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Coverage and citation impact of oncological journals in the *Web of Science* and *Scopus*

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ABSTRACT

This paper reviews a number of studies comparing *Thomson Scientific*'s *Web of Science* (*WoS*) and Elsevier's *Scopus*. It collates their journal coverage in an important medical subfield: oncology. It is found that all *WoS*-covered oncological journals ($n = 126$) are indexed in *Scopus*, but that *Scopus* covers many more journals (an additional $n = 106$). However, the latter group tends to have much lower impact factors than *WoS* covered journals. Among the top 25% of sources with the highest impact factors in *Scopus*, 94% is indexed in the *WoS*, and for the bottom 25% only 6%. In short, in oncology the *WoS* is a genuine subset of *Scopus*, and tends to cover the best journals from it in terms of citation impact per paper. Although *Scopus* covers 90% more oncological journals compared to *WoS*, the average *Scopus*-based impact factor for journals indexed by both databases is only 2.6% higher than that based on *WoS* data. Results reflect fundamental differences in coverage policies: the *WoS* based on Eugene Garfield's concepts of covering a selective set of most frequently used (cited) journals; *Scopus* with broad coverage, more similar to large disciplinary literature databases. The paper also found that 'classical', *WoS*-based impact factors strongly correlate with a new, *Scopus*-based metric, SCImago Journal Rank (*SJR*), one of a series of new indicators founded on earlier work by Pinski and Narin [Pinski, G., & Narin F. (1976). Citation influence for journal aggregates of scientific publications: Theory, with application to the literature of physics. *Information Processing and Management*, *12*, 297–312] that weight citations according to the prestige of the citing journal (Spearman's rho = 0.93). Four lines of future research are proposed.

1. Introduction

During the past 40 years citation analysis has proven to be a very useful tool in studies of science and technology, especially in the evaluation of research performance (Braun, Glänzel, & Schubert, 1988; Garfield, 1979; Martin & Irvine, 1983; Price, 1978; Van Raan, 2004). Despite its limitations (e.g., Cheek, Garnham, & Quan, 2006; MacRoberts & MacRoberts, 1996; Seglen, 1997), the application of citation analysis to research evaluation provides powerful indicators to measure and assess the contributions of scholarly work to the advancement of knowledge (Moed, 2005). Consequently, it has become a well-established and widely practised tool in informed, evidence-based policy decision making.

Vannevar Bush's citation-based ideas led Eugene Garfield, 50 years ago, to the creation of a citation index (Garfield, 1955). Garfield realised this idea of tracking citation to quantitatively evaluate publications when he created the three citation indexes: *Science Citation Index (SCI)*, *Social Science Citation Index (SSCI)* and the *Arts & Humanities Index (A&HCI)*. These three

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print indexes were transformed into an electronic resource, a database called the *Web of Science* (*WoS*), produced by the *Institute for Scientific Information* (*ISI*), currently *Thomson Scientific*, based in Philadelphia, Pennsylvania. Other important *Thomson* products are the *Journal Citation Reports* (*JCR*) and the Essential Science Indicators (ESI), which together with *WoS* have been the main resources for systematic analysis of the impact of scholarly communication, until recently.

When Garfield launched the Science Citation Index there were no other abstract and citation indexing multidisciplinary databases and *Thomson* enjoyed a monopoly, for half a century, as the only comprehensive tool for carrying out measuring response to scientific publications (Bakkalbasi, Bauer, Glover, & Wang, 2006; Ball & Tunger, 2006). But lately this situation has changed, first with the release of discipline-oriented databases such as Cite Seer (computer and information science), SMEALSearch (academic business) or RePEc (economics) and recently with two other citation-enhanced databases of multidisciplinary nature, *Scopus* and *Google Scholar* (Bar-Ilan, 2008; Neuhaus & Daniel, 2008). In the fall of 2004 the scientific publisher Elsevier placed its multidisciplinary database *SCOPUS* on the market [http://www.Scopus.com/] and it was followed, only a few days later, by *Google Scholar* [http://scholar.google.com/].

Since these new databases have become available, the number of papers describing and analysing each individual tool and comparing one to another is increasingly growing (Burnham, 2006; Dess, 2006; Deis & Goodman, 2005; LaGuardia, 2005; Norris & Oppenheim, 2007; *Scopus*, 2007b). However, despite these numerous studies only a few compare them from a scientometric perspective (Bakkalbasi et al., 2006; Gorraiz & Schlögl, 2007; Jacso, 2006). Therefore, and since "the question of a global, internationally recognised benchmark for the evaluation of science output is far too important to simply leave it up to one product or the other without further investigation" (Ball & Tunger, 2006, p. 294), thorough in-depth analysis of the new alternatives remains imperative.

Evaluation of science through citation analysis depends entirely on citation-enhanced databases. Their potentialities and limitations need to be examined cautiously and meticulously (Moed, 2005). This paper compares *WoS* and *Scopus* data, since most studies about *Google Scholar* concluded that, up until now, citation analysis cannot be conducted using the metrics provided by *Google Scholar* for various reasons (Bauer & Bakkalbasi, 2005; Jacso, 2005; Neuhaus & Daniel, 2008; Norris & Oppenheim, 2007; Notess, 2005).

Thomson's *Web of Science* web page reveals that it covers 8700 of the most high impact research journals in the world and provides access to "the *Science Citation Index* (1900–present), *Social Sciences Citation Index* (1956–present), *Arts & Humanities Citation Index* (1975–present), Index Chemicus (1993–present), and *Current Chemical Reactions* (1986–present), plus archives 1840–1985 from INPI." (Thomson Scientific, 2007). *Scopus*, otherwise, covers 15,000 peer-reviewed journals from more than 4000 international publishers, 33 million records, of which "16 million records include references going back to 1996, and 17 million pre-1996 records go back as far as 1869" (Scopus, 2007a). *Scopus* covers about 70% more sources compared to the *WoS*.

The *WoS* list of indexed journals is shorter than that of *Scopus*, but the time period covered by *WoS* is much longer. Cited references in a large number of sources indexed in *Scopus* do not go back further than 1996. Information scientists study the implications of these two apparently different policies: depth versus breadth (Ball & Tunger, 2006; Fingerman, 2006). "Limiting themselves to a set volume of journals is considered a quality criterion for ISI" (Ball & Tunger, 2006, p. 294) while for *Scopus* "the less highly perceived journals could become interesting for scholarly communication" (Ball & Tunger, 2006, p. 300). As highlighted by Neuhaus and Daniel "two aspects must thereby be differentiated: (a) the importance of journals in a field's written communication system and (b) the extent to which the citation indexes cover the journal literature in a field" (Neuhaus & Daniel, 2008, p. 194). Both databases are powerful platforms providing analytical tools for citation analysis, but presenting a review of the multiple searching and browsing options they both offer exceeds the scope of this paper. There are already several papers covering this subject (Burnham, 2006; Codina, 2005; Dess, 2006; Fingerman, 2005; Jacso, 2005; LaGuardia, 2005). The research reported here, instead, intends to examine the implications for research evaluation of the differences in coverage among the two databases, and to explore whether the new citation tracking resources provide more complete and useful citation information.

Previous comparative studies of *WoS* and *Scopus* come to the conclusion that, up until now, there is not a clear winner, that they are both permanently improving, and that the relative advantage of using one source or the other would depend much on the particular subject area. Most authors recommend undertaking subject specific analysis to determine which sources perform best for particular fields or time periods (Bakkalbasi et al., 2006; Bar-Ilan, 2008; Bar-Ilan, Levene, & Lin, 2007; Fingerman, 2005; Neuhaus & Daniel, 2008). They concluded that the pros and cons of each database would depend on the discipline and time period of the analysis.

Although "*Scopus* is a database with criteria similar to those of *Thomson* ISI, not only in the development of the collection but also in its coverage on the world level" (Moya-Anegon et al., 2007, p. 76), each database still shows differences in relation to their collection policy, which influence both the publication and citation counts. *WoS* and *Scopus*' coverage has also been reviewed by Moya-Anegon et al. (2007) in relation to the distribution of journals and their papers across journal subject categories, journal publishers and their country of origin, publication languages, and to the extent to which indexed journals are peer-reviewed. Albeit journal coverage is not the only criterion for determining the appropriateness of citation-enhanced databases for performing research analysis, the selective coverage of the journal literature in a field is the crucial first step for the assessment of a discipline.

Hence, the aim in this study is to compare the journal coverage of *WoS* and *Scopus* with one another, in order to determine which database responds best as an assessment tool of research performance in one particular field, *oncology*, during the time period 1996–2006. This paper is a further step from our preliminary overview of the research performance of major

European countries in the field oncology based on *Thomson Scientific*'s *Web of Science* (López-Illescas, Moya-Anegón, & Moed, 2008), in which the definition of the field oncology was broadened by retrieving, apart from articles in specialist journals in the *WoS* subject category Oncology, oncology-related papers from general journals and specialist journals covering other medical specialties.

Although the citation tracking tends to be limited to this relatively narrow *Scopus*' time span 1996+, the window of access would probably be too restrictive for research investigating subject areas with longer periods of historical development (Scopus, 2007b); but this is not the case with oncology, a relatively new, rapidly developing discipline, in which the past decade has been decisive for the explosion in knowledge of genetics and molecular biology of cancer. Thus, having the records been enhanced by cited references in both databases during the time period of our case study (1996–2006) we need to focus mainly upon the databases' breadth of coverage and its implications for the assessment of the field oncology.

Specific research questions addressed in this paper are:

- What is the degree of overlap in coverage of oncological journals between *WoS* and *Scopus*?
- How do for a journal covered in both databases its number of source items and its journal impact factor in the *WoS* compare to those in *Scopus*?
- How do the impact factors of journals indexed in *Scopus*, especially those that are not covered by the *Web of Science*, compare to those indexed in the *WoS*?

This paper also analysed new science metrics, induced and developed following the new resources and technology, to determine whether they broaden and supplement scientometric methodology. During the past decades the most influential measure has been the Journal Impact Factor, defined in the *JCR*, as the "average number of times articles from the journal published in the past 2 years have been cited in the *JCR* year (JCR, 2007). However, this measure, although highly influential, is not free of controversy (Seglen, 1997; Walter, Bloch, Hunt, & Fisher, 2003). Researchers argue that *Thomson Scientific*'s impact factor is being overvalued, is based on hidden data, and that it has some deficiencies, which are raising some questions with regard to weighting publications across disciplines and weighting citations (Debackere & Glanzel, 2004, p. 272).

During the past years a series of new journal metrics was introduced (Bergston, 2007; Bollen, Rodríguez, & Van de Sompel, 2006; SCImago, 2007b), all based on the pioneering work of Pinski and Narin (1976). The base idea underlying these new measures is that citations should be weighted according to the 'importance' of the sources containing them. As Pinsky and Narin put it, "it seems more reasonable to give higher weight to a citation from a prestigious journal than to a citation from a peripheral one" (Pinski & Narin, 1976, p. 298). In 2004 Palacios-Huerta, investigating the properties of ranking methods, concluded that the invariant method, proposed by Pinski and Narin in 1976, is the unique method satisfying the requirements for bearing the ranking problem (Palacios-Huerta & Volij, 2004).

The new measures build further upon the *Google* PageRank algorithm (Brin & Page, 1998) which is on its turn based on Pinski and Narin's ideas, and rank journals in the same way as *Google* uses the hyperlinks network to rank Web pages. Bollen has suggested a weighted version of this algorithm to obtain a metric able to reflect prestige. He introduced the Y-factor, a product of the popularity-oriented ISI Impact Factor and the prestige-oriented Weighted PageRank (Bollen et al., 2006). Carl Bergstrom and his team applied the *Google* PageRank principle (Bergston, 2007) to calculate their Eigenfactor (Eigenfactor org, 2007). In December 2007 the SCImago group at the University of Granada in collaboration with Elsevier launched its *SCIMago Journal Rank* indicator (*SJR*) calculated within *Scopus.* The *SJR* indicator is based on the transfer of prestige from a journal to another as expressed in citations a journal gives to other journals and to itself, and calculated in an iterative process (SCImago, 2007b).

It is true that the information provided by bibliometric analyses depends on the database chosen (Bakkalbasi et al., 2006; Bar-Ilan, 2008). For this reason it may be difficult to compare the results of *SJR* journal analyses with those based on impact factors from the *JCR*. However, both databases share important characteristics: they are both interdisciplinary citation-enhanced databases and they are primarily concerned with the sciences. Social sciences, and especially arts and humanities are less well covered (Moed, 2005). Several analyses have confirmed strong correlations between some of their indicators rankings (Bakkalbasi et al., 2006; Bar-Ilan et al., 2007; Bauer & Bakkalbasi, 2005; Norris & Oppenheim, 2007).

A specific research question addressed in this part of our analyses is

- How does the 'classical' *JCR* impact factor of oncological journals indexed in *Scopus* correlate with the *SCIMago Journal Rank* indicator?

The remainder of this paper is structured as follows: Section 2 explains the methodology. Section 3 presents the results and discussion on the comparison of *Scopus* and *WoS* journal coverage in oncology. 'Classical' impact factors and new metrics (*SCIMago Journal Rank*) are compared with one another in Section 4. Finally, Section 5 presents the main conclusions and proposes future research.

Two comments as regards the terminology used in this paper should be made. Firstly, this paper uses the term 'journal' to indicate a source publication covered by a database. It must be noted, however, that not all sources covered by the *WoS* or *Scopus* are journals. Especially *Scopus* indexes a large number of conference proceedings and books. As shown below, the sources in oncology are almost all journals. Secondly, in this paper the terms 'oncology' and 'cancer' will be used interchangeably.

2. Methodology

We started our descriptive and exploratory analysis of oncological journals by examining the journal coverage in both databases according to their web pages. It should be kept in mind that both data sources are well updated and the numbers shown in this study will, most probably, have undergone some changes by the time of publication of this paper.

For the analysis of *WoS* data we used the *Thomson*'s *Journal Citation Reports* 2007 (*JCR*) which covers "more than 7500 of the world's most highly cited, peer-reviewed journals in approximately 200 disciplines" and which "offers access to citation statistics from 1997 onward" (JCR, 2007).

When *Scopus* was launched an information product comparable to *Thomson*'s *JCR* was not available (Gorraiz & Schlögl, 2007), but now a new Internet database enables users to calculate publications' impact factors and generate citation statistics from *Scopus*' data. Therefore, for the analysis of *Scopus* we used this tool: the SCImago Journal and Country Rank 2007. The *SJR* is a portal created by the SCImago research group at the Universities of Granada, Extremadura, Carlos III and Alcalá de Henares in Spain "which includes journals and country scientific indicators developed from the information contained in the *Scopus*® database" (SCImago, 2007a). The UGR group is the first research group that made journal impact measures for all *Scopus* journals publicly available, enabling one to compare the citation impact of *Scopus* covered journals with those included in the *WoS* or *JCR*. It must be noted that the *SJR* is based on raw data obtained from *Scopus* in the beginning of 2007. Corrections and additions to *Scopus* that were made later are *not* included in the database used in this study.

Each journal in *SJR* and *JCR* is assigned to one or more subject categories. *JCR* comprises 127 categories in its Science Edition and 55 in its Social Sciences Edition, whereas in *SJR* all journals are classified in 27 broader areas and in 295 specific subject categories. In *JCR* we have found just one category related to cancer: Oncology. In *SJR* we found three cancer related categories, each belonging to a different subject area: Oncology (Medicine), Cancer Research (Biochemistry, Genetics and Molecular Biology) and Oncology Nursing (Nursing).

For this analysis we decided to compare the *WoS* category Oncology with the *Scopus* categories Oncology and Cancer Research. We discarded Oncology Nursing because it covers only 7 journals, 5 of which are already included in the other two cancer related categories. Besides, the 2 remaining journals are more closely related to Nursing and Palliative Care, although, according to specialists in the field, they could also be well assigned to Oncology or Cancer Research. The 2 journals are: *European Journal of Palliative Care* and *Oncology Nursing Forum*.

We combined in *Scopus* the journals in the two oncology-related subject categories into one set, removing duplicate titles. Next, we compared the sets of oncology journals and determined which titles are included or missing in the two databases and whether they had been assigned to other categories (see Table 1 in the next section). This examination was carried out in three main steps, classifying journals into three groups: journals included in *WoS* and in *Scopus* in different categories, journals in *WoS* and in *Scopus* in cancer categories and journals indexed only in one of the two databases.

Step 1: For the journals included in both databases and assigned to different categories we have checked the journals' scopes and have gathered specialists' opinion with regards to which database makes a more accurate classification of journals.

Step 2: For the journals indexed in both databases in cancer categories, we compared the number of published documents in a 3-year period (2003–2004–2005) and the journal impact factor in 2006 calculated in each of the two databases. We also ranked the journals by their *WoS* impact factor and by their SCImago Journal Rank, and compared their rank positions.

Step 3: For the third group of journals, the ones indexed only by one of the two databases, we measured the importance of these journals, mainly through citation counts, to determine the implications of their inclusion for the assessment of the field.

In order to compare the indicators derived from the two databases' we used several methods and measures for computing the similarity between rankings. We calculated the Pearson correlation coefficient and, in order to correct for its sensitivity to outliers, also the Spearman rank–correlation coefficient, which is based on rank orders

3. Results on journal coverage

3.1. Oncological journals in Scopus and WoS

Table 1 shows that *all* 126 oncology journals indexed in the *WoS* are included in *Scopus*. 112 of these are allocated to oncological journal categories in *Scopus*, and 14 to other categories. In *Scopus* the journal category Oncology includes 167 journals, and Cancer Research 139. 75 journals were included in both categories. Once corrected for the journal overlapping it appeared that *Scopus* covers 231 journals in the categories Oncology and Cancer Research. 112 of these are found in the *WoS* category Oncology and 13 in other *WoS* categories. The number of oncological journals in *Scopus* not indexed in the *WoS* amounts to 106.

Table 1
Journals in *WoS* and *Scopus* cancer categories.

WoS cancer categories	*WoS* journals in cancer categories	*WoS* journals in *Scopus*	*Scopus* cancer categories	*Scopus* journals in cancer categories		Journals included in both categories	*Scopus* journals in *WoS*	
Oncology	126	111	In cancer categories	*Oncology*	167	75	112	In cancer categories
		14	In other categories	*Cancer Research*	139		13	In other categories
		0	Not in *Scopus*				106	Not in *WoS*
Total no. of journals		126		Total no. of journals			231	

Table 2
WoS journals in the category Oncology assigned in *Scopus* to non-cancer categories.

No.	*WoS* (category oncology)	*Scopus* (non-cancer categories)	Correctly assigned to oncology
1	Biodrugs	*Immunology and Allergy|Pharmacology (Medical)*	Y
2	Bone Marrow Transplantation	*Hematology|Transplantation*	Y
3	Breast	*Obstetrics and Gynecology*	Y
4	Chemotherapy	*Cardiology and Cardiovascular Medicine Pharmacology (Medical)*	Y
5	Experimental Cell Research	*Cell Biology*	Y
6	Folia Biologica	*Agricultural and Biological Sciences (miscellaneous)*	N
7	International Journal Of Biological Markers	*Biochemistry|Immunology*	Y
8	Investigational New Drugs	*Molecular Medicine|Pharmacology*	Y
9	Journal Of Chemotherapy	*Microbiology (medical)|Pharmacology (medical)*	Y
10	Stem Cells	*Cell Biology*	N
11	Oncology Nursing Forum	*Oncology Nursing*	Y
12	Cancer Detection and Prevention	Medicine/Biochemistry, Genetics and Molecular Biology	Y
13	Progress IN Experimental Tumor Research	Medicine/Biochemistry, Genetics and Molecular Biology	Y
14	Journal of Thoracic Oncology	*Medicine|No journal category available*	Y

3.2. Journals indexed in WoS and Scopus in different categories

Tables 2 and 3 give an overview of the journals included in the first group. Table 2 relates to the 14 cancer journals in the *WoS* that were assigned to other, non-oncology related categories in *Scopus*, and Table 3 to the 13 cancer journals in *Scopus* not included in the *WoS* category Oncology. After having checked the journals' scopes and having consulted specialists in the field, it resulted that among the 14 journals in the *WoS* category Oncology 12 are correctly allocated and 2 are better assigned to other categories. The last column in Tables 2 and 3 indicate for each journal whether or not it was properly assigned to an oncological category.

Table 3 shows that among the 13 journals in *Scopus* not included in the *WoS*, 11 are correctly assigned to cancer categories, 1 is better assigned to another category and the other one should be removed, *Avian Diseases*, which is the official publication of the American Association of Avian Pathologists and its content is related to the field of avian diseases.

3.3. Journals in WoS and in Scopus in cancer categories

Table 4 gives the 10 journals with the highest impact factor in the *JCR* and in the *SJR*, defined as number of cites in 2006 to documents published during 2004 and 2005, divided by the number of citable documents published in these 2 years. The *SJR* denotes this indicator as 'cites per document'. But since it is the same type of indicator as the *JCR* journal impact factor, the terms cites per document' and 'impact factor' are used interchangeably, even though the latter normally relates to *JCR* citation counts only.

Impact factors calculated in *Scopus* data are on average higher than those extracted from *WoS* data, but the differences are small. The average impact factor of the 112 journals calculated in the *WoS* amounts to 4.29, against 4.40 for the same journals calculated in *Scopus*, which is 2.6% higher than the average in the *WoS*. For 85 journals the impact factor in *Scopus* was higher than that calculated in the *WoS* – on average 0.40 higher in favour of *Scopus* – while only 27 journals obtained a higher impact factor in the *WoS* than they had in *Scopus* – on average 0.85 higher than in *Scopus*.

Strong similarities between rankings of *WoS* and *Scopus* have been previously demonstrated in particular case studies conducted by other authors, in which they recommend to carry out further discipline-specific analysis in order to generalize their conclusion (Bar-Ilan et al., 2007; Norris & Oppenheim, 2007). In our analysis, this strong similarity between the two databases can be also observed in the set of oncology journals covered by both databases. Fig. 1 clearly illustrated this. The

Table 3
Scopus' journals in cancer categories assigned in *WoS* to other categories.

No.	*Scopus* (cancer categories)	*WoS* (non-cancer categories)	Correctly assigned to oncology
1	Avian Diseases	*Veterinary Sciences*	N
2	Blood Reviews	*Hematology*	Y
3	Clinical Radiology	*Radiology, Nuclear Medicine & Medical Imagining*	Y
4	Drug Resistance Updates	*Pharmacology & Pharmacy*	Y
5	Experimental Hematology	*Hematology; Medicine, Research & Experimental*	Y
6	Journal of Mammary Gland Biology and Neoplasia	*Endocrinology & Metabolism; Physiology*	Y
7	Molecular Imaging and Biology	*Radiology, Nuclear Medicine & Medical Imaging*	Y
8	Nuclear Medicine and Biology	*Radiology, Nuclear Medicine & Medical Imaging*	Y
9	Virus Research	*Virology*	N
10	PLoS genetics	*Genetics & Heredity*	Y
11	Best Practice and Research in Clinical Hematology	*Hematology*	Y
12	Nature Clinical Practice Gastroenterology and Hepatology	*Gastroenterology & Hepatology*	Y
13	Journal of Oral Pathology and Medicine	*Gastroenterology & Hepatology*	Y

Table 4
The top 10 journals with the highest number of cites per document (2 years) in *SJR* and *JCR* in 2006.

Journals	In *WoS*/*JCR*	In *Scopus*/*SJR*
WoS top ten (2006 cites per 2004–2005 document)		
Ca-A Cancer Journal for Clinicians	63.3	63.0
Nature Reviews Cancer	31.6	24.8
Cancer Cell	24.1	23.4
Journal of the National Cancer Institute	15.3	13.5
Journal of Clinical Oncology	13.7	13.1
Advances in Cancer Research	10.7	10.0
Lancet Oncology	10.1	8.0
Biochimica et Biophysica Acta—Reviews on Cancer	9.2	9.4
Cancer Research	7.7	7.8
Seminars in Cancer Biology	7.4	7.4
Scopus top ten (2006 cites per 2004–2005 document)		
Ca-A Cancer Journal for Clinicians	63.3	63.0
Nature Reviews Cancer	31.6	24.8
Cancer Cell	24.1	23.4
Journal of the National Cancer Institute	15.3	13.5
Journal of Clinical Oncology	13.7	13.1
IARC monographs on the evaluation of carcinogenic risks to humans	Not in *JCR*	11.0
Advances in Cancer Research	10.7	10.0
Biochimica et Biophysica Acta Reviews on Cancer	9.2	9.4
Lancet Oncology	10.1	8.0
Cancer Research	7.7	7.8

cites per document calculated in *Scopus* and the same indicator based on *WoS* data show Pearson and Spearman correlation coefficients of 0.99 and 0.95, respectively ($n = 112$, $p = 0.0001$ for both measures).

In the set of the 112 journals included both in *Scopus* and in the *WoS*, we identified the outliers, i.e., journals whose position showed the largest deviation from the regression line, both with respect to cites per document and to number of citable documents. Defining the *Scopus*-based indicators as the independent variables (X) and the *WoS*-based measures as the dependent ones (Y), the regression lines for these two indicator were found to be $Y = 1.01X - 0.23$ and $Y = 1.01X - 0.92$, respectively. For cites per documents we counted citations in 2006 to documents published during 2004 and 2005, but in the calculation of the number of citable documents we counted documents published during a *3-year* period, 2003–2004–2005. The *SJR* does *not* give separate counts for the 2-year period 2004–2005. The results are presented in Tables 5 and 6. Some outliers appear both in Table 5 and in Table 6 because, although it is not the only factor at stake, there is a strong relationship between cites per document and number of citable documents as pointed out below.

The two databases' different collection and processing policies may affect both the publications covered and the citation counts (Ball & Tunger, 2006; Bar-Ilan, 2008). Therefore, we compared the numerators of the impact factors, the number of citations, and no significant differences were found. The numbers of citable documents in the two databases present an even stronger correlation and fewer outliers than the number of cites per document. For citable documents the Pearson correlation coefficient between their number found in *Scopus* and *WoS* is 0.99 and the Spearman rank coefficient 0.96 ($n = 112$, $p = 0.0001$ for both measures). The average numbers of citable documents for the set of 112 journals are in *Scopus* and *WoS* almost the same: 501 versus 505. *Scopus* shows a higher number of citable documents than the *WoS* in 49 journals – on average 36 higher in favour of *Scopus* – while in the *WoS* this number is higher than in *Scopus* for 53 journals – on average 42 higher.

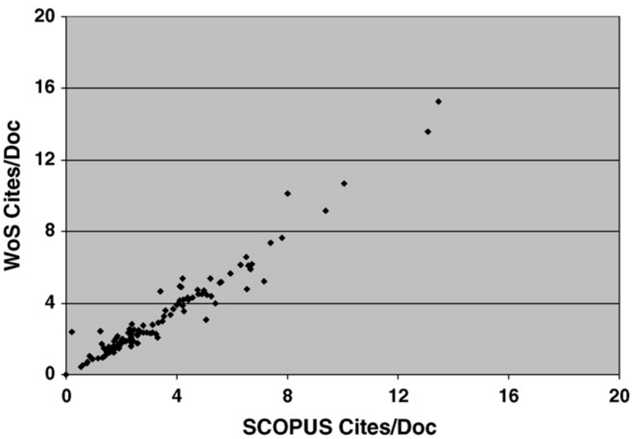

Fig. 1. Cites per document distribution for journals in both *Scopus* and *WoS*.

Table 5
Top ten outliers in cites per document.

5 most far above the regression line (higher in *WoS*)

Journals	2006 Cites per 2004–2005 document		Citable documents 2003–2005	
	WoS	*Scopus*	*WoS*	*Scopus*
Nature Reviews Cancer	31.6	24.8	234	285
Journal of the National Cancer Institute	15.2	13.5	474	595
Lancet Oncology	10.1	8.0	245	307
European Journal of Cancer, Supplement	2.4	0.2	96	101
Breast Cancer Research and Treatment	4.7	3.4	617	573

5 most far below the regression line (higher in *Scopus*)

Journals	*Scopus*	*WoS*	*Scopus*	*WoS*
Oncologist	7.2	5.2	230	262
Endocrine-Related Cancer	6.5	4.8	163	209
Seminars in Oncology	5.1	3.1	420	614
Radiotherapy and Oncology	5.4	4.0	462	571
Urologic Oncology	3.3	2.1	128	198

These outcomes illustrate that the largest differences are merely among the outliers, the remaining journals give very similar results.

These outliers may constitute one of the reasons why for some journals impact factors in *Scopus* tend to be somewhat lower than they are in the *WoS*. Although the two databases share similar document type policies and take into account as citable documents the same type of documents, i.e., research articles, notes and reviews only (JCR, 2007; Scopus, 2007b), they do not always consider the same document as belonging to the same type. Hence, the discrepancies in the resulting numbers of cites per document in the two databases may be partly influenced by different assignments to document types at the moment of classification of records by the editorial teams.

3.4. Journals indexed only in one of the two databases

In order to further characterize the position of journals indexed in *Scopus* but not covered by the *WoS*, we have analysed the distribution of cites per document and also number of citable documents among *Scopus* journals. Journals covered by the *Scopus* are arranged in quartiles on the basis of each of these two indicators. Quartile 4 represents the top and quartile 1 the bottom of the distribution. Next, the journals in *Scopus* indexed by the *WoS* are positioned in these quartiles. The outcomes are presented in Table 7.

Table 7 shows that only few journals indexed by *Scopus* but not covered by the *WoS* occupy positions in the third and fourth quartile, the quartiles with the highest values. The overwhelming part of these journals is situated in the first quartile, i.e., the bottom of the distribution. This means that they have a relatively low citation impact. But Table 7 also shows that there are some journals which are quite often cited, at least as much as the *WoS* journals in the third and fourth quartile, that are missing in *WoS*. Table 7 also shows that the journals in *Scopus* not indexed by the *WoS* tend to publish a low number of citable documents per year.

Table 6
Top ten outliers in number of citable documents.

5 most far above the regression line (higher in *WoS*)

Journals	Citable documents 2003–2005		2006 Cites per 2004–2005 document	
	WoS	*Scopus*	*WoS*	*Scopus*
Clinical Cancer Research	2911	2780	6.2	6.7
Cancer Letters	1148	1026	3.3	3.5
Seminars in Oncology	614	420	3.1	5.1
Oncology (Basel)	429	278	2.3	3.3
Hematology/Oncology Clinics of North America	204	57	1.5	1.7

5 most far below the regression line (higher in *Scopus*)

Journals	*Scopus*	*WoS*	*Scopus*	*WoS*
Oncology (New York)	507	138	1.9	1.8
Hematological Oncology	207	49	1.7	1.9
Journal of the National Cancer Institute	595	474	13.5	15.3
Cancer	2110	1975	5.0	4.6
Lancet Oncology	307	245	8.0	10.1

Table 7
Distribution of *WoS* covered oncology journals in *Scopus* oncological categories.

Quartile	No. (%) journals in *Scopus* ($n = 206$)	2006 Cites per 2004–2005 document		Citable documents 2003–2005	
		Range of scores (2 years)	No. (%) of journals *in WoS* ($n = 112$)	Range of scores (3 years)	No. (%) of journals in *WoS* ($n = 112$)
1 (bottom)	51 (25%)	0–0.5	3 (6%)	1–83	11(22%)
2	52 (25%)	0.5–1.8	25 (48%)	85–157	17(33%)
3	52 (25%)	1.8–3.3	36 (69%)	161–345	36 (69%)
4 (top)	51(25%)	3.3–63.0	48 (94%)	345–3992	48 (94%)

12 Journals in *Scopus* with zero number of citable documents in the years analysed were not taken into account.

Table 8
The ten most highly cited journals in *Scopus* not indexed by the *WoS*.

Ranges	Journals	*SJR*	Citable docs 2003–2005	2006 Cites per 2004–2005 document	Quartile	Additional info
1	*IARC monographs on the evaluation of carcinogenic risks to humans/World Health Organization, International Agency for Research on Cancer*	0.954	4	11	4	Book/monograph, not a journal
2	*Curr Med Chem Anti-Cane Agents*	0.64	130	3.95	3	Current title: Anti-cancer agents in Medicinal Chemistry
3	*Molecular Cancer*	0.795	114	3.81	3	Covered by *WoS* as from 2006
4	*Angiogenesis*	0.726	92	3.34	3	
5	*CytoJournal*	0.189	24	3.21	3	
6	*Familial Cancer*	0.438	96	2.84	3	Covered by *WoS* as from 2005
7	*Cancer Immunity*	0.536	88	2.67	2	
8	*Integrative Cancer Therapies*	0.203	104	2.5		Covered by *WoS* as from 2006
9	*Clinical breast cancer*	0.39	186	2.43		Covered by *WoS* as from 2006
10	*Clinical colorectal cancer*	0.339	129	2.35	2	Covered by *WoS* as from 2006 but only partly

Table 8 gives the 10 *Scopus* journals not indexed by the *WoS* with the highest number of cites per document, and Table 9 the 10 journals with the lowest value of this ratio. Table 8 also gives additional information about the journals. It must be noted that the source in the top position of the ranking in Table 8 is not a journal. It is a book from a monographs series: *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, published by the World Health Organization, International Agency for Research on Cancer. The journals *Molecular Cancer*, *Familial Cancer*, *Integrative Cancer Therapies*, *Clinical Breast Cancer* and *Clinical Colorectal Cancer* are indexed in the *WoS* as from 2006, although the latter journal only during a part of a year. These 5 journals were not included in the JCR (2007) that was used in this analysis. Four journals, *Anti-cancer Agents in Medicinal Chemistry*, *Angiogenesis*, *CytoJournal* and *Cancer Immunity* are not indexed in the *WoS* at the moment this paper was written. But, as emphasised in the introduction section, this situation may change rapidly.

Table 9
The ten journals in *Scopus* and not in *WoS* with the lowest citation impact.

Ranges	Journals	*SJR*	Citable docs 2003–2005	2006 Cites per 2004–2005 document	Quartile
1	*Japanese Journal of Lung Cancer*	0.039	221	0.02	1
2	*Chinese Journal of Clinical Oncology*	0.038	203	0.01	1
3	*Oncologia*	0.038	120	0.01	1
4	*Women's Oncology Review*	0.038	95	0.01	1
5	*Revisions en Cancer*	0.038	93	0	1
6	*Turkish Journal of Cancer*	0.044	81	0	1
7	*Libri Oncology*	0.038	44	0	1
8	*Tumor Diagnostik und Therapie*	0.038	43	0	1
9	*Enhancer—Biotherapy of Cancer*	0.038	10	0	1
10	*Tumor Research*	0.038	9	0	1

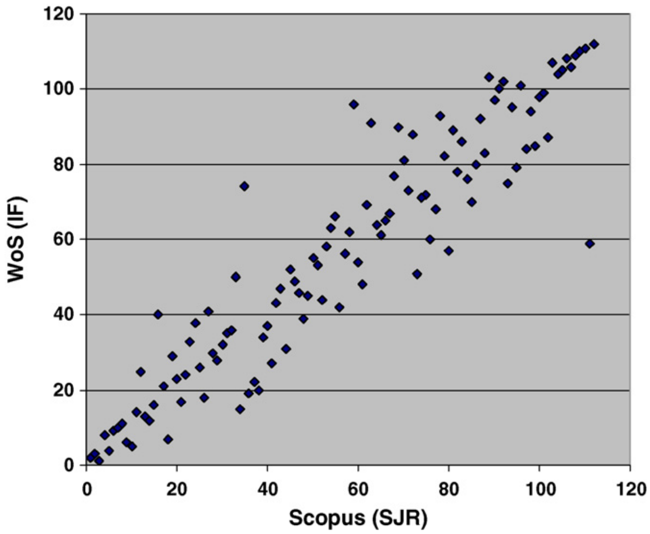

Fig. 2. *Scopus SJR* vs. *WoS* impact factor (IF).

4. *WoS* impact factor and *Scopus SJR* rankings

Fig. 2 presents a scatter plot in which each dot represents a journal covered both in the *WoS* and in *Scopus*. The horizontal axis gives the rank of a journal according to the *SJR* indicator calculated in *Scopus*, and the vertical axis a journal's rank according to the journal impact factor derived from *WoS* data. The two indicators show a Spearman rank correlation coefficient of 0.93 ($n = 112$, $p = 0.0001$). To put this outcome in perspective, we also calculated the Spearman coefficient between *WoS* impact factor and *SJR* indicator for all about 8000 journals indexed both by *WoS* and *Scopus* and covering all fields of science. Data relate to the citing year 2006. We obtained a rank correlation coefficient of 0.69.

Two of the four strongest outliers in the figure above, *European Journal of Cancer*, *Supplement* and *Hematology/Oncology Clinics of North America*, are also included in Tables 5 and 6, respectively, presenting outliers as regards citation counts and number of citable documents.

In the table below it can be observed that the top journals in cancer categories are the same in both databases' rankings, although they may occupy different positions; for some this difference in positions is small but for others it is large. *Cancer Research* ranks 6th and *Lancet Oncology* 18th according to their *SJR*. However, *Lancet Oncology* ranks 7th while *Cancer Research* ranks 9th on the basis of their *WoS* impact factor (IF). *Lancet Oncology* has a higher *WoS* impact factor than *Cancer Research* but a lower *SJR*. Another clear example of this is *Ca-A Cancer Journal for Clinicians* with IF of 63.0 is third in the *SJR* ranking, while *Nature Reviews Cancer* with a *Scopus* impact factor of only 24.8 ranks first. It should be also noticed that journals such as *Nature Reviews Cancer* which shows important differences in IF among the two databases may move only a few positions

Table 10
Top journals in *SJR* and *WoS* rankings.

Journal	*WoS* IF[a] rank	*Scopus SJR* rank	*Scopus SJR* 2006	*WoS* IF[a] 2006	*Scopus* IF[a] 2006	*WoS* citable documents 2003–2005	*Scopus* citable documents 2003–2005
Ca-A Cancer Journal for Clinicians	1	3	7.3	63.3	63.0	51	68
Nature Reviews Cancer	2	1	9.2	31.6	24.8	234	285
Cancer Cell	3	2	8.2	24.1	23.4	302	282
Journal of the National Cancer Institute	4	5	2.1	15.3	13.5	474	595
Journal of Clinical Oncology	5	10	1.8	13.6	13.1	2259	2283
Advances in Cancer Research	6	9	1.9	10.7	10.0	45	46
Lancet Oncology	7	18	1.0	10.1	8.0	245	307
Biochimica et Biophysica Acta—Reviews on Cancer	8	4	3.3	9.2	9.4	55	55
Cancer Research	9	6	2.0	7.7	7.8	4002	3992
Seminars in Cancer Biology	10	7	2.0	7.4	7.4	148	149

[a] IF: citations in 2006 to documents published in 2004–2005, divided by the number of citable documents published during 2004–2005.

in the rankings or not move at all. *Clinical and Experimental Metastasis* with a *SJR* of 0.67 occupies the 35th position in the *SJR*/*Scopus* ranking while it ranks, with an IF of 2.0, 74th in the *WoS*/IF ranking. Such differences may be explained by the fact that popular journals receive more citations but from journals of low prestige, while prestigious journals receive less citations but from more prestigious journals. The differences in rankings must be interpreted in terms of quality of citation, little cite, big cite (Table 10).

5. Conclusions

In the first place we should emphasise that a comparison of the two databases is hampered by the fact that both are in continuous development; source coverage is expanded, backlogs are added, and data capturing and standardization are improved. Specific outcomes may therefore become quickly obsolete. As a typical example, Table 8 presenting the ten journals with the highest impact factors in *Scopus* but not indexed in the *WoS* includes 5 journals that are not listed in the JCR (2007) used in this study, but that are covered by the *WoS* as from 2006. It is therefore more appropriate to focus on the main outcomes.

The comparison of the coverage of oncological journals in the *Web of Science* and *Scopus* reveals the following general patterns of great interest.

- In Oncology all 126 journals covered by the *Web of Science* and listed in the 2007 *Journal Citation Reports* are included in *Scopus*. In addition, *Scopus* covers 106 oncological journals not indexed in the *WoS*. In other words, in terms of oncological journals covered, the *WoS* constitutes a genuine subset of *Scopus*; *Scopus* indexes some 90% more journals in its oncological journal categories compared to the *WoS* category Oncology.
- The 106 journals indexed in *Scopus* that are *not* covered by the *Web of Science* tend to have low to very low journal impact factors. More specifically, among the top 25% of sources with the highest impact factors in *Scopus*, 94% is indexed in the *WoS*. For the bottom 25% of *Scopus* journals the percentage of *WoS* covered journals is only 6. In other words, the *Web of Science* tends to contain a selection of the 'best' journals in *Scopus* in terms of citation impact.
- For an oncological journal covered both in *WoS* and *Scopus* the impact factor calculated from *Scopus* data is on average higher than that extracted from *WoS* data, but the differences are small. The average *Scopus*-based impact factor is 2.6% higher than that based on *WoS* data. Several discrepancies between *WoS* and *Scopus* as regards impact factors and especially number of citable documents await further investigation and explanation.

Outcomes suggest that the criteria for selecting sources are rather different among the two databases. The *Web of Science*'s coverage is primarily based on Eugene Garfield's concept of measuring the importance of journals on the basis of their citation impact, and including the most important ones as sources in the database. *Scopus* coverage is more comprehensive, and citation impact of journals is apparently less discriminative, although it includes virtually all *Web of Science* journals in science fields. The broadness of *Scopus* coverage is similar to that found in large literature databases covering a particular discipline, such as MEDLINE or EMBASE for (bio)medical literature, and CHEMABS for the chemical literature.

One would expect that *Scopus* would show on average a higher impact factor for a journal than the *WoS* for the same journal, due to the broader coverage of the former, which influences the citation data, since the citations taken into account come from the items indexed by it (Ball & Tunger, 2006; Bar-Ilan et al., 2007). The differences in citation levels between *Scopus* and *WoS* are much smaller than the difference in oncological journal coverage (about 90% more journals in *Scopus* compared to *WoS*) or in the total number of sources covered by the two databases (about 70% more sources in *Scopus*). After all, we found that there are 106 oncological journals in *Scopus* not covered by the *WoS*, and one would expect that these journals cite the *WoS* covered journals. But there are also other factors that may explain the fact that having more journals included in *Scopus* than in *WoS* does not always assure higher impact factor values in *Scopus* compared to the *WoS*. An important factor affecting citation counts is that the *WoS* includes more secondary documents, which also may be cited. Citations to such documents would be counted in the numerator of the impact factor, but the documents themselves would not be counted in the denominator as they are not defined as citable documents (Moed & van Leeuwen, 1996).

In some studies, dealing with other disciplines found higher citation rates in *Scopus* than in the *WoS* (Dess, 2006; Gorraiz & Schlögl, 2007; Neuhaus & Daniel, 2008). However, research conducted by other authors showed that the citation rates in *WoS* were found to be higher than in *Scopus* (Ball & Tunger, 2006). Although, there are also numerous studies which coincide in remarking that there is no significant difference in citation counts between *WoS* and *Scopus*, albeit older material may be covered most completely by *WoS* (Bar-Ilan et al., 2007; Bauer & Bakkalbasi, 2005; Norris & Oppenheim, 2007). This corroborates the notion that the outcomes of a comparison between *Scopus* and *WoS* may differ significantly from one discipline to another. The current paper presents a case study of one field, but it is an important field. Moreover, the methodology developed in the paper can be applied to other fields in future studies, and the outcomes obtained in the paper can serve as a benchmark in such studies.

The differences in citation levels between *Scopus* and *WoS* for oncology obtained in this paper are smaller than those reported in Bakkalbasi et al. (2006). They found in a sample of 259 papers published in 2003 in 11 oncological journals that cites (counted until November 2005) per paper in *Scopus* was around 7% higher than that for the *WoS* (8.9 versus 8.3), but standard deviations were large because of the skewness of the underlying citation distribution. Hence, their findings are not inconsistent with those obtained in this paper.

For oncology journals the Spearman rank correlation coefficient between the classical, *WoS*-based journal impact factor and the new, *Scopus* based SCImago Journal Rank indicator was found to be 0.93. This value is higher than the value of 0.69 obtained for all journals in all fields combined. The explanation of this difference needs to be further examined. Possibly, in specialized fields such as oncology the correlation between *JCR* journal impact factor and weighted citation indicators tends to be higher than in broad fields such as Medicine or all fields combined. Bollen et al. (2006) found for the correlation between *JCR* impact factor and their weighted page rank for journals in all fields a Spearman rank correlation coefficient of 0.61, and for Physics, Computer Science and Medicine values of 0.59, 0.63 and 0.77, respectively. Interestingly, their coefficient for all fields combined is similar to that obtained from the correlation between impact factor and the *SJR* indicator. This outcome suggests that the two types of weighted citation indicators produce statistically similar results, but further research is needed.

Apart from a further investigation of the potentialities of weighted citation indicators, the following three lines of research are important.

In their study examining the stability of citation ratings of articles as the level of observation (e.g., total database, journal category, journal) changes – and hence the basis of field normalisation – Zitt, Ramanana-Rahary, and Bassecoulard (2005) concluded that "the average citation rankings of articles substantially change with the level of observation", and that "when considering the top-cited fractions, a standard measure of excellence, . . . the contents of the top-cited set is completely dependent on the level of observation". The *Scopus* database, viewed as an expansion of the *WoS* can be conceived as the total database, and the *WoS* segment in it as a special level of observation. This perspective can be expected to be fruitful also if one compares the outcomes of citation analyses in *Scopus* with those obtained from the *WoS*. We plan to conduct a further analysis of the stability of citation ratings in the two databases in future research.

A comparison of *Scopus* and *Web of Science* merely on the basis of the number of sources covered provides insight in differences in coverage among the two databases. The approach adopted in this paper, taking into account the number of source documents and the citation counts extracted from *Thomson*'s *Journal Citation Reports* and *SCImago*'s *Journal Rank* database is much more informative. A next step is matching the two databases one against another on *a paper-by-paper basis*, determining their degree of overlap at the level of *individual* articles. Researchers at *CWTS* have recently carried out such an analysis (Visser & Moed, 2008).

Bar-Ilan et al. (2007) conducted an ANOVA test to examine whether the dissimilarities between the rankings were significant. They developed a number of measures to compare two ranked lists, when the items in these lists are not necessarily identical. Their work builds upon the measure introduced by Fagin, Kumar, and Sivakumar (2003). We are currently working on a new index, able to measure databases' similarity, taking into account not only the common elements but the *non-common ones,* which are determinant over the common journals' distribution and which, to the best of our knowledge, have being ignored until now To measure the similarity we plan to compute the deviations' average of the common elements after *having compressed* the biggest set to the size of the smaller one.

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References

Bakkalbasi, N., Bauer, K., Glover, J., & Wang, L. (2006). Three options for citation tracking: Google Scholar, Scopus and Web of Science. *BMC Biomedical Digital Libraries*, *3*, 7. Retrieved March 25, 2008, from. http://www.biodiglib.com/content/3/1/7

Ball, R., & Tunger, D. (2006). Science indicators revisited—Science Citation Index versus SCOPUS. A citation comparison of both citation dababases. *Information Services and Use*, *26*, 293–301.

Bar-Ilan, J. (2008). Which h-index?—A comparison of WoS Scopus and Google Scholar. *Scientometrics*, *74*(2), 257–271.

Bar-Ilan, J., Levene, M., & Lin, A. (2007). Some measures for comparing citation databases. *Journal of Informetrics*, *1*, 26–34.

Bauer, K., & Bakkalbasi, N. (2005). An examination of citation counts in a new scholarly communication environment. *D-Lib Magazine*,. Retrieved March 28, 2008, from. http://dx.doi.org/10.1045/september2005-bauer

Bergston, C. (2007). Eigenfactor: Measuring the value and prestige of scholarly journals. *College & Research Libraries News*, *68*, 5. Retrieved March 26, 2008, from http://www.ala.org/ala/acrl/acrlpubs/crlnews/backissues2007/may07/eigenfactor.cfm.

Bollen, J., Rodríguez, M. A., & Van de Sompel, H. (2006). Journal status. *Scientometrics*, *69*(3), 669–687.

Braun, T., Glänzel, W., & Schubert, A. (1988). World flash on basic research—The newest version of the facts and figures on publication output and relative citation impact of 100 countries 1981–1985. *Scientometrics*, *13*, 181–188.

Brin, S., & Page, L. (1998). The anatomy of a large-scale hypertextual search engine. *WWW7/Computer Networks*, *30*(1–7), 107–117.

Burnham, J. F. (2006). Scopus database: A review. *Biomedical Digital Libraries*, *3*, 1. Retrieved March 28, 2008, from. http://www.bio-diglib.com/content/3/1/1

Codina, L. (2005). Scopus: el mayor navegador científico de la web. *El Profesional de la Información*, *14*, 44–49.

Cheek, J., Garnham, B., & Quan, J. (2006). What's in a number? Issues in providing evidence of impact and quality of research(ers). *Qualitative Health Research*, *16*, 423–435.

Debackere, K., & Glanzel, W. (2004). Using a bibliometric approach to support research policy making: The case of the Flemish BOF-key. *Scientometrics*, *59*(2), 253–276.

Deis, L. F., & Goodman, D. (2005). Web of Science (2004 version) and Scopus. *The Charleston Advisor*, *6*. Retrieved March 26, 2008, from. http://www.charlestonco.com/comp.cfm?id=43

Dess, H. M. (2006). Database reviews and reports, Scopus. *Issues in Science and Technology Librarianship*,. Retrieved March 28, 2008, from. http://www.istl.org/06-winter/databases4.html
Eigenfactor.org (2007). Eigenfactor.org ranking and mapping scientific knowledge. Retrieved March 11, 2008, from http://www.eigenfactor.org/.
Fagin, R., Kumar, R., & Sivakumar, D. (2003). Comparing top k lists SIAM. *Journal on Discrete Mathematics*, *17*(1), 134–160.
Fingerman, S. (2005). Scopus: Profusion and confusion. *Online (Medford)*, *29*(2), 36–39.
Fingerman, S. (2006). Web of Science and Scopus: Current features and capabilities. Issues in *Science & Technology Librarianship*, *48*. Retrieved March 28, 2008, from http://www.istl.org/06-fall/electronic2.html.
Garfield, E. (1955). Citation indexes for science new dimension in documentation through association of ideas. *Science*, *122*(3159), 108–111.
Garfield, E. (1979). *Citation indexing. Its theory and application in science technology and humanities*. New York: Wiley.
Gorraiz, J., & Schlögl, C. (2007). Comparison of two counting houses in the field of pharmacology and pharmacy. In *Proceedings of the international conference of the international society for scientometrics and informetrics, Vol. 11* (pp. 854–855).
JCR. (2007). Thomson Scientific. *Journal Citation Reports*,. Retrieved March 28, 2008, from. http://scientific.thomson.com/products/JCR/
Jacso, P. (2005). As we may search–Comparison of major features of Web of Science, Scopus and Google Scholar citation-based and citation-enhanced databases. *Current Science*, *89*(9), 1537–1547.
Jacso, P. (2006). Evaluation of citation enhanced scholarly databases. *Journal of Information Processing and Management*, *48*(12), 763–774.
LaGuardia, C. (2005). E-views and reviews: Scopus vs. Web of Science. *Library Journal.com*,. Retrieved March 28, 2008 from. http://www.libraryjournal.com/index.asp%3Flayout=articlePrint&articleID=CA491154
López-Illescas, C., Moya-Anegón, F., & Moed, H. F. (2008). The actual citation impact of European oncological research. *European Journal of Cancer*, *44*(2), 228–236.
MacRoberts, M. H., & MacRoberts, B. R. (1996). Problems of citation analysis. *Scientometrics*, *36*(3), 435–444.
Martin, B. R., & Irvine, J. (1983). Assessing basic research: Some partial indicators of scientific progress in radio astronomy. *Research Policy*, *12*, 61–90.
Moed, H. F. (2005). *Citation analysis in research evaluation*. Dordrecht, The Netherlands: Springer.
Moed, H. F., & van Leeuwen, Th. N. (1996). Impact factors can mislead. *Nature*, *381*, 186.
de Moya-Anegon, F., Chinchilla-Rodríguez, Z., Vargas-Quesada, B., Corera-Álvarez, E., Muñoz-Fernández, F. J., González-Molina, A., et al. (2007). Coverage analysis of Scopus: A journal metric approach. *Scientometrics*, *73*(1), 53–78.
Neuhaus, C., & Daniel, H. D. (2008). Data sources for performing citation analysis: An overview. *Journal of Documentation*, *64*(2), 193–210.
Norris, M., & Oppenheim, C. (2007). Comparing alternatives to the Web of Science for coverage of the social sciences' literature. *Journal of Informetrics*, *1*, 161–169.
Notess, G. (2005). Scholarly web searching: Google Scholar and Scirus. *Online magazine*, *29*(4). Retrieved March 30, 2008 from. http://www.infotoday.com/Online/jul05/OnTheNet.shtml
Palacios-Huerta, I., & Volij, O. (2004). The measurement of intellectual influence. *Econometrica*, *70*(3), 963–977.
Pinski, G., & Narin, F. (1976). Citation influence for journal aggregates of scientific publications: Theory, with application to the literature of physics. *Information Processing and Management*, *12*, 297–312.
Price, D. J. D. (1978). Towards a model for science indicators. In Y. Elkana, J. Lederberg, R. K. Merton, A. Thackray, & H. Zuckerman (Eds.), *Toward a metric of science: The advent of science indicators* (pp. 69–95). New York: John Wiley.
SCImago (2007a). SJR Portal—*SCImago Journal and Country Rank*. Retrieved March 11, 2008, from http://www.scimagojr.com.
SCImago (2007b). Description of SCImago Journal Rank Indicator. Retrieved 3 July, 2008, from http://www.scimagojr.com/SCImagoJournalRank.pdf.
Scopus (2007a). Retrieved March 28, 2008 from http://www.info.Scopus.com/detail/what/.
Scopus (2007b). Scopus Content Coverage. Retrieved March 28, 2008, from http://www.info.Scopus.com/docs/content_coverage.pdf.
Seglen, P. O. (1997). Why the impact factor of journals should not be used for evaluating research. *British Medical Journal*, *314*, 498–502.
Thomson Scientific (2007). Retrieved March 28, 2008 from http://scientific.thomson.com/products/WoS/.
Van Raan, A. F. J. (2004). Measuring science. In H. F. Moed, W. Glänzel, & U. Schmoch (Eds.), *Handbook of quantitative science and technology research. The use of publication and patent statistics in studies of S&T systems*. Dordrecht, The Netherlands: Kluwer Academic Publishers, pp. 19–50
Visser, M. S., & Moed, H. F. (2008). Comparing Web of Science and Scopus on a paper-by paper-basis. In *Abstract submitted to the 10th international conference on science and technology indicators*.
Walter, G., Bloch, S., Hunt, G., & Fisher, K. (2003). Counting on citations: A flawed way to measure quality. *Medical Journal of Australia*, *178*(6), 280–281.
Zitt, M., Ramanana-Rahary, A., & Bassecoulard, E. (2005). Relativity of citation performance and excellence measures: From cross-field to cross-scale effects of field-normalisation. *Scientometrics*, *63*, 373–401.