- University of Waterloo Working Group on Bibliometrics. 2016. *White paper on bibliometrics: Measuring research outputs through bibliometrics*. Waterloo: University of Waterloo.
- Vieira, E.S. and Gomes, J.A.N.F. 2009. A comparison of Scopus and Web of Science for a typical university. *Scientometrics*, 81(2): 587–600.
- Wang, Q. and Waltman, L. 2016. Large-scale analysis of the accuracy of the journal classification systems of Web of Science and Scopus. *Journal of Informetrics*, 10(2): 347–364.

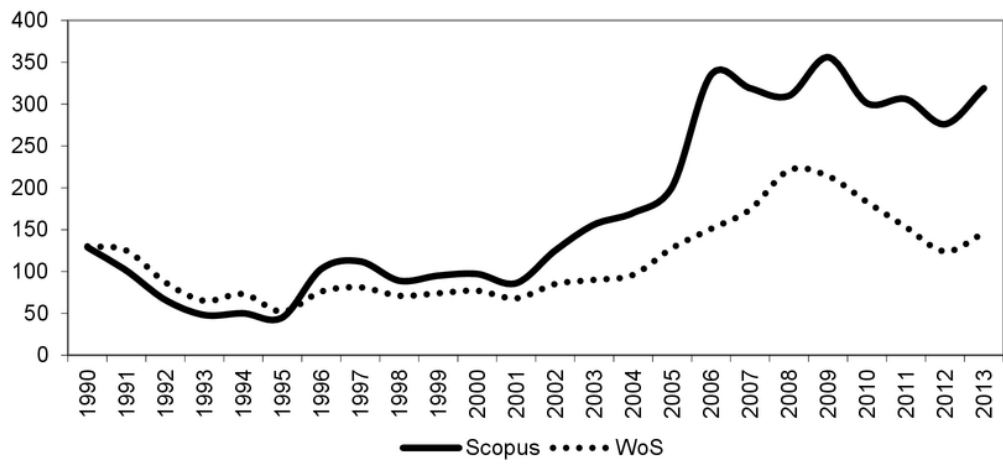


Figure 1 OAU articles in Scopus and WoS, by year (1990 to 2013)

Table 1 Articles by OAU faculties and by data source (1990–2013)

OAU faculties	Data sources					
	Scopus and WoS combined (N=4705)		Scopus (N=4195)		WoS (N=2744)	
	Count	%	Count	%	Count	%
Science	1084	23%	967	23%	712	26%
Clinical Sciences	1039	22%	933	22%	584	21%
Technology	596	13%	535	13%	400	15%
Agriculture	534	11%	494	12%	259	9%
Basic Medical Sciences	478	10%	441	11%	255	9%
Pharmacy (FoP)	370	8%	350	8%	247	9%
Educational & Research Institutions (#)	238	5%	207	5%	162	6%
Social Sciences	207	4%	186	4%	134	5%
Dentistry	168	4%	150	4%	92	3%
Environmental Design & Management	102	2%	84	2%	48	2%
Education	88	2%	71	2%	31	1%
Community & Educational Services (#)	64	1%	58	1%	27	1%
Administration	61	1%	53	1%	20	1%
Arts	56	1%	42	1%	31	1%
Law	10	0.2%	9	0.2%	3	0.1%

(#) These are not faculties but research centres and support units at the university and affiliated teaching hospitals.

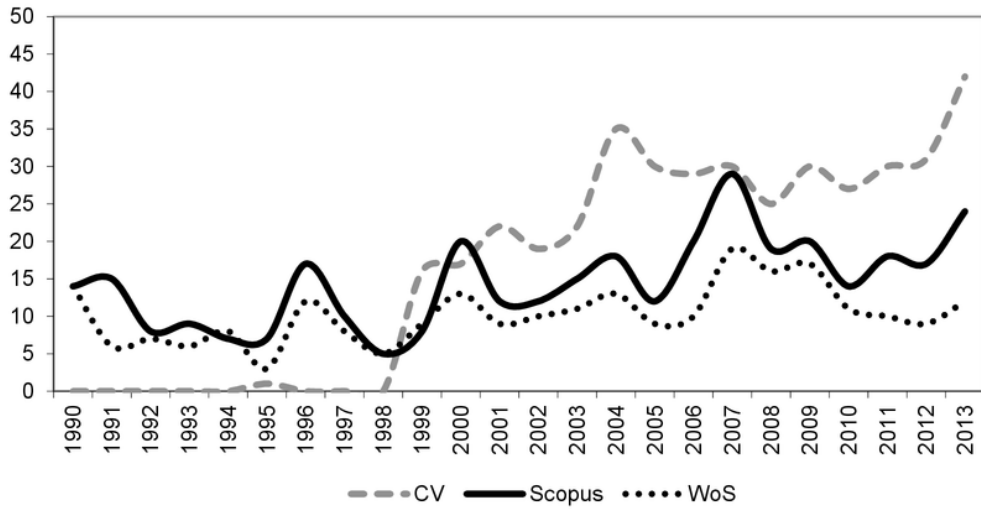


Figure 2 FoP articles in the CVs, Scopus and WoS, by year (1990 to 2013)

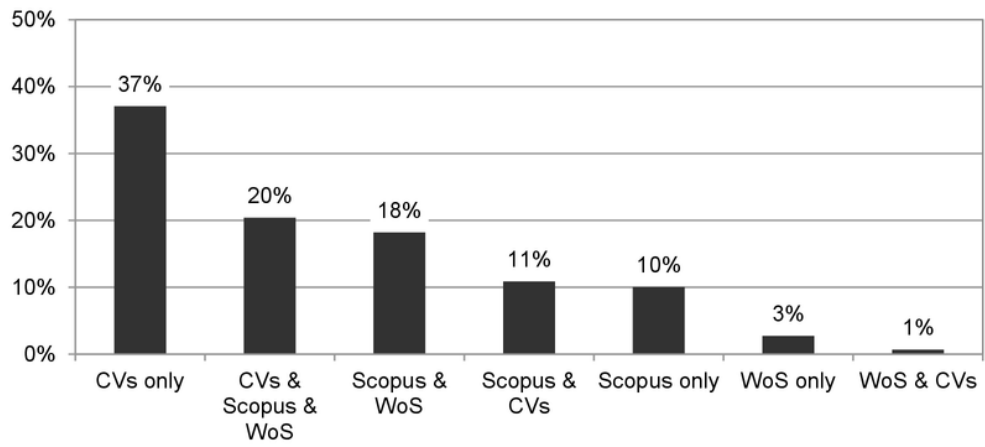


Figure 3 Source of articles produced by the FoP (1990–2013, N=588)

Table 2 Eight journals with at least 10 FoP articles each, by data source (1990–2013)

Journals	Count	Data sources						
		CVs only	Scopus only	WoS only	Scopus & CVs	WoS & CVs	WoS & Scopus	All three
<i>Nigerian Journal of Natural Products and Medicine</i>	42	42	–	–	–	–	–	–
<i>African Journal of Traditional, Complementary and Alternative Medicines</i>	29	9	–	–	4	2	3	11
<i>Journal of Ethnopharmacology</i>	20	–	–	1	–	–	8	11
<i>Fitoterapia</i>	19	–	12	–	1	–	4	2
<i>Phytotherapy Research</i>	17	–	2	1	–	–	9	5
<i>Nigerian Journal of Pharmaceutical Research</i>	14	14	–	–	–	–	–	–
<i>Phytochemisty</i>	14	–	–	1	–	–	10	3
<i>African Journal of Biotechnology</i>	13	–	–	–	1	–	2	10

Table 3 Reasons why some FoP articles are only partially covered in Scopus and WoS

Data sources	Five journals and their coverage in Scopus and WoS				
	<i>African Journal of Traditional, Complementary and Alternative Medicines</i> (N=29)	<i>Journal of Ethnopharmacology</i> (N=20)	<i>Fitoterapia</i> (N=19)	<i>Phytotherapy Research</i> (N=17)	<i>Phytochemistry</i> (N=14)
	Scopus: since Vol 3(1), 2006 WoS: since Vol 3(3), 2006	Scopus: since Vol 1(1), 1979 WoS: since Vol 1(1), 1979	Scopus: since Vol 19(4), 1948 WoS: since Vol 69(1), 1998	Scopus: since Vol 1(3), 1987 WoS: since Vol 3(1), 1989	Scopus: since Vol 1(1), 1961 WoS: since Vol 9(1), 1970
CVs only	9 articles not in Scopus or WoS All 9 were published before 2006.	--	--	--	--
Scopus only	--	--	12 articles in Scopus but not in WoS All 12 were published between 1990 and 1995.	2 articles in Scopus but not in WoS One article, which appears in WoS, has no OAU author address. The other article appears in WoS (with an OAU author address) but is classified as a 'note' (not as an article or review).	--
WoS only	--	1 article in WoS but not in Scopus The article appears in Scopus but has no OAU author address.	--	1 article in WoS but not in Scopus The article appears in Scopus but has no OAU author address.	1 article in WoS but not in Scopus The article appears in Scopus but has no OAU author address.
Scopus & CVs	4 articles in Scopus but not in WoS Three articles were published outside the WoS coverage period. The other article (although within the WoS coverage period) is not listed in WoS.	--	1 article in Scopus but not in WoS The article (although published in the WoS coverage period) is not listed in WoS.	--	--
WoS & CVs	2 articles in WoS but not in Scopus One article appears in Scopus but has no OAU author address. The other article (although within the Scopus coverage period) is not listed in Scopus.	--	--	--	--

Table 4 FoP articles by department and by data source (1990–2013)

Departments	Data sources							
	CVs, Scopus and WoS combined (N=588)		Scopus and WoS combined (N=370)		Scopus (N=350)		WoS (N=247)	
	Count	%	Count	%	Count	%	Count	%
Pharmaceutics	155	26%	101	27%	97	28%	59	24%
Pharmacognosy	153	26%	94	25%	90	26%	60	24%
Pharmacology	143	24%	82	22%	76	22%	60	24%
Pharmaceutical Chemistry	123	21%	72	19%	67	19%	50	20%
Drug Research and Production Unit	117	20%	74	20%	72	21%	51	21%
Clinical Pharmacy and Pharmacy Administration	81	14%	37	10%	37	11%	17	7%

Table 5 FoP articles by collaboration indicator and by data source (1990–2013)

Collaboration indicators	Data sources			
	CVs, Scopus and WoS combined	Scopus and WoS combined	Scopus	WoS
% co-authorship (as a share of all articles)	95% (N=588)	96% (N=370)	96% (N=350)	96% (N=247)
% co-authorship within FoP (as a share of co-authored articles)	30% (N=559)	24% (N=357)	25% (N=337)	23% (N=238)
% co-authorship with rest of OAU (as a share of co-authored articles)	34% (N=559)	28% (N=357)	28% (N=337)	26% (N=238)
% co-authorship with rest of Nigeria (as a share of co-authored articles)	28% (N=559)	24% (N=357)	24% (N=337)	23% (N=238)
% international co-authorship (as a share of co-authored articles)	28% (N=559)	31% (N=357)	29% (N=337)	36% (N=238)

Table 6 FoP articles by collaboration indicator and by data source (2010–2013)

Collaboration indicators	Data sources			
	CVs, Scopus and WoS combined	Scopus and WoS combined	Scopus	WoS
% co-authorship (as a share of all articles)	97% (N=166)	97% (N=91)	97% (N=73)	98% (N=58)
% co-authorship within FoP (as a share of co-authored articles)	31% (N=146)	30% (N=73)	30% (N=71)	34% (N=41)
% co-authorship with rest of OAU (as a share of co-authored articles)	41% (N=146)	40% (N=73)	39% (N=71)	39% (N=41)
% co-authorship with rest of Nigeria (as a share of co-authored articles)	42% (N=146)	33% (N=73)	31% (N=71)	20% (N=41)
% international co-authorship (as a share of co-authored articles)	19% (N=146)	21% (N=73)	21% (N=71)	22% (N=41)

Table 7 Percentage of internationally co-authored FoP articles by world region and by data source (1990–2013)

World regions	Data sources			
	CVs, Scopus and WoS combined (N=156)	Scopus and WoS combined (N=110)	Scopus (N=99)	WoS (N=85)
West Africa	1%	1%	1%	1%
Rest of Africa	27%	20%	22%	20%
Asia	10%	7%	8%	6%
Europe	49%	63%	62%	64%
Latin America	0%	0%	0%	0%
Middle East	0%	0%	0%	0%
North America	25%	22%	20%	21%
Oceania	1%	1%	1%	0%

Boshoff & Akanmu

ORIGINALITY REPORT

10%

SIMILARITY INDEX

8%

INTERNET SOURCES

6%

PUBLICATIONS

%

STUDENT PAPERS

PRIMARY SOURCES

1	www.oauife.edu.ng Internet Source	2%
2	jcom.sissa.it Internet Source	1%
3	Frederick Owusu-Nimo, Nelius Boshoff. "Research collaboration in Ghana: patterns, motives and roles", <i>Scientometrics</i> , 2017 Publication	1%
4	journals.sfu.ca Internet Source	<1%
5	www.ost.uqam.ca Internet Source	<1%
6	sajlis.journals.ac.za Internet Source	<1%
7	repository.um.edu.my Internet Source	<1%
8	Nelius Boshoff. "Neo-colonialism and research collaboration in Central Africa", <i>Scientometrics</i> , 04/17/2009	<1%

9 Nelius Boshoff. "South–South research collaboration of countries in the Southern African Development Community (SADC)", *Scientometrics*, 12/11/2009 <1%
Publication

10 edoc.hu-berlin.de <1%
Internet Source

11 www.naymz.com <1%
Internet Source

12 www.leydesdorff.net <1%
Internet Source

13 dns2.asia.edu.tw <1%
Internet Source

14 www2.fc.up.pt <1%
Internet Source

15 www.journals.ac.za <1%
Internet Source

16 www.sajs.co.za <1%
Internet Source

17 www.dcscience.net <1%
Internet Source

18 act-r.psy.cmu.edu <1%
Internet Source

19

www.vandenbesselaar.net

Internet Source

<1%

20

repositorio.uchile.cl

Internet Source

<1%

21

issi2013.org

Internet Source

<1%

22

Franceschini, Fiorenzo, Domenico Maisano, and Luca Mastrogiacomo. "Do Scopus and WoS correct "old" omitted citations?", *Scientometrics*, 2016.

Publication

<1%

23

Liboni, Lara B., Charbel Jos Chiappetta Jabbour, Ana Jabbour, and K. Devika. "Sustainability as a dynamic organizational capability: A systematic review and a future agenda toward a sustainable transition", *Journal of Cleaner Production*, 2016.

Publication

<1%

24

www.jacso.info

Internet Source

<1%

25

observatori.iec.cat

Internet Source

<1%

26

Cavacini, Antonio. "What is the best database for computer science journal articles?", *Scientometrics*, 2015.

Publication

<1%

27

appswl.elsevier.es

Internet Source

<1%

28

Elizabeth Vieira. "Indicadores bibliométricos de desempenho científico: estudo da aplicação de indicadores na avaliação individual do desempenho científico", Repositório Aberto da Universidade do Porto, 2014.

Publication

<1%

29

wokinfo.com

Internet Source

<1%

30

www.myjournal.my

Internet Source

<1%

31

web-2.oauife.edu.ng

Internet Source

<1%

32

Pato, Maria Lúcia, and Aurora A.C. Teixeira. "Twenty Years of Rural Entrepreneurship: A Bibliometric Survey : Twenty years of rural entrepreneurship", Sociologia Ruralis, 2014.

Publication

<1%

33

Sarkozy, Alexandra, Alison Slyman, and Wendy Wu. "Capturing Citation Activity in Three Health Sciences Departments: A Comparison Study of Scopus and Web of Science", Medical Reference Services Quarterly, 2015.

Publication

<1%

34

Franceschini, Fiorenzo, Domenico Maisano, and Luca Mastrogiacomo. "Empirical analysis and classification of database errors in Scopus and Web of Science", Journal of Informetrics, 2016.

Publication

<1%

35

188.136.184.17

Internet Source

<1%

36

Crawford, Walt. "Open-access journals: idealism and opportunism.(Report)", Library Technology Reports, August-Sept 2015 Issue

Publication

<1%

Exclude quotes On

Exclude matches Off

Exclude bibliography On

Boshoff & Akanmu

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23

PAGE 24

PAGE 25

PAGE 26

PAGE 27

PAGE 28

PAGE 29

PAGE 30
