# Assessing the Citation Impact of Books: The Role of Google Books, Google Scholar, and Scopus

**Kayvan Kousha**
*Statistical Cybermetrics Research Group, School of Technology, University of Wolverhampton, Wulfruna Street, Wolverhampton WV1 1LY, United Kingdom, and Department of Library and Information Science, University of Tehran, Jalle-Ahmad Highway, P.O. Box 14155–6456, Tehran, Iran. E-mail: k.kousha@wlv.ac.uk*

**Mike Thelwall**
*Statistical Cybermetrics Research Group, School of Technology, University of Wolverhampton, Wulfruna Street, Wolverhampton WV1 1LY, United Kingdom. E-mail: m.thelwall@wlv.ac.uk*

**Somayeh Rezaie**
*Department of Library and Information Science, Shahid Beheshti University, Evin Street, Tehran, Iran. E-mail: s_aries80@yahoo.com*

**Citation indictors are increasingly used in some subject areas to support peer review in the evaluation of researchers and departments. Nevertheless, traditional journal-based citation indexes may be inadequate for the citation impact assessment of book-based disciplines. This article examines whether online citations from Google Books and Google Scholar can provide alternative sources of citation evidence. To investigate this, we compared the citation counts to 1,000 books submitted to the 2008 U.K. Research Assessment Exercise (RAE) from Google Books and Google Scholar with Scopus citations across seven book-based disciplines (archaeology; law; politics and international studies; philosophy; sociology; history; and communication, cultural, and media studies). Google Books and Google Scholar citations to books were 1.4 and 3.2 times more common than were Scopus citations, and their medians were more than twice and three times as high as were Scopus median citations, respectively. This large number of citations is evidence that in book-oriented disciplines in the social sciences, arts, and humanities, online book citations may be sufficiently numerous to support peer review for research evaluation, at least in the United Kingdom.**

## Introduction

Books and monographs are primary research outputs in the arts and humanities and in many social sciences (Glänzel & Schoepflin, 1999; Hicks, 2004; Huang & Chang, 2008; Nederhof, 2006), but it is difficult for subject experts to evaluate the quality of books on a large scale because books tend to be much longer than are journal articles. In the context of U.K. research evaluation, for example, Taylor and Walker (2009) argued that "Given the time constraints facing panel members, it is obvious that not all publications could be considered in detail, and certainly not by more than one panel member in the majority of cases"(p. 3). To support this, there were more than 14,000 monographs overall in the 2008 U.K. Research Assessment Exercise (RAE), 14 per reviewer, but in book-oriented disciplines there were up to 100 books per reviewer (e.g., 1,665 monographs for history's 17 reviewers). While it could be argued that the selective reading of any individual text (which Taylor & Walker implied must occur) may be adequate for its overall quality assessment, this practice seems likely to increase the chance of errors and reviewer susceptibility to extraneous factors such as institutional reputation. Citation analysis also has been widely used for research evaluation, but has its own problems, errors, and biases (for an in-depth review, see MacRoberts & MacRoberts, 1996). For instance, influential research can be uncited, and even types of influential research can remain uncited within a particular field (MacRoberts & MacRoberts, 2010). Consequently, it seems to be widely accepted in the field that bibliometric indicators should be used as supporting information for peer review rather than as a replacement for research-quality assessment (e.g., van Raan, 2005; Warner, 2000; Weingart, 2005).

Is the problem of books significant when assessing national research outputs or is it only a minor issue? Our initial study of the United Kingdom showed that while 16.5%

Received March 28, 2011; revised June 16, 2011; accepted June 17, 2011

 • Published online 26 August 2011 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/asi.21608

of the submissions to 67 units of assessment (UoAs) in the 2008 RAE were related to books (including monographs, edited books, and chapters), the proportion of book submissions in the 38 social sciences and arts & humanities subject areas was 31%. However, the percentage of book submissions varied from 1.3% in psychology to 68% in theology, divinity, and religious studies (Appendix Table A1). Furthermore, 12.4% of the submissions in the 38 social sciences and arts & humanities subject areas were "authored books" (excluding edited books and chapters), indicating that authored books (i.e., monographs) form a significant portion of the national research outputs (at least in the United Kingdom; see Table 1).

Quantitative indicators may be helpful to aid the large-scale evaluations of books. Citations are a logical choice due to their use in the sciences, but book citation counting seems to be rarely used for research assessment. This may be due to the almost-complete absence of citation associations from monographs in the two key citation indexes, the Web of Science (WoS) and Scopus (Cronin, Snyder, & Atkins, 1997; Hicks, 1999; Moed, 2005; Oppenheim & Summers, 2008; Taylor, 2011). Although citations to books from indexed journal articles and conference papers are recorded in the major citation indexes and attempts have been made to extract citations to monographs based on cited reference search techniques from journal articles (e.g., Bar-Ilan, 2010; Butler & Visser, 2006), it does not seem reasonable to rely on these for book-based disciplines because the logical source of bibliometric-impact evidence in such cases would be other books. In fact, the WoS does not include citations from most books and monographs and primarily restricts its indexing coverage to high-impact journals and few selected serials and reviews (e.g., *Lecture Notes in Computer Science*). To fill this gap, there have been calls for a "Book Citation Index" (Garfield, 1996) to make citation counting possible. Previous studies have also suggested that Google Scholar (e.g., Bar-Ilan, 2008; Bornmann et al., 2009; Harzing & van derWal, 2009; Kousha & Thelwall, 2008) and Google Books (e.g., Kousha, Thelwall, & Rezaie, 2010) contains publication types outside of the WoS and Scopus, and therefore might be particularly useful for impact assessment outside of the hard sciences. Nevertheless, both Google databases do not publish a complete list of their sources; consequently, their coverage of academic information and the quality of the indexed sources are unknown (see Jacsó, 2005a; Kousha & Thelwall, 2009). There also have been initiatives to develop noncitation indicators such as counting library holdings as a way of estimating the reach of books (White et al., 2009) or attempting to systematically classify publisher reputation (Giménez-Toledo & Román, 2008) by analogy with journal reputation. Webometrics also has proposed new methods for extracting information for research evaluation. For instance, link analysis results have been shown to correlate significantly with U.K. RAE ratings in some subject areas (X. Li, Thelwall, Musgrove, & Wilkinson, 2003). The number of times an article is downloaded also has been used (Brody, Harnad, & Carr, 2006), and in the era of digital books, book downloads are a possible indicator, although download data might not be accessible for large-scale studies from some academic publishers.

The main objective of the current study is to assess two new, web-based sources of citation data for books: Google Books and Google Scholar. We used books submitted to the 2008 RAE in seven selected book-oriented disciplines (described later) as a convenient and reasonably comprehensive source of lists of key academic outputs in a country. We compared citation counts *to books* from Google Books and Google Scholar with Scopus in archaeology; law; politics and international studies; philosophy; sociology; history; and communication, cultural, and media studies to assess whether citations in the two new sources were sufficiently numerous to be useful and to get some indication of whether they were potentially relevant for research assessment.

## Research Assessment: The United Kingdom

The U.K. Research Excellence Framework (REF) is the modified successor to the RAE, the periodic national process to allocate public research funds for academic research. The main outcome is "quality profiles for each submission of research activity" (RAE 2008 Guidance on Submissions, 2005, p. 5). In 2008, there were 67 UoAs or subject areas within which research was assessed by peer review, and more than 1,000 reviewers scored the submitted research outputs (up to four per researcher) against five quality levels from unclassified (below the standard of nationally recognized work) to 4* (*world-leading*) (RAE 2008 Panels, n.d.).

The Higher Education Funding Council for England (HEFCE) is in charge of the new framework for assessing the quality of research, the REF, which was set to be first used in 2014. Although peer review is the main factor in the quality assessment of REF research outputs and has its own advantages and controversies (for an in-depth review, see Bence & Oppenheim, 2004), citation information (from the Thomson Reuters WoS and Elsevier's Scopus) also will be used in some subject areas to assist the peer-review process. As discussed later, previous investigations have reported significant correlations between citation measures and RAE scores in different subject areas, supporting the use of citation counts in this context as indicators of research quality. Furthermore, the significant correlations found between other types of expert review and citation metrics, for instance, in library and information science (J. Li, Sanderson, Willett, Norris, & Oppenheim, 2010), mathematics (Korevaar & Moed, 1996), chemistry (van Raan, 2006), and condensed matter physics (Rinia, van Leeuwen, van Vuren, & van Raan, 1998) and also between the research impact of successful postdoctoral applicants and the judgments of selection committees (Bornmann & Daniel, 2006) suggest that citation data are relevant for research evaluation in many fields. Some even have argued that bibliometrics could replace peer review for monitoring research performance (Oppenheim, 1996, p. 155).

Despite this evidence, there are criticisms about supplementing peer review with citation analysis and criticisms


DOI: 10.1002/asi

of citation analysis itself (e.g., MacRoberts & MacRoberts, 1996; Warner, 2000; also see van Raan, 2005). Moreover, a recent study has revealed that correlations between citations (from the WoS) and RAE peer-review scores are not statistically significant in several social science and humanities UoAs, but are significant in most sciences (Mahdi, D'Este & Neely, 2008, p. 16; see also Citation Indicators and the RAE section). One explanation might be the low WoS coverage of the journals in these disciplines (see Moed, 2005, p. 119) or that other types of research outputs such as book chapters and monographs are significant in them (discussed later).

Using the WoS and Scopus citation databases, a pilot exercise commissioned by the HEFCE (2009a) to develop bibliometric indicators for the REF, reported that "bibliometrics are not sufficiently robust at this stage to be used formulaically or to replace expert review in the REF. However there is considerable scope for citation information to be used to inform expert review" (p. 3). This study selected 35 UoAs from the 2008 RAE in 22 U.K. institutions, and was conducted as evidence to be used for academic research planning and to decide whether and how bibliometrics should be used within the REF because the potential use of citation indicators for research evaluation varies across disciplines (discussed later) and because the main journal-based citation indexes (WoS and Scopus) may not be adequate for citation information to inform peer review in some subject areas. This would be the case if the results were more misleading than informative because a broad spectrum of influential research was not recognized or because there was too little information to identify any influential research.

Although about "80% of journal articles submitted to the RAE 2001 could be found in the Web of Science" (Mahdi et al., 2008, p. 9), this varies across disciplines and is much lower in many social sciences and arts & humanities UoAs (e.g., 24% in law; 29% in arts and design; ~30% in theology, divinity, and religious studies; and 39% in education). One explanation for these disciplinary differences in publication behavior is that in the basic sciences, research tends to have an international audience, but many research topics in social sciences and arts & humanities disciplines have a more geographically limited audience because they are based on national or regional issues (e.g., national or regional law, social policy, economics and business considerations) and may appear in regional or national publications (e.g., monographs and reports) in national languages other than English, which are not well indexed by the WoS (see Nederhof, 2006). This confirms that broader types of publications and sources of citation data may be needed to identify research excellence in the social sciences and the arts & humanities.

## Book Impact Assessment

Peer review is probably the optimal way to assess the value of books, but metrics also have been assessed as replacements or supplementary sources of information. Although books might be assessed in many different ways such as publisher quality (or even, in law, by length; Moed, Luwel, & Nederhof, 2001), for a long time, information scientists have sought appropriate citation data for their impact assessment (e.g., Garfield, 1996; Small & Crane, 1979). In particular, many investigations have suggested that conventional journal-based citation databases (e.g., WoS) can sometimes be inadequate for the impact assessment of book-based disciplines (e.g., Cronin et al., 1997; Glänzel & Schoepflin, 1999; Nederhof, 2006; Thompson, 2002), and attempts have been made to use online citations and informal scholarly indictors for social science research evaluation (Kousha & Thelwall, 2007b).

The importance of book citations is supported by evidence that there are more citations to books and monographs than to journal articles in some social sciences and many arts & humanities subject areas (for a review, see Huang & Chang, 2008; Nederhof, 2006). For instance, "books account for 46 percent of the overall citations to U.K. social science literature, whereas only 12 percent of the citations in natural science were to books" (Earle & Vickery, 1969, as cited in Tang, 2008, p. 357). Small and Crane (1979) also reported that the proportion of citations to books was about 40% in sociology and 25% in economics whereas it was about 1% in high-energy physics. Nederhof and van Raan (1993) also found that the number of citations per publication was much higher for books ($n = 3.15$) than it was for ISI-indexed articles ($n = 0.95$) in six research groups in economics. Similarly, sociological books seem to receive about three times more citations than do journal articles (Clemens, Powell, McIlwaine, & Okamoto, 1995, as cited in Nederhof, 2006). Within library and information science, Chung (1995) also examined over 5,000 references in 68 monographs and 352 journal articles during 1981 to 1990 and found that about 50% of the cited references were to books and book chapters and that 38% were to journal articles.

### *Online Indicators of Book Impact*

Although several investigations have used Google (e.g., Vaughan & Shaw, 2005), Google Scholar (e.g., Bar-Ilan, 2008; Bornmann et al., 2009; Franceschet, 2010; Jacsó, 2005b; Kousha & Thelwall, 2007a; Meho & Yang, 2007; Mingers & Lipitakis, 2010; Shaw & Vaughan, 2008), and Google Books (Kousha & Thelwall, 2009; Kousha et al., 2010) for the impact assessment of scientific research, it seems that no comprehensive study has directly used Google Books and Google Scholar for the citation impact of *books* across different disciplines. Most previous studies instead have focused on citations from Google Scholar to journal articles and compared the results with the WoS or Scopus. In contrast, Bar-Ilan (2010) used Google Scholar, Scopus, and the WoS to assess citations to the book *Introduction to Informetrics* by Leo Egghe and Ronald Rousseau. For Google Scholar citations, three variations of the title (with and without the authors) were searched, and the results were manually checked to remove false and duplicate matches. Of the total 358 potential citing items, 86% were scientific sources that cited the book, indicating high accuracy for this specific case. Bar-Ilan (2010) found that the WoS and Scopus databases


DOI: 10.1002/asi

covered about 90% of the citations found by each other. Google Scholar missed about 30% of the citing items covered by the WoS and Scopus, but 109 unique citations located by Google Scholar were not found by either Scopus or by the WoS. Bar-Ilan (2010) concluded that the three databases supplement each other; in particular, the coverage of citing items in the WoS and Scopus was "quite comparable" and that Google Scholar's coverage was "surprisingly good, and its accuracy was also better than expected" (pp. 505–506).

It seems that only two studies have used Google Books for scientific impact assessment, and both assessed only citations to journal articles. For research in 10 sciences, social sciences, and humanities subject areas, Kousha and Thelwall (2009) compared citations from Google Books searches with WoS citations to selected journal articles. Google Book citations were 31 to 212% of the WoS citations in the social sciences and humanities, but only 3 to 5% in the sciences, except for computing (46%). There were relatively strong correlations between Google Books citations and ISI citations in all the studied disciplines (although weaker in chemistry and physics), suggesting that book citations measure a similar kind of impact to that of ISI citations. They concluded that Google Books citations were numerous enough to supplement WoS citations for impact assessment of articles in the social sciences and humanities. In another study, Kousha et al. (2010) used a combined Integrated Online Impact indicator for impact assessment of articles published in the *Journal of the American Society for Information Science and Technology* (*JASIST*) and *Scientometrics* in 2003. They compared citation counts from the WoS and Scopus with five online sources of citation data: Google Scholar, Google Books, Google Blogs, PowerPoint presentations, and course reading lists. Most notably, the Google Books mean citations per article were 2.23 and 1.08 times larger than the WoS citations, and Google Scholar mean citations per article were 22.2 and 14.3 larger than the WoS citations for *JASIST* and *Scientometrics*, respectively, confirming the numerical value of citations from books.

### *Citation Indictors and the RAE*

A number of studies have investigated associations between bibliometric indicators and RAE ratings in different subject areas, with most of them finding significant correlations between the results of citation analysis and the peer-review RAE ratings. Such correlations have been found between the 1992 RAE ratings for British library and information science (LIS) departments and total citations as well as citations per member of staff (Oppenheim, 1995; Seng & Willett, 1995); citations also have been used to predict future RAE performance in this area (Holmes & Oppenheim, 2001). Similar results have been found for anatomy, genetics, and archaeology (Oppenheim, 1997); psychology (Smith & Eysenck, 2002); archaeology (Norris & Oppenheim, 2003); and music (Oppenheim & Summers, 2008). Despite significant correlation between citations and RAE rankings for music, the WoS citation database was judged insufficient to assess music research (discussed later). A more recent study also reported a significant correlation between the peer ranking of LIS scholars and their h-index at the individual level as well as between 2008 U.K. RAE rankings and h-/g-index scores in pharmacy and library and information management (excluding anthropology) at the departmental level (Norris & Oppenheim, 2010). Significant correlations are necessary to assess whether particular types of citation can be used as impact indicators, but it is important to understand the reason for any differences found to effectively interpret the results.

Oppenheim (1995) conducted one of the first investigations of this kind to assess the rank correlation between citation counts and RAE ratings. He found a strong, significant correlation between citation-based rankings and the 1992 RAE ratings for British LIS university departments. Spearman correlation coefficients were 0.81 between RAE ratings and numbers of citations received by departments and 0.82 between RAE scores and numbers of citations per member of staff ($ps = 0.01$). Seng and Willett (1995) also found strongly significant rank correlations between the total number of citations and both the mean number of citations per member of staff and per publication with 1992 RAE rankings for seven U.K. LIS departments.

In a complementary study, Oppenheim (1997) tested the rank correlation between citation counts and the RAE ratings in multiple disciplines including genetics, anatomy, and archaeology. In all three subject areas, he again reported a statistically significant rank correlation between the total number of citations received, or the average number of citations per member of staff, and the RAE scores. ISI's *Science Citation Index* (for genetics and anatomy) or the *Arts and Humanities Citation Index* (for archaeology) were used to record citations counts for each of the academics. In anatomy, genetics, and archaeology, Spearman rank correlations between average citations per member of staff and the 1992 RAE rankings were 0.48, 0.68, and 0.73, respectively.

Smith and Eysenck (2002) examined the correlation between average ISI citation counts (excluding self-citations) to academic staff in 38 university psychology departments in the United Kingdom in 1998 with RAE grades awarded in 1996 and 2001. They found highly significant rank correlations for both years (Spearman's $\alpha = 0.91$ and 0.85, respectively). Smith & Eysenck concluded that citation counts are "more cost-efficient" and "less subjective" than is "time-consuming RAE" for research evaluation of psychology departments (p. 8). One reason for finding high correlations between ISI citations and RAE scores might be that journal articles play a particularly significant role in research communication in psychology because its publication pattern is close to that of science. For instance, about 96% of the 2008 RAE submissions were journal articles whereas only 1.3% were books (including authored and edited books and chapters, see Appendix Table A1).

Using the ISI WoS (*Arts and Humanities Citation Index*)-cited reference searches, Norris and Oppenheim (2003) recorded citation counts by searching the names of 692 staff members in the 2001 RAE in the field of archaeology.


DOI: 10.1002/asi

Correlation analysis showed high statistically significant rank correlations, $r = 0.79$–$0.85$, $p \leq 0.01$, between the RAE results in archaeology departments and different citation measures of the academics (e.g., total and average staff citations). Norris and Oppenheim (2003) recommended that although citations analysis is not the ultimate assessment tool, "it should be adopted as the primary procedure for the initial ranking of university departments" (p. 728).

In a follow-up study, Oppenheim and Summers (2008) examined citation-count rankings and rankings based on the 2001 RAE scores in the field of music using the ISI *Arts and Humanities Citation Index*. At the departmental level, total and mean citation-count rankings correlated strongly with RAE-based rankings, $r = 0.80$ and $r = 0.81$, respectively; $p \leq 0.01$. However, they found a weaker rank correlation between RAE scores and individual citation counts, $r = 0.46$, $p \leq 0.01$, and concluded that despite the strong, significant correlations between citation measures and RAE scores, "the coverage of the Arts and Humanities Citation Index is unrepresentative of music research," and broader types of citation data from nonjournal material such as books are needed for evaluating the quality of music research.

On a large scale, Mahdi et al. (2008) assessed whether citation counts correlated with RAE scores for 141,789 journal articles submitted to 67 RAE 2001 UoAs. About 80% of the journal articles were found in the WoS. The study then selected (a) institutions that had 20 or more matched journal articles in the specific UoA and (b) UoAs with at least 20 institutions. The overall results gave statistically significant correlations for 19 of the 28 qualifying UoAs. Most important, for five of eight social sciences and humanities disciplines—politics and international studies; social policy and administration; sociology; history; and education—there were insignificant correlations between citation measures and RAE ratings. The correlation was statistically significant, but low, in geography (0.383) and economics and econometrics (0.677), but relatively strong in business and management (0.782). In nearly all biomedical fields (seven of eight, with the exception of nursing) and most engineering subject areas (9 of 13), research impact indicators based on citations to journal articles correlated with the RAE 2001 scores. The authors concluded that the WoS "offers only partial coverage in some subjects, and hence the use of bibliometrics becomes increasingly less valuable as we move from Biomedical, Physical Sciences and Engineering, to Socials Sciences, Literature and Arts and Humanities" (Mahdi et al., 2008, p. 3). Taking this evidence in conjunction with the aforementioned studies, it seems that citation-count rankings widely, but not universally, correlate with RAE rankings, particularly for science. Note, however, that the raw figures are more important than are the rankings, and it is the latter that has tended to be tested. Hence, the evidence is not clear that citations are useful to inform judgments about RAE (or REF) scores, although they should be reasonably successful at pointing to the best and worst performing departments.

Web indicators also have been assessed for other national research-evaluation exercises. Smith (2008) used Google Scholar to generate citation counts to the web-based research output of eight New Zealand universities and found that the total citations and hits from Google Scholar correlated with the New Zealand national research assessment exercise. Although there were methodological problems using Google Scholar for citation mining, it "provides a relatively simple way of assessing the Web based research output of institutions" based on different types of information available on the Web (Smith, 2008, p. 315).

Despite evidence of statistically significant correlations between bibliometric indicators and RAE ratings in many subject areas and arguments that the RAE unwisely adds secondary subjective judgments to "articles that have already undergone peer review" (Bence & Oppenheim, 2004, p. 347), there have been criticisms about early proposals to replace peer review with citation measures in the RAE. This is because in the peer-review process, the quality of research is directly assessed through the specialized knowledge of informed experts, but citation counts depend on the complex citing behaviors of various authors (Bornmann & Daniel, 2008). Perhaps there also is a fear that citation counts could be manipulated and that citations or the standard sources of citations may ignore some relevant types of scholarly contributions. For instance, van Raan (2005) argued that the ranking of institutions by bibliometric indicators is an inappropriate tool for research evaluation, and that "peer review has to remain the primary process of research evaluation, bibliometric indicators must act as a support tool in order to make peer review more objective and transparent" (p. 141). Weingart (2005) also argued that bibliometric "raw data" should be cleaned and corrected when used for indicators that support science policy and funding decisions and warned against "the uncritical use of bibliometric measures independent of the peer review process" (p. 130). Warner (2000) also argued that replacing expert peer review with citation analysis in the RAE was "highly unrealistic" and claimed that "the future value of citation analysis could be to inform, but not to determine, judgements of research quality" (p. 453).

## Research Questions

The objective of this study is to assess whether nontraditional online sources of citations are sufficiently numerous to help evaluate the scholarly contribution of books. In particular, we are interested to see whether our method gives significantly more useful results, based upon different sources of citation data, and to examine the potential uses of web citation to support peer judgments about the scholarly impact of books in the future REF. Correlation tests have been preformed for interpreting the extent of the agreement between journal-based citation indicators and boarder types of online-citation measures. The following questions drive this research:

**RQ1:** Is the number of Google Scholar and Google Book citations *to books* in book-based disciplines sufficiently numerous for research impact assessment? This is a heuristic evaluation, but if these sources yielded more citations than do traditional


DOI: 10.1002/asi

TABLE 1. Statistics for the main 2008 Research Assessment Exercise submission types for the 67 units of assessment (UoAs).

| UoA | Authored book *n* (%) | Edited book *n* (%) | Chapter in book *n* (%) | All book types *n* (%) | Journal article *n* (%) | Conference output *n* (%) | Other *n* (%) | Total (%) |
|---|---|---|---|---|---|---|---|---|
| Social sciences and arts & humanities (38 UoAs) | 13,795 (12.38) | 2,915 (2.62) | 17,486 (15.69) | 34,196 (30.68) | 64,531 (57.90) | 1,510 (1.35) | 1,1216 (10.06) | 111,453 |
| Science (29 UoAs) | 410 (0.40) | 59 (0.06) | 785 (0.76) | 1,254 (1.22) | 96,732 (94.06) | 2,467 (2.40) | 2,383 (2.32) | 102,836 |
| Total (67 UoAs) | 14,205 (6.63) | 2974 (1.39) | 18,271 (8.53) | 35,450 (16.54) | 161,263 (75.25) | 3,977 (1.86) | 13,599 (6.35) | 214,289 (100) |

citation indexes such as Scopus, then they would earn consideration, even in contexts when traditional citation sources were insufficient.

**RQ2:** Do Google Books and Google Scholar citations to authored books correlate with citations from traditional citation indexes such as Scopus in book-based disciplines?

## Methods

We compared Google Scholar and Google Books citations with Scopus citations to 1,000 sampled books submitted to the 2008 RAE in seven book-based disciplines. The U.K. 2008 RAE is a convenient, large, and fairly comprehensive list of the best academic outputs of a single country over a fixed period (6 years 7 months). We did not assess the value of the citations because this needs a separate qualitative study and extensive manual checking in itself, but only whether they are sufficiently numerous to be an alternative or a compliment to traditional citation indexes. Google Scholar was used because it encompasses a wide range of nontraditional academic sources, and Google Books was used because it is logical to check books for citations to other books. We selected Scopus instead of the WoS to compare conventional against web-extracted citations because (a) Scopus is sufficiently mature, especially from 1996 onward (see Ball & Tunger, 2006), that it will be one of the key sources of citation data for the future REF (see HEFCE, 2009a); (b) it is more comprehensive than is the WoS in terms of indexed peer-reviewed journals (~17,000 vs. 10,000) and other types of publications, especially in the social sciences and arts & humanities (see Scopus Content Coverage Guide, 2010); and (c) it has an effective search option to locate citations to books in the references of journals and other publications. The "Cited Reference Search" field in the WoS was problematic for locating citations, especially for books with very general titles. In fact, the WoS cited reference search does not display the full bibliographic information of cited works in the context of the reference section, and it thus was not possible to manually check the accuracy of citation counts (e.g., citations to different editions of books). Moreover, the large overlap in active journals between the two citation databases (e.g., 84% of the WoS is indexed by Scopus) (see Gavel & Iselid, 2008, p. 17) and the strong correlation between impact indicators from the two databases (see Archambault, Campbell, Gingras, & Larivière, 2009) suggest that it would be largely redundant to check the WoS against Google Scholar and Google Books.

### *Research Population*

To identify book-based disciplines to be sampled, we downloaded all submission profiles from the 67 UoAs from the 2008 RAE website (http://www.rae.ac.uk). We then used the "output type" label for each submission and manually recorded the number of the main submission types: authored books, edited books, chapters in books, journal articles, conference contributions, and other types (see Appendix Table A1). As shown in Table 1, 16.5% of the submissions to all 67 UoAs were book items (authored books, edited books, and chapters). There were broad disciplinary differences in the proportion of books in the 38 social sciences and arts & humanities compared to the 29 hard sciences. For instance, the proportion for all types of books was 31% in social sciences and arts & humanities subject areas, but was much lower (1.2%) in the hard sciences. In contrast, the proportion of journal article submissions was 94% in the 29 hard sciences, but this was lower in the 38 social sciences and arts & humanities subject areas (~58%). These figures confirm previous findings that books and monographs are a major research communication platform in the arts & humanities and in many social science disciplines (e.g., Glänzel & Schoepflin, 1999; Hicks, 2004; Huang & Chang, 2008; Nederhof, 2006), but are less significant in many hard sciences.

To study the citation impact of book-based disciplines, we selected seven major subject areas with a high percentage of "authored book" submissions (i.e., excluding edited books and chapters). The two factors considered when selecting the book-based disciplines were that (a) at least 15% of the submissions were "authored books" and that (b) the selected areas were representative of major social sciences and arts & humanities subjects. We selected seven UoAs to make the project manageable. For each selected UoA, we took a random sample approximately proportional to the total number of authored book submissions in each discipline to make a total of 1,000. Table 2 shows that the average number of authored books (excluding edited books and chapters) per panel member in the seven selected fields is 52.


DOI: 10.1002/asi

TABLE 2. Books per panel member in seven units of assessment (UoAs) submitted to the 2008 Research Assessment Exercise.

| UoA | Authored books | Sampled books | No. Panel members | Authored books per panel member |
|---|---|---|---|---|
| Archaeology | 376 (17.5%) | 100 | 11 | 34 |
| Law | 996 (15.9%) | 170 | 14 | 71 |
| Politics and international studies | 1,028 (21.8%) | 170 | 16 | 64 |
| Sociology | 619 (16.6%) | 160 | 16 | 38 |
| Philosophy | 326 (15.7%) | 100 | 16 | 20 |
| History | 1,665 (23.9%) | 200 | 17 | 97 |
| Communication, cultural, and media studies | 410 (18.8%) | 100 | 13 | 31 |
| Total | 5,420 | 1,000 | 103 | 52 |

*Google Books*

Google Books (http://books.google.com) supports full text searching of its database and displays where the keywords occur in the matching texts. Hence, it is possible to search the bibliographic information of books and to locate citations in the full text of many digitized books.

To locate Google Books citations to authored books, we searched the titles of all 1,000 sampled books as phrase searches (e.g., "Political Leadership and the Northern Ireland Peace Process"). For books with very short or general titles, additional bibliographic information was added to the query, such as the first- author's name, the publisher's name, or the publication year, to reduce the number of false matches (e.g., "Political Constitutionalism" "Cambridge University Press" Bellamy 2007). Furthermore, sometimes we conducted several searches to get more accurate citation counts (e.g., omitting nonalphanumeric characters such as hyphens or slashes from book titles). Another important task was to manually check the results with the Google Books "preview" (of the whole book) or "snippet view" (a few sentences displaying the search terms in context) to check for false matches and to check whether a book had been mentioned as a citation, such as in a reference list or a footnote. Nevertheless, for "no preview" books within the Google Books search results, we could not find a practical method to manually check the citation motivations and therefore excluded all such results from the citation counts. Although the manual checking was time-consuming, it was useful because in some cases we found bibliographic data that were not created for citation reasons, such as annotated bibliographies or advertisements for new or future publications—usually at the end of books.

In most cases, we could not find the first-author names in the RAE book submissions to be used in the searches, so we used Google Books itself and also sometimes the Library of Congress Online Catalogue to locate first-author names, checking bibliographic information (e.g., ISBN, pages, coauthors, etc.) against the original RAE submissions. In some cases, we found incorrect, incomplete, or modified bibliographic information in RAE submission records, such as misspellings or technical hitches (e.g., "Marsilius of Padua and 'the Truth of History&#39," where &#39 is the HTML code for quotes) or slight modifications (e.g., using "&" instead of "and" or "17th-century" instead of "seventeenth-century"). In such cases, we tried to identify the original bibliographic information and then used it for all searches in Google Books, Google Scholar, and Scopus. Another important issue in the manual-checking process was the existence of various editions of the same book. For instance, the book *Legal Problems of Credit and Security* by Royston Miles Goode has three different editions published in 1982 (133 pages), 1988 (218 pages), and 2003 (343 pages). Consequently, we found citations in the Google Books search results to different editions. However, the 2003 edition was submitted to 2008 RAE, and as shown earlier, it seems that there are significant changes in the 2003 edition based on additional page numbers. Thus, we decided to ignore citation counts to other editions (both 1982 and 1988) as irrelevant to the intellectual impact of the submitted research in the time period of the 2008 RAE.

*Google Scholar*

For Google Scholar searches, we again searched the exact titles of books as phrase searches and combined them with other bibliographic data such as first-author names, publishers, or publication years if necessary. We then recorded the number of Google Scholar citations by selecting the "cited by" option below each displayed record. We did not consider the citation counts reported by Google Scholar because they may include duplicate citing items or false matches. For this reason, we again manually checked the full text of open-access citing documents through either the "view as HTML" and "cached" options below some retrieved records or preprint/postprint links (e.g., "[PDF] from cornell.edu"). Otherwise, we followed the link in Google Scholar to the full text of the citing documents through our institutional subscriptions to major journal publishers (e.g., Elsevier, Springer, Wiley, InformaWorld, Emerald, Sage, Oxford, JSTOR). In some cases, it was not possible to check the citations in the context of the retrieved documents through these methods. Therefore, the only practical method was to recognize the formal citation reasons for using books based


DOI: 10.1002/asi

TABLE 3. Comparisons between Google Books, Google Scholar, and Scopus citation counts for authored books submitted to seven social sciences and humanities disciplines in the 2008 Research Assessment Exercise.

| | | Google Books citations | | Google Scholar citations | | Scopus citations |
|---|---|---|---|---|---|---|
| UoA | No. of sampled books | *n*<br>*M*<br>*Mdn* | % of Scopus | *n*<br>*M*<br>*Mdn* | % of Scopus | *n*<br>*M*<br>*Mdn* |
| Law | 170 | 1,687<br>9.9<br>6 | 254.4% | 2,838<br>16.7<br>8 | 428.1% | 663<br>3.9<br>2 |
| History | 200 | 3,723<br>18.6<br>11.5 | 281% | 2,851<br>14.3<br>7 | 215.2% | 1,325<br>6.6<br>4 |
| Sociology | 160 | 4,512<br>28.2<br>14 | 91.7% | 15,648<br>97.8<br>37 | 318% | 4,920<br>30.8<br>11 |
| Philosophy | 100 | 1,668<br>16.7<br>9 | 115.1% | 4,553<br>45.5<br>17 | 314.2% | 1,449<br>14.5<br>6.5 |
| Archaeology | 100 | 1,225<br>12.3<br>6.5 | 174.3% | 2,028<br>20.3<br>8 | 288.5% | 703<br>7<br>3 |
| Politics and international studies | 170 | 3,469<br>20.4<br>11 | 143.5% | 8,267<br>48.6<br>20 | 341.9% | 2,418<br>14.2<br>6 |
| Communication, cultural, and media studies | 100 | 1,621<br>16.2<br>11.5 | 164.7% | 3,548<br>35.5<br>16 | 360.6% | 984<br>9.8<br>3 |
| Total | 1,000 | 17,905<br>17.9<br>9 | 143.7% | 39,733<br>39.7<br>13 | 318.8% | 12,462<br>12.5<br>4 |

UoA = unit of assessment.

on the brief textual information below each retrieved record in the Google Scholar search results. Our initial observations revealed that if the citation information of a book appeared in brief records in bold and looked like a cited reference (e.g., APA or Chicago citation styles), then it was likely to be a formal citation; otherwise, it was more likely to be a false match. Moreover, in rare cases, there were citations from books (usually with [BOOK] at the beginning of the record). We also checked these few cases with our Google Books search results to avoid counting duplicate citations in the two databases.

All Google Books, Google Scholar, and Scopus Searches (discussed later) were conducted during 2 months (October–November 2010) consecutively for each book to lessen the potential impact of the time window on the citation count and to make the project manageable, although this short period of time may still have a small impact on the citation changes over time for the studied disciplines.

### *Scopus Search*

For Scopus citation searches, we searched the book titles as phrase searches in the reference source title field (REFTITLE). However, for general book titles, we again used additional bibliographic information such as the first author or the publisher to generate more effective searches.

## Results

Table 3 compares the number, mean, and median of Google Books and Google Scholar with Scopus citations across seven book-based disciplines based upon the sample of 1,000 authored books submitted to the 2008 RAE. It shows that Google Book and Google Scholar citations were 143 and 318% of Scopus citations, respectively, and therefore seem numerous enough to warrant consideration in the role of supporting the peer-review process in book-based disciplines, especially in conjunction with additional citation information from Scopus.

### *Google Books Versus Scopus Citations*

The results indicate that Google Books has relatively good coverage of books for citation impact in book-based disciplines. Surprisingly, the median of the Google Books citations (not overlapping with Scopus citations) is more than double


DOI: 10.1002/asi

TABLE 4. Correlations between Google Books, Google Scholar, and Scopus citation counts to authored books submitted to the 2008 Research Assessment Exercise for each studied discipline.

| UoA | Sampled books | Google Books and Scopus | Google Scholar and Scopus | Google Books and Google Scholar |
|---|---|---|---|---|
| Law | 170 | 0.616** | 0.740** | 0.746** |
| History | 200 | 0.683** | 0.778** | 0.744** |
| Sociology | 160 | 0.833** | 0.944** | 0.833** |
| Philosophy | 100 | 0.726** | 0.934** | 0.771** |
| Archaeology | 100 | 0.684** | 0.793** | 0.798** |
| Politics and international studies | 170 | 0.731** | 0.873** | 0.814** |
| Communication, cultural, and media studies | 100 | 0.732** | 0.791** | 0.773** |

UoA = unit of assessment.
**$p = 0.01$.

($Mdn = 9$) the median of the Scopus citations ($Mdn = 4$), suggesting that Google Books could potentially be considered as a valuable source of citation impact for book-based disciplines, although follow-up investigations would be needed for the quality assessment of book citations. Moreover, the medians of the Google Books citations are much higher in three humanities: law; history (both about three times higher than that of Scopus); and communication, cultural, and media studies (about four times higher than that of Scopus).

Most significant, in history, the median number of Google Books citations ($Mdn = 11.5$) is higher than both Google Scholar ($Mdn = 7$) and Scopus ($Mdn = 4$) citations, suggesting that in some arts & humanities subject areas, book citations may be more significant than are other sources of citations (e.g., journal and conference papers).

Appendix Table A2 reports the top-five highly cited books in the 2008 RAE in the seven selected book-oriented disciplines based on Google Books.

### *Google Scholar Versus Scopus Citations*

Table 3 reports Google Scholar and Scopus citations of authored books submitted to the 2008 RAE. It shows that Google Scholar citations were about 3.2 times more numerous than were Scopus citations ($Mdn$s = 13 and 4, respectively), confirming previous studies (reviewed earlier) that showed that Google Scholar is more comprehensive and includes broader types of document. Most notably, in communication, cultural, and media studies and law, the median citations for Google Scholar were four times higher than the median of Scopus, suggesting that Google Scholar can be a helpful source of citation data when nonjournal publications are important for evaluating social science and arts & humanities research.

Note that since in most cases the distributions of citations are highly skewed, the median is reported to compare Google Books, Google Scholar, and Scopus citations.

### *Patterns of Similarity*

The correlation tests in Table 4 were performed for each UoA using the individual-sampled authored books submitted to the 2008 RAE as the data points. Spearman correlation tests were applied instead of Pearson because in all cases the frequency distributions of citations were highly skewed. As shown in Table 4, there is a significant correlation between Scopus citations and both the Google Books and the Google Scholar citation counts in all studied subject areas ($p < 0.01$). The correlations are stronger between Google Scholar and Scopus citations and weaker between Google Books and Scopus citations. One explanation might be that both Google Scholar and Scopus measure a similar type of citation impact mostly based on journal citation counts whereas a weaker relationship is expected between Google Books and Scopus because they index completely different sources of citations: books versus journals and conference papers. Furthermore, the fact that books receiving more citations from journals in the Scopus database tend to receive more citations from books indexed by Google Books suggests that the intellectual influence of book-based research often overlaps between book-based and journal-based research. For example, this may occur because citing journal articles are combined and republished as a monograph, because a book is influential in a field that publishes both books and journal articles, or because a book is influential in multiple fields, some of which tend to publish books and some of which tend to publish journal articles. From a research-assessment perspective, it probably does not matter which of these applies most for any particular book.

## Further Analysis

### *Overlaps Between Scopus and Google Scholar Citations*

We measured the overlap between Scopus citations and Google Scholar citations for a sample of 100 authored books submitted to the RAE in communication, cultural, and media studies to estimate how the coverage of these different sources may influence citation indicators. As shown in Table 5, Google Scholar citations have a 16% relative overlap with Scopus (84% unique citations) whereas the relative overlap is about 55% for Scopus citations (45% unique citations). There are small disciplinary differences in the relative overlap of Google Scholar and Scopus for most areas, with


DOI: 10.1002/asi

TABLE 5. The relative overlap and unique citations for Google Scholar and Scopus to 100 sampled authored books submitted to the 2008 Research Assessment Exercise.

| UoA | Book sampled | Citation count | | Overlapping citations | Relative overlap | | Unique citations (%) | |
|---|---|---|---|---|---|---|---|---|
| | | Google Scholar | Scopus | | Google Scholar | Scopus | Google Scholar | Scopu |
| Law | 17 | 326 | 71 | 32 | 9.82% | 45.07% | 294 (90.18%) | 39 (54.93%) |
| History | 20 | 185 | 107 | 35 | 18.92% | 32.71% | 150 (81.08%) | 72 (67.29%) |
| Sociology | 16 | 878 | 232 | 159 | 18.11% | 68.53% | 719 (81.89%) | 73 (31.47%) |
| Philosophy | 10 | 129 | 41 | 24 | 18.60% | 58.54% | 105 (81.40%) | 17 (41.46%) |
| Archaeology | 10 | 218 | 88 | 42 | 19.27% | 47.73% | 176 (80.73%) | 46 (52.27%) |
| Politics and international studies | 17 | 522 | 183 | 94 | 18.01% | 51.37% | 428 (81.99%) | 89 (48.63%) |
| Communication, cultural, and media studies | 10 | 341 | 67 | 45 | 13.20% | 67.16% | 296 (86.80%) | 22 (32.84%) |
| Total | 100 | 2,599 | 789 | 431 | 16.58% | 54.63% | 2,168 (83.42%) | 358 (45.37%) |

UoA = unit of assessment.

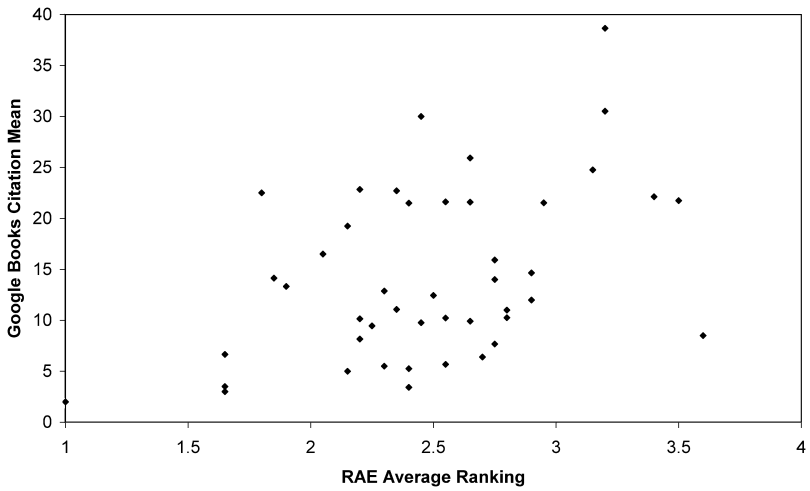


FIG. 1. Google Books citations against Research Assessment Exercise peer review scores in communication, cultural, and media studies.

two exceptions: law with about 91% Google Scholar unique citations and history with 67% Scopus unique citations.

### *Correlations Between Google Books Citation Means and RAE Scores*

The significant number of books indexed in Google Books allows the use of an alternative web-citation indicator for assessing the impact of research outputs in book-based disciplines. To check this, correlation analysis can provide statistical evidence about the extent of the agreement between RAE scores and Google Books citation measures. For this reason, we recorded the 2008 RAE average ranking scores in communication, cultural, and media studies for 47 U.K. institutions (from http://www.guardian.co.uk/education/rae). We also recorded the number of Google Books citations to the 407 authored books submitted (omitting three duplicate titles) by 45 U.K. institutions to the 2008 RAE after manual checking of citations and removing false matches. The 407 authored books received 6,235 citations from other books indexed by Google Books, with a mean and median of 138.5 and l08, respectively (Appendix Table A3).

A correlation test was performed for RAE average ranking scores and average Google Books citations, using institutions in communication, cultural, and media studies as the units of data analysis. There was a small, but significant, correlation, Spearman $r = 0.387, n = 45, p = 0.009$, between the two variables. This weak, but significant, relationship between the average RAE ranking score and average Google Books citation suggests that book citations might be useful indicators to support the peer-review process, especially in subject areas where books are important. The relatively weak correlation


DOI: 10.1002/asi

may be due to the differing importance of books in the field specialties of individual departments. The correlation between the *total* number of Google Books citations received by each department in communication, cultural, and media studies and their RAE score was much higher, Spearman $r = 0.648, n = 45, p = 0.000$, but this only confirms that larger departments attracted more citations and gained higher RAE ratings.

## Conclusions

Our study indicates that there are substantial numbers of citations to academic books from Google Books and Google Scholar, and it therefore may be possible to use these potential sources to help evaluate research in book-oriented disciplines. Most notable, the possibility to locate cited references in many academic books through Google Books provides new opportunities to assess citations from books to books (but see the limitations discussed later) that were not traceable before through traditional article-based citation indexes (e.g., WoS and Scopus). Due to the relatively moderate overlap between Google Scholar and Scopus citations, a combination of the two is recommended rather than just one of them. The moderate, but significant, correlation between average RAE scores and average Google Books citations in communication, cultural, and media studies is promising since a recent study has found no significant correlation between ISI citations and RAE peer-review scores in several social science and humanities UoAs (e.g., history; sociology; education; social policy and administration; politics and international studies) whereas a significant relationship was found in most sciences (Mahdi et al., 2008). The discrepancy seems to be because in the aforementioned social science and humanities subject areas, books and monographs are one of the main platforms for research communication (e.g., Huang & Chang, 2008; Nederhof, 2006). While the significant correlations do not imply that citations have a causal relationship with research quality or can be used to *measure* research impact in the sense of the RAE, they do give evidence that citations can be used as *indicators* of research impact: evidence to present to human judges to help them to identify research quality.

A limitation of this study is that it focused on one country, and this is particularly important in humanities disciplines with a national focus (e.g., law, history). It may be that Google Books' coverage of other countries' literature is much larger or smaller due to local agreements between Google and libraries or publishers for book indexing. Similarly, other countries may not find as many Google Scholar citations because less of the national academic output is published online.

Another limitation is that this study only used quantitative methods to assess book citations, and follow-up studies of motivations for book citations also are needed to validate their use for research-quality assessment. A practical issue is that the data had to be collected manually, which makes large-scale analyses time-consuming, although it should still be cost-effective for the U.K. REF. The challenging issue for automatic extraction is the same as that for bibliometrics: data cleaning. For instance, the mean and median Google Book search citations were 28.3 and 17, respectively, but after manual checking, they decreased to 17.9 and 9, respectively. Nevertheless, the unique content of Google Books (citations from books to books) for impact assessment of book-based disciplines over conventional citations indexes and better coverage of citation information for research assessment (Google Books $Mdn = 9$ vs. Scopus $Mdn = 4$) might be a motivating factor in support of Garfield's (1996) Book Citation Index call. In fact, such a citation index already has been created for Spanish by the Dialnet Consortium (http://dialnet.unirioja.es). Another methodological issue is that RAE submissions contain a combination of books, journal articles, and other sources, and that it therefore would be instructive to examine the extent to which citations from books and from journal articles to books and to journal articles were complementary in the sense of giving different rather than similar evidence of impact. Presumably, there would be some cases of articles and books having very different citation impacts from books or from journal articles (e.g., Kousha & Thelwall, 2009), but it is not known how extensive this would be.

In terms of practical implications of this study for the UK, as discussed earlier, the absence of a plan to use citation information to inform expert reviewers about the impact of research outputs in the REF in "the arts, humanities and a number of other panels" (see HEFCE, 2009b, p. 3), may be a drawback in quality assessment of U.K. research because of the difficulty in assessing large numbers of books.

The challenge is that in arts & humanities and many social sciences, subject-area books are a major research platform, and therefore broader sources of citation information (e.g., citations from books to books) also may be required to effectively identify research excellence. Our results suggest that HEFCE or REF panels in book-based disciplines should urgently consider the possibility to generate new citation indicators to support peer review, using Google Scholar and Google Books in addition to Scopus and the WoS. Although indicators based on journal citations in these areas already have been rejected, the case is worth reconsidering because the addition of citations from books fills a significant gap that would otherwise have disadvantaged more book-oriented RAE submissions within a specific UoA and because the combination of the different sources would give 143 to 318% more citation "evidence" than would Scopus citations alone.

Finally, a future practical step would be developing and assessing methods for the automatic submission and checking of most or all U.K. research outputs in the social sciences and arts & humanities with the Google Books application programming interface (http://code.google.com/apis/books). This would help to avoid the need for manual searching and checking huge numbers of submissions. This approach could systematically create citing and cited associations between books based on extracting both bibliographic information and the cited references of books indexed by Google Books, and would be a useful resource in itself.


DOI: 10.1002/asi

## Acknowledgments

We thank the Leverhulme Trust for funding this research. This article was adapted and extended from Kousha, K., & Thelwall, M. (2011, July). Assessing the Citation Impact of Book-Based Disciplines: The Role of Google Books, Google Scholar and Scopus in the UK RAE. Paper presented at the 13th International Conference Society of Scientometrics and Informetrics Conference, Durban, South Africa.

## References

Archambault, É., Campbell, D., Gingras, Y., & Larivière, V. (2009). Comparing bibliometric statistics obtained from the Web of Science and Scopus. Journal of the American Society for Information Science and Technology, 60(7), 1320–1326.

Ball, R., & Tunger, D. (2006). Science indicators revisited—Science Citation Index versus SCOPUS: A bibliometric comparison of both citation databases. Information Services & Use, 26(4), 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. (2010). Citations to the "Introduction to informetrics" indexed by WOS, Scopus and Google Scholar. Scientometrics, 82(3), 495–506.

Bence, V., & Oppenheim, C. (2004). The influence of peer review on the research assessment exercise. Journal of Information Science, 30(4), 347–368.

Bornmann, L., & Daniel, H.-D. (2006). Selecting scientific excellence through committee peer review—A citation analysis of publications previously published to approval or rejection of post-doctoral research fellowship applicants. Scientometrics, 68(3), 427–440.

Bornmann, L., & Daniel, H.-D. (2008). What do citation counts measure? A review of studies on citing behavior. Journal of Documentation, 64(1), 45–80.

Bornmann, L., Marx, W., Schier, H., Rahm, E., Thor, A., & Daniel, H.-D. (2009). Convergent validity of bibliometric Google Scholar data in the field of chemistry citation counts for papers that were accepted by Angewandte Chemie International Edition or rejected but published elsewhere, using Google Scholar, Science Citation Index, Scopus, and Chemical Abstracts. Journal of Informetrics, 3(1), 27–35.

Brody, T., Harnad, S., & Carr, L. (2006). Earlier Web usage statistics as predictors of later citation impact. Journal of the American Association for Information Science and Technology, 57(8), 1060–1072.

Butler, L., & Visser, M. (2006). Extending citation analysis to non-source items. Scientometrics, 66(2), 327–343.

Chung, Y. (1995). Characteristics of references in international classification systems literature. Library Quarterly, 65(2), 200–215.

Cronin, B., Snyder, H., & Atkins, H. (1997). Comparative citation rankings of authors in monographic and journal literature: A study of sociology. Journal of Documentation, 53(3), 263–273.

Franceschet, M. (2010). A comparison of bibliometric indicators for computer science scholars and journals on Web of Science and Google Scholar. Scientometrics, 83(1), 243–258.

Garfield, E. (1996, October). Citation indexes for retrieval and research evaluation. Paper presented at the G7 Consensus Conference on the Theory and Practice of Research Assessment, Capri, Italy.

Gavel, Y., & Iselid, L. (2008). Web of Science and Scopus: A journal title overlap study. Online Information Review, 32(1), 8–21.

Giménez-Toledo, E., & Román, A. (2008, September). Peer review and in-depth interviews with publishers as a means of assessing quality of research monographs. Poster presented at the 10th International Conference on Science and Technology Indicators, Vienna (Austria). Retrieved from http://eprints.rclis.org/handle/10760/12337

Glänzel, W., & Schoepflin, U. (1999). A bibliometric study of reference literature in the sciences and social sciences. Information Processing & Management, 35(1), 31–44.

Harzing, A.-W., & van der Wal, R. (2009). A Google Scholar h-index for journals: An alternative metric to measure journal impact in economics and business. Journal of the American Society for Information Science and Technology, 60(1), 41–46.

Higher Education Funding Council for England. (2009a). Report on the pilot exercise to develop bibliometric indicators for the Research Excellence Framework. Retrieved from http://www.hefce.ac.uk/pubs/hefce/2009/09_39/09_39.pdf

Higher Education Funding Council for England. (2009b). The Research Excellence Framework: A brief guide to the proposals. Retrieved from http://www.hefce.ac.uk/research/ref/resources/REFguide.pdf

Hicks, D. (1999). The difficulty of achieving full coverage of international social science literature and the bibliometric consequences. Scientometrics, 44(2), 193–215.

Hicks, D. (2004). The four literatures of social science. In H. Moed (Ed.), Handbook of quantitative science and technology research (pp. 476–496). Dordrecht, The Netherlands: Kluwer.

Holmes, A., & Oppenheim, C. (2001). Use of citation analysis to predict the outcome of the 2001 Research Assessment Exercise for Unit of Assessment (UoA) 61: Library and Information Management. Information Research, 6(2). Retrieved from http://informationr.net/ir/6-2/paper103.html

Huang, M., & Chang, Y. (2008). Characteristics of research output in social sciences and humanities: From a research evaluation perspective. Journal of the American Society for Information Science and Technology, 59(11), 1819–1828.

Jacsó, P. (2005a). Google Scholar: The pros and the cons. Online Information Review, 29(2), 208–214.

Jacsó, P. (2005b). As we may search: Comparison of major features of the Web of Science, Scopus, and Google Scholar citation-based and citation-enhanced databases. Current Science, 89(9), 1537–1547. Retrieved from http://www.ias.ac.in/currsci/nov102005/1537.pdf

Korevaar, J.C., & Moed, H.F. (1996). Validation of bibliometric indicators in the field of mathematics. Scientometrics, 37(1), 117–130.

Kousha, K., & Thelwall, M. (2007a). Google Scholar citations and Google Web/URL citations: A multi-discipline exploratory analysis. Journal of the American Society for Information Science and Technology, 58(7), 1055–1065.

Kousha, K., & Thelwall, M. (2007b). The Web impact of open-access social science research. Library and Information Science Research, 29(4), 495–507.

Kousha, K., & Thelwall, M. (2008). Sources of Google Scholar citations outside the Science Citation Index: A comparison between four science disciplines. Scientometrics, 74(2), 273–294.

Kousha, K., & Thelwall, M. (2009). Google Book search: Citation analysis for social science and the humanities. Journal of the American Society for Information Science and Technology, 60(8), 1537–1549.

Kousha, K., Thelwall, M., & Rezaie, S. (2010). Using the web for research evaluation: The Integrated Online Impact indicator. Journal of Informetrics, 4(1), 124–135.

Li, J., Sanderson, M., Willett, P., Norris, M., & Oppenheim, C. (2010). Ranking of library and information science researchers: Comparison of data sources for correlating citation data, and expert judgments. Journal of Informetrics, 4(4), 554–563.

Li, X., Thelwall, M., Musgrove, P., & Wilkinson, D. (2003). The relationship between the links/Web Impact Factors of computer science departments in UK and their RAE (Research Assessment Exercise) ranking in 2001. Scientometrics, 57(2), 239–255.

MacRoberts, M., & MacRoberts, B. (1996). Problems of citation analysis. Scientometrics, 36(3), 435–444.

MacRoberts, M.H., & MacRoberts, B.R. (2010). Problems of citation analysis: A study of uncited and seldom-cited influences. Journal of the American Society for Information Science and Technology, 61(1), 1–13.

Mahdi, S., D'Este, P., & Neely, A. (2008). Citation counts: Are they good predictors of RAE scores? London, England: Advanced Institute of Management Research. Retrieved from http://ssrn.com/abstract=1154053

Meho, L.I., & Yang, K. (2007). Impact of data sources on citation counts and rankings of LIS faculty: Web of Science vs. Scopus and Google Scholar. Journal of the American Society for Information Science and Technology, 58(13), 2105–2125.

Mingers, J., & Lipitakis, E. (2010). Counting the citations: A comparison of Web of Science and Google Scholar in the field of business and management. Scientometrics, 85(2), 613–625.

Moed, H. (2005). Citation analysis in research evaluation. New York: Springer.

Moed, H., Luwel, M., & Nederhof, A. (2001). Towards research performance in the humanities. Library Trends, 50(3), 498–520.

Nederhof, A. (2006). Bibliometric monitoring of research performance in the social sciences and the humanities: A review. Scientometrics, 66(1), 81–100.

Nederhof, A., & van Raan, A. (1993). A bibliometric analysis of six economics research groups: A comparison with peer review. Research Policy, 22(4), 353–368.

Norris, M., & Oppenheim, C. (2003). Citation counts and the Research Assessment Exercise V: Archaeology and the 2001 RAE. Journal of Documentation, 59(6), 709–730.

Norris, M., & Oppenheim, C. (2010). Peer review and the h-index: Two studies. Journal of Informetrics, 4(3), 221–232.

Oppenheim, C. (1995). The correlation between citation counts and the 1992 Research Assessment Exercise ratings for British library and information science university departments. Journal of Documentation, 51(1), 18–27.

Oppenheim, C. (1996). Do citations count? Citation indexing and the Research Assessment Exercise (RAE). Serials, 9(2), 151–161.

Oppenheim, C. (1997). The correlation between citation counts and the 1992 Research Assessment Exercise ratings for British research in genetics, anatomy and archaeology. Journal of Documentation, 53(5), 477–487.

Oppenheim, C., & Summers, M. (2008). Citation counts and the Research Assessment Exercise, Part VI: Unit of assessment 67 (music). Information Research, 13(2). Retrieved from http://InformationR.net/ir/13-2/paper342.html

RAE 2008 Guidance on Submissions. (2005). Retrieved from http://www.rae.ac.uk/pubs/2005/03/rae0305.pdf

RAE 2008 Panels (n.d.). Retrieved from http://www.rae.ac.uk/aboutus/panels.asp

Rinia, E.J., van Leeuwen, T.N., van Vuren, H.G., & van Raan, A.F.J. (1998). Comparative analysis of a set of bibliometric indicators and central peer review criteria: Evaluation of condensed matter physics in the Netherlands. Research Policy, 27(1), 95–107.

Scopus Content Coverage Guide. (2010). Retrieved from http://www.info.sciverse.com/documents/files/scopus-training/resourcelibrary/pdf/sccg0510.pdf

Seng, L.B., & Willett, P. (1995). The citedness of publications by United Kingdom library schools. Journal of Information Science, 21(1), 68–71.

Shaw, D., & Vaughan, L. (2008). A new look at evidence of scholarly citation in citation indexes and from web sources. Scientometrics, 74(2), 317–330.

Small, H., & Crane, D. (1979). Specialties and disciplines in science and social science: An examination of their structure using citation indexes. Scientometrics, 1(5–6), 445–461.

Smith, A., & Eysenck, M. (2002, June). The correlation between RAE ratings and citation counts in psychology [Unpublished Tech. Rep.]. University of London. Retrieved from: http://cogprints.org/2749/1/citations.pdf

Smith, A.G. (2008). Benchmarking Google Scholar with the New Zealand PBRF research assessment exercise. Scientometrics, 74(2), 309–316.

Tang, R. (2008). Citation characteristics and intellectual acceptance of scholarly monographs. College & Research Libraries, 69(4), 356–369.

Taylor, J. (2011). The assessment of research quality: Peer review or metrics? British Journal of Management, 22(2), 202–217.

Taylor, J., & Walker, I. (2009). Peer assessment of research: How many publications per staff? Lancaster University Management School, Working Paper No. 2009/035. Retrieved from http://eprints.lancs.ac.uk/48977/1/Document.pdf

Thompson, J. (2002). The death of the scholarly monograph in the humanities? Citation patterns in literary scholarship. Libri, 52, 121–136.

van Raan, A.F.J. (2005). Fatal attraction: Conceptual and methodological problems in the ranking of universities by bibliometric methods. Scientometrics, 62(1), 133–143.

van Raan, A.F.J. (2006). Comparison of Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups. Scientometrics, 67(3), 491–502.

Vaughan, L., & Shaw, D. (2005). Web citation data for impact assessment: A comparison of four science disciplines. Journal of the American Society for Information Science and Technology, 56(10), 1075–1087.

Warner, J. (2000). A critical review of the application of citation studies to the Research Assessment Exercises. Journal of Information Science, 26(6), 453–459.

Weingart, P. (2005). Impact of bibliometrics upon the science system: Inadvertent consequences? Scientometrics, 62(1), 117–131.

White, H.D., Boell, S.K., Yu, H., Davis, M., Wilson, C.S., & Cole, F.T. (2009). Libcitations: A measure for comparative assessment of book publications in the humanities and social sciences. Journal of the American Society for Information Science and Technology, 60(6), 1083–1096.


DOI: 10.1002/asi

## Appendix

Table A1. Number and percentage for the main types of 2008 Research Assessment Exercise (RAE) submissions to the 67 units of assessment.

| RAE 2008 UoA | Authored book | | Edited book | | Chapter in book | | All types of book sources[a] | | Journal article | | Conference contribution | | Total[a] | Total no. of submissions[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | | |
| 1. Cardiovascular Medicine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 1,496 | 98.42 | 0 | 0 | 1,496 | 1,520 |
| 2. Cancer Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 3,002 | 98.56 | 0 | 0 | 3,002 | 3,046 |
| 3. Infection and Immunology | 1 | 0.04 | 0 | 0 | 1 | 0.04 | 2 | 0.07 | 2,671 | 98.6 | 0 | 0 | 2,673 | 2,709 |
| 4. Other Hospital-Based Clinical Subjects | 1 | 0.01 | 0 | 0 | 1 | 0.01 | 2 | 0.03 | 6,673 | 98.74 | 1 | 0.01 | 6,676 | 6,758 |
| 5. Other Laboratory-Based Clinical Subjects | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 1,092 | 98.73 | 0 | 0 | 1,092 | 1,106 |
| 6. Epidemiology and Public Health | 5 | 0.21 | 1 | 0.04 | 4 | 0.17 | 10 | 0.41 | 2,322 | 95.99 | 0 | 0 | 2,332 | 2,419 |
| 7. Health Services Research | 11 | 0.5 | 2 | 0.09 | 20 | 0.91 | 33 | 1.50 | 2,060 | 93.42 | 2 | 0.09 | 2,095 | 2,205 |
| 8. Primary Care and Other Community-Based Clinical Subjects | 3 | 0.45 | 0 | 0 | 3 | 0.45 | 6 | 0.90 | 649 | 96.87 | 0 | 0 | 655 | 670 |
| 9. Psychiatry, Neuroscience, and Clinical Psychology | 5 | 0.15 | 0 | 0 | 0 | 0 | 5 | 0.15 | 3,305 | 98.54 | 0 | 0 | 3,310 | 3,354 |
| 10. Dentistry | 0 | 0 | 0 | 0 | 1 | 0.06 | 1 | 0.06 | 1,616 | 97.12 | 0 | 0 | 1,617 | 1,664 |
| 11. Nursing and Midwifery | 38 | 1.34 | 9 | 0.32 | 51 | 1.8 | 98 | 3.45 | 2,582 | 90.92 | 3 | 0.11 | 2,683 | 2,840 |
| 12. Allied Health Professions and Studies | 34 | 0.55 | 14 | 0.23 | 89 | 1.44 | 137 | 2.21 | 5,812 | 93.82 | 18 | 0.29 | 5,967 | 6,195 |
| 13. Pharmacy | 2 | 0.11 | 0 | 0 | 3 | 0.16 | 5 | 0.27 | 1,780 | 96.63 | 1 | 0.05 | 1,786 | 1,842 |
| 14. Biological Sciences | 15 | 0.15 | 1 | 0.01 | 9 | 0.09 | 25 | 0.26 | 9,587 | 98 | 4 | 0.04 | 9,616 | 9,783 |
| 15. Preclinical and Human Biological Sciences | 9 | 0.37 | 1 | 0.04 | 19 | 0.78 | 29 | 1.19 | 2,374 | 97.06 | 0 | 0 | 2,403 | 2,446 |
| 16. Agriculture, Veterinary, and Food Science | 6 | 0.14 | 1 | 0.02 | 16 | 0.38 | 23 | 0.55 | 4,081 | 97.14 | 4 | 0.1 | 4,108 | 4,201 |
| 17. Earth Systems and Environmental Sciences | 29 | 0.57 | 0 | 0 | 118 | 2.33 | 147 | 2.90 | 4,857 | 95.76 | 8 | 0.16 | 5,012 | 5,072 |
| 18. Chemistry | 4 | 0.08 | 0 | 0 | 4 | 0.08 | 8 | 0.16 | 4,858 | 98.9 | 0 | 0 | 4,866 | 4,912 |
| 19. Physics | 9 | 0.13 | 0 | 0 | 10 | 0.14 | 19 | 0.27 | 7,022 | 98.22 | 22 | 0.31 | 7,063 | 7,149 |
| 20. Pure Mathematics | 54 | 1.96 | 0 | 0 | 65 | 2.35 | 119 | 4.31 | 2,344 | 84.87 | 81 | 2.93 | 2,544 | 2,762 |
| 21. Applied Mathematics | 24 | 0.69 | 0 | 0 | 23 | 0.66 | 47 | 1.36 | 3,315 | 95.73 | 9 | 0.26 | 3,371 | 3,463 |
| 22. Statistics and Operational Research | 24 | 1.62 | 1 | 0.07 | 14 | 0.95 | 39 | 2.63 | 1,334 | 90.07 | 5 | 0.34 | 1,378 | 1,481 |
| 23. Computer Science and Informatics | 75 | 1 | 9 | 0.12 | 199 | 2.66 | 283 | 3.78 | 4,966 | 66.35 | 1,989 | 26.57 | 7,238 | 7,485 |
| 24. Electrical and Electronic Engineering | 8 | 0.24 | 0 | 0 | 9 | 0.27 | 17 | 0.51 | 3,244 | 96.95 | 53 | 1.58 | 3,314 | 3,346 |
| 25. General Engineering and Mineral & Mining Engineering | 34 | 0.58 | 17 | 0.29 | 75 | 1.28 | 126 | 2.15 | 5,465 | 93.29 | 156 | 2.66 | 5,747 | 5,858 |
| 26. Chemical Engineering | 3 | 0.36 | 0 | 0 | 3 | 0.36 | 6 | 0.73 | 800 | 96.97 | 8 | 0.97 | 814 | 825 |
| 27. Civil Engineering | 12 | 0.58 | 0 | 0 | 30 | 1.46 | 42 | 2.04 | 1,928 | 93.59 | 47 | 2.28 | 2,017 | 2,060 |
| 28. Mechanical, Aeronautical, and Manufacturing Engineering | 2 | 0.05 | 1 | 0.02 | 14 | 0.34 | 17 | 0.42 | 3,987 | 97.65 | 34 | 0.83 | 4,038 | 4,083 |
| 29. Metallurgy and Materials | 2 | 0.13 | 2 | 0.13 | 4 | 0.25 | 8 | 0.51 | 1,510 | 95.45 | 22 | 1.39 | 1,540 | 1,582 |
| 30. Architecture and the Built Environment | 174 | 6.58 | 51 | 1.93 | 240 | 9.08 | 465 | 17.59 | 1,702 | 64.37 | 220 | 8.32 | 2,387 | 2,644 |
| 31. Town and Country Planning | 105 | 6.15 | 22 | 1.29 | 112 | 6.56 | 239 | 14.00 | 1,379 | 80.79 | 19 | 1.11 | 1,637 | 1,707 |
| 32. Geography and Environmental Studies | 214 | 4.67 | 18 | 0.39 | 243 | 5.3 | 475 | 10.36 | 3,951 | 86.19 | 12 | 0.26 | 4,438 | 4,584 |

(*Continued*)


DOI: 10.1002/asi

Table A1. (*Continued*)

| RAE 2008 UoA | Authored book | | Edited book | | Chapter in book | | All types of book sources[a] | | Journal article | | Conference contribution | | Total[a] | Total no. of submissions[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | | |
| **33. Archaeology** | 376 | 17.55 | 145 | 6.77 | 627 | 29.27 | 1,148 | 53.59 | 901 | 42.06 | 39 | 1.82 | 2,088 | 2,142 |
| 34. Economics and Econometrics | 21 | 0.7 | 6 | 0.2 | 55 | 1.82 | 82 | 2.71 | 2,566 | 84.94 | 3 | 0.1 | 2,651 | 3,021 |
| 35. Accounting and Finance | 16 | 2.81 | 0 | 0 | 14 | 2.46 | 30 | 5.27 | 490 | 86.12 | 2 | 0.35 | 522 | 569 |
| 36. Business and Management Studies | 285 | 2.27 | 60 | 0.48 | 332 | 2.64 | 677 | 5.38 | 11,373 | 90.44 | 85 | 0.68 | 12,135 | 12,575 |
| 37. Library and Information Management | 31 | 2.57 | 9 | 0.75 | 103 | 8.53 | 143 | 11.85 | 854 | 70.75 | 118 | 9.78 | 1,115 | 1,207 |
| **38. Law** | 996 | 15.93 | 23 | 0.37 | 1,330 | 21.27 | 2,349 | 37.56 | 3,691 | 59.02 | 4 | 0.06 | 6,044 | 6,254 |
| **39. Politics and International Studies** | 1,028 | 21.84 | 91 | 1.93 | 655 | 13.91 | 1,774 | 37.68 | 2,831 | 60.13 | 9 | 0.19 | 4,614 | 4,708 |
| 40. Social Work and Social Policy & Administration | 618 | 11.74 | 141 | 2.68 | 624 | 11.85 | 1,383 | 26.26 | 3,515 | 66.75 | 7 | 0.13 | 4,905 | 5,266 |
| **41. Sociology** | 619 | 16.6 | 96 | 2.57 | 526 | 14.11 | 1,241 | 33.28 | 2,366 | 63.45 | 4 | 0.11 | 3,611 | 3,729 |
| 42. Anthropology | 181 | 14.45 | 104 | 8.3 | 292 | 23.3 | 577 | 46.05 | 636 | 50.76 | 2 | 0.16 | 1,215 | 1,253 |
| 43. Development Studies | 73 | 8.95 | 37 | 4.53 | 97 | 11.89 | 207 | 25.37 | 571 | 69.98 | 2 | 0.25 | 780 | 816 |
| 44. Psychology | 28 | 0.42 | 6 | 0.09 | 56 | 0.83 | 90 | 1.34 | 6,472 | 96.4 | 9 | 0.13 | 6,571 | 6,714 |
| 45. Education | 732 | 10.25 | 54 | 0.76 | 938 | 13.14 | 1,724 | 24.15 | 4,898 | 68.6 | 72 | 1.01 | 6,694 | 7,140 |
| 46. Sports-Related Studies | 38 | 1.89 | 3 | 0.15 | 60 | 2.98 | 101 | 5.02 | 1,831 | 90.96 | 6 | 0.3 | 1,938 | 2,013 |
| 47. American Studies and Anglophone Area Studies | 71 | 20.94 | 20 | 5.9 | 94 | 27.73 | 185 | 54.57 | 139 | 41 | 1 | 0.29 | 325 | 339 |
| 48. Middle Eastern and African Studies | 153 | 23.29 | 35 | 5.33 | 231 | 35.16 | 419 | 63.77 | 219 | 33.33 | 1 | 0.15 | 639 | 657 |
| 49. Asian Studies | 111 | 18.2 | 24 | 3.93 | 162 | 26.56 | 297 | 48.69 | 292 | 47.87 | 5 | 0.82 | 594 | 610 |
| 50. European Studies | 341 | 18.8 | 89 | 4.91 | 425 | 23.43 | 855 | 47.13 | 902 | 49.72 | 5 | 0.28 | 1,762 | 1,814 |
| 51. Russian, Slavonic, and East European Languages | 75 | 16.06 | 33 | 7.07 | 118 | 25.27 | 226 | 48.39 | 219 | 46.9 | 1 | 0.21 | 446 | 467 |
| 52. French | 295 | 19.13 | 82 | 5.32 | 450 | 29.18 | 827 | 53.63 | 623 | 40.4 | 3 | 0.19 | 1,453 | 1,542 |
| 53. German, Dutch, and Scandinavian Languages | 167 | 19.09 | 65 | 7.43 | 326 | 37.26 | 558 | 63.77 | 281 | 32.11 | 3 | 0.34 | 842 | 875 |
| 54. Italian | 73 | 18.77 | 18 | 4.63 | 116 | 29.82 | 207 | 53.21 | 156 | 40.1 | 4 | 1.03 | 367 | 389 |
| 55. Iberian and Latin American Languages | 196 | 21.4 | 44 | 4.8 | 249 | 27.18 | 489 | 53.38 | 378 | 41.27 | 13 | 1.42 | 880 | 916 |
| 56. Celtic Studies | 108 | 25.9 | 26 | 6.24 | 124 | 29.74 | 258 | 61.87 | 120 | 28.78 | 7 | 1.68 | 385 | 417 |
| 57. English Language and Literature | 1,905 | 25.64 | 495 | 6.66 | 2,118 | 28.5 | 4,518 | 60.80 | 2,304 | 31.01 | 23 | 0.31 | 6,845 | 7,431 |
| 58. Linguistics | 117 | 9.98 | 22 | 1.88 | 256 | 21.84 | 395 | 33.70 | 687 | 58.62 | 45 | 3.84 | 1,127 | 1,172 |
| 59. Classics, Ancient History, Byzantine, and Modern Greek Studies | 329 | 19.86 | 92 | 5.55 | 668 | 40.31 | 1,089 | 65.72 | 460 | 27.76 | 12 | 0.72 | 1,561 | 1,657 |
| 60. Philosophy | 326 | 15.65 | 31 | 1.49 | 464 | 22.28 | 821 | 39.41 | 1,132 | 54.34 | 2 | 0.1 | 1,955 | 2,083 |
| 61. Theology, Divinity, and Religious Studies | 573 | 28.82 | 106 | 5.33 | 680 | 34.21 | 1,359 | 68.36 | 579 | 29.12 | 8 | 0.4 | 1,946 | 1,988 |
| **62. History** | 1,665 | 23.93 | 386 | 5.55 | 2,063 | 29.65 | 4,114 | 59.12 | 2,510 | 36.07 | 12 | 0.17 | 6,636 | 6,959 |
| 63. Art and Design | 572 | 7.21 | 190 | 2.4 | 772 | 9.74 | 1,534 | 19.35 | 1,131 | 14.26 | 652 | 8.22 | 3,317 | 7,929 |
| 64. History of Art, Architecture, and Design | 298 | 21.83 | 84 | 6.15 | 451 | 33.04 | 833 | 61.03 | 415 | 30.4 | 13 | 0.95 | 1,261 | 1,365 |
| 65. Drama, Dance, and Performing Arts | 274 | 15.35 | 85 | 4.76 | 393 | 22.02 | 752 | 42.13 | 480 | 26.89 | 24 | 1.34 | 1,256 | 1,785 |
| **66. Communication, Cultural, and Media Studies** | 410 | 18.83 | 72 | 3.31 | 581 | 26.69 | 1,063 | 48.83 | 916 | 42.08 | 8 | 0.37 | 1,987 | 2,177 |
| 67. Music | 201 | 7.92 | 50 | 1.97 | 441 | 17.37 | 692 | 27.25 | 561 | 22.1 | 55 | 2.17 | 1,308 | 2,539 |
| Total (%) | 14,205 | 6.63 | 2,974 | 1.39 | 18,271 | 8.53 | 35,450 | 16.54 | 161,263 | 75.25 | 3,977 | 1.86 | 200,690 | 214,289 |

*Note.* UoA = unit of assessment. Selected subject areas (UoAs) boldface.

[a]Total number of book sources including authored books, edited books, and chapter in books.

[b]Total number of all submitted types of research outputs, including patents, software, research reports, Internet publication, and so on in the 2008 RAE.


DOI: 10.1002/asi

Table A2. Top-five highly cited books in 2008 Research Assessment Exercise based on Google Books Searches (as of November 2010).

| UoA | First author | Book titles | Google Books *n* (% of Scopus) | Google Scholar *n* (% of Scopus) | Scopus *n* |
|---|---|---|---|---|---|
| Law | Douglas-Scott | *Constitutional Law of the European Union* | 64 (1066.7) | 51 (850) | 6 |
| | Craig | *EU Law, Text, Cases and Materials (4th ed.)* | 51 (175.9) | 89 (306.9) | 29 |
| | Kretzmer | *The Occupation of Justice: The Supreme Court of Israel and the Occupied Territories* | 50 (250.0) | 110 (550) | 20 |
| | Hood | *The Death Penalty: A World-Wide Perspective (3rd ed.)* | 47 (235.0) | 182 (910) | 20 |
| | Honore | *Ulpian: Pioneer of Human Rights* | 45 (562.5) | 11 (137.5) | 8 |
| History | Strachan | *The First World War: To Arms (Vol. 1)* | 213 (645.5) | 104 (315.2) | 33 |
| | Hobsbawm | *Interesting Times: A Twentieth-Century Life* | 117 (365.6) | 99 (309.4) | 32 |
| | Malcolm | *Aspects of Hobbes* | 102 (242.9) | 80 (190.5) | 42 |
| | Rodger | *The Command of the Ocean: A Naval History of Britain, 1649–1815* | 93 (357.7) | 70 (269.2) | 26 |
| | MacMillan | *Peacemakers: The Paris Conference of 1919 and Its Attempt to End War* | 89 (387.0) | 73 (317.4) | 23 |
| Sociology | Sassen | *Territory, Authority and Rights: From Medieval to Global Assemblages* | 198 (117.2) | 437 (258.6) | 169 |
| | Amin | *Cities: Reimagining the Urban* | 194 (71.1) | 728 (266.7) | 273 |
| | Sklair | *Globalization: Capitalism and Its Alternatives* | 185 (196.8) | 354 (376.6) | 94 |
| | Lash | *Critique of Information* | 178 (138.0) | 460 (356.6) | 129 |
| | Mann | *The Dark-Side of Democracy: Explaining Ethnic Cleansing* | 173 (122.7) | 326 (231.2) | 141 |
| Philosophy | Clark | *Natural-Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence* | 132 (107.3) | 497 (404.1) | 123 |
| | Dancy | *Ethics Without Principles* | 100 (102.0) | 289 (294.9) | 98 |
| | Papineau | *Thinking About Consciousness* | 83 (94.3) | 249 (283.0) | 88 |
| | Hallward | *Badiou: A Subject to Truth* | 82 (149.1) | 159 (289.1) | 55 |
| | Hallward | *Absolutely Postcolonial: Writing Between the Singular and the Specific* | 64 (220.7) | 96 (331.0) | 29 |
| Archeology | Cummings | *Places of Special Virtue: Megaliths in the Neolithic Landscapes of Wales* | 65 (309.5) | 36 (171.4) | 21 |
| | Shennan | *Genes, Memes and Human History: Darwinian Archaeology and Cultural Evolution* | 60 (64.5) | 234 (251.6) | 93 |
| | Wheatley | *Spatial Technology and Archaeology: The Archaeological Applications of GIS* | 49 (136.1) | 147 (408.3) | 36 |
| | Gosden | *Archaeology and Colonialism: Cultural Contact From 5000 BC to the Present* | 56 (116.7) | 103 (214.6) | 48 |
| | Fowler | *The Archaeology of Personhood: An Anthropological Approach* | 41 (113.9) | 100 (277.8) | 36 |

(*Continued*)


DOI: 10.1002/asi

Table A2. (*Continued*)

| UoA | First author | Book titles | Google Books *n* (% of Scopus) | Google Scholar *n* (% of Scopus) | Scopus *n* |
|---|---|---|---|---|---|
| Politics and international studies | Putnam | *Better Together: Restoring the American Community* | 180 (137.4) | 470 (358.8) | 131 |
| | Acharya | *Constructing a Security Community in Southeast Asia: ASEAN and the Problem of Regional Order* | 170 (182.8) | 392 (421.5) | 93 |
| | Buzan | *Regions and Powers: The Structure of International Security* | 170 (161.9) | 620 (590.5) | 105 |
| | Gray | *Al Qaeda and What it Means to Be Modern* | 145 (439.4) | 189 (572.7) | 33 |
| | Laclau | *On Populist Reason* | 128 (103.2) | 410 (330.6) | 124 |
| Communication, cultural, and media studies | Ahmed | *The Cultural Politics of Emotion* | 132 (56.9) | 501 (215.9) | 232 |
| | Lister | *New Media: A Critical Introduction* | 115 (221.2) | 270 (519.2) | 52 |
| | Critcher | *Moral Panics and the Media* | 72 (288.0) | 14 (56) | 25 |
| | Newman | *Videogames* | 59 (151.3) | 162 (415.4) | 39 |
| | Tumber | *Media at War: The Iraq Crisis* | 52 (136.8) | 126 (331.6) | 38 |
| Total | | | 3,754 (174.6) | 8,238 (323.8) | 2,544 |

UoA = unit of assessment.

Table A3. Statistics for Google Books citations and average 2008 Research Assessment Exercise (RAE) ranking score in communication, cultural, and media studies for 45 U.K. institutions.

| University name | Google Books citation *M* | Google Books citation *Mdn* | No. of books submitted | Total citations | RAE average ranking |
|---|---|---|---|---|---|
| University of Leicester | 8.5 | 5.5 | 10 | 85 | 3.600 |
| University of Westminster | 21.75 | 14.5 | 20 | 435 | 3.500 |
| University of East Anglia | 22.12 | 15.5 | 8 | 177 | 3.400 |
| Goldsmiths College, University of London | 30.52 | 21 | 23 | 702 | 3.200 |
| London School of Economics and Political Science | 38.66 | 29.5 | 6 | 232 | 3.200 |
| Cardiff University | 24.76 | 14 | 17 | 421 | 3.150 |
| University of East London | 21.53 | 10 | 13 | 280 | 2.950 |
| Royal Holloway, University of London | 12 | 12.5 | 120 | 95 | 2.900 |
| University of Sussex | 14.66 | 11 | 15 | 220 | 2.900 |
| Nottingham Trent University | 10.25 | 7.5 | 16 | 164 | 2.800 |
| University of Ulster | 11 | 3 | 9 | 99 | 2.800 |
| University of Lincoln | 14 | 12.5 | 4 | 56 | 2.750 |
| University of Sunderland | 7.67 | 5.5 | 16 | 123 | 2.750 |
| University of Stirling | 15.92 | 7 | 13 | 207 | 2.750 |
| De Montfort University | 6.4 | 5 | 9 | 58 | 2.700 |
| University of the West of England, Bristol | 25.93 | 13.5 | 16 | 415 | 2.650 |
| University of Leeds | 9.91 | 7 | 12 | 119 | 2.650 |
| University of Oxford | 21.6 | 13 | 5 | 108 | 2.650 |
| University of Bedfordshire | 21.62 | 20 | 8 | 173 | 2.550 |
| Leeds Metropolitan University | 5.68 | 4 | 19 | 108 | 2.550 |
| University of Salford | 10.23 | 6 | 13 | 133 | 2.550 |
| Bournemouth University | 12.44 | 7 | 9 | 122 | 2.500 |
| University of Derby | 9.77 | 9 | 9 | 88 | 2.450 |
| Queen Margaret University Edinburgh | 30 | 30 | 2 | 60 | 2.450 |
| Sheffield Hallam University | 3.42 | 3 | 7 | 24 | 2.400 |
| London South Bank University | 5.25 | 3 | 4 | 21 | 2.400 |


DOI: 10.1002/asi

Table A3. (*Continued*)

| University name | Google Books citation *M* | Google Books citation *Mdn* | No. of books submitted | Total citations | RAE average ranking |
|---|---|---|---|---|---|
| Brunel University | 21.5 | 16 | 12 | 258 | 2.400 |
| Roehampton University | 11.07 | 3 | 13 | 144 | 2.350 |
| London Metropolitan University | 22.71 | 20 | 7 | 159 | 2.350 |
| Glasgow Caledonian University | 5.5 | 5.5 | 2 | 11 | 2.300 |
| University of Nottingham | 12.87 | 5.5 | 8 | 103 | 2.300 |
| University of Winchester | 9.46 | 3 | 13 | 123 | 2.250 |
| University of Brighton | 8.16 | 8.5 | 6 | 49 | 2.200 |
| University of Central Lancashire | 10.14 | 8 | 7 | 71 | 2.200 |
| University of Sheffield | 22.85 | 20 | 7 | 160 | 2.200 |
| Middlesex University | 5 | 6 | 3 | 15 | 2.150 |
| University of Glamorgan | 19.25 | 5 | 4 | 77 | 2.150 |
| Swansea University | 16.5 | 11.5 | 8 | 132 | 2.050 |
| University of the West of Scotland | 13.33 | 14 | 3 | 40 | 1.900 |
| Staffordshire University | 14.14 | 13 | 7 | 99 | 1.850 |
| Bath Spa University | 22.5 | 22.5 | 2 | 45 | 1.800 |
| University of Greenwich | 6.66 | 0 | 3 | 20 | 1.650 |
| Thames Valley University | 3.5 | 3.5 | 2 | 7 | 1.650 |
| University of Bradford | 3 | 3 | 1 | 3 | 1.650 |
| University of Huddersfield | 2 | 0 | 5 | 10 | 1.000 |


DOI: 10.1002/asi