

Is Clarivate's Web of Science Still Unable to Identify Review Papers Correctly? Evidence, Implications, and Potential Solutions

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Abstract

This paper presents a study of 97 papers classified as review papers by Clarivate's Web of Science. The 97 peer-reviewed papers were published in three prestigious information and library science journals. According to the findings, 57 of the 97 alleged reviews are genuine. 37 research articles, brief communication, case studies, and film reviews are among the 40 papers mislabeled as reviews. The author identifies the causes of these misclassifications, discusses the implications of these misclassifications, and suggests potential solutions to avoid them.

Keywords: Web of Science, Misclassification, Review Papers.

Introduction

Despite competition from Scopus and Microsoft Academic, Clarivate's Web of Science (from now on WoS) is the most widely used database in research evaluation and bibliometric studies (Birkle, Pendlebury, Schnell & Adams, 2020; Fahimifar, Ghorbi, & Ausloos, 2022; Prankutė, 2021). Clarivate's WoS has been in existence for a quarter-century (it went online in 1997)¹, and it is also the most widely securitized bibliometric database (Donner, 2017; Harzing, 2013; Liu, 2021; Yeung, 2019; Zhu, Hu & Liu, 2019). Several studies have concluded that the WoS is far from perfect (Donner, 2017; Harzing, 2013; Liu, 2021; Yeung, 2019; Zhu, Hu & Liu, 2019). Three of these studies show that a single persistent issue has plagued the WoS: the inability to recognize review papers correctly (Donner, 2017; Harzing, 2013; Yeung, 2019).

Review papers "which comprehensively collect, synthesize, and interpret extant research in a domain, are a fundamental genre in every scientific discipline" (Wagner et al., 2021, p.1). In 1987, Eugene Garfield, founder of the Institute for Scientific Information (now owned by Clarivate), emphasized the importance of review papers. He stated, "Many of our greatest scientists have used, created, and contributed to the review literature" (Garfield, 1987, p.113).

Clarivate's WoS has provided information about the document type for each article since 2007 (Blümel & Schniedermann, 2020). Clarivate has included a citation distribution histogram in the Journal Citation Reports (JCR) since 2018, displaying the article citation median and review citation median for each journal and the ratio of articles to reviews in each citation count interval. WoS employs algorithms to enable document-specific queries, automatically assigning

the document type "review" to publications. Nonetheless, studies by Harzing (2013), Donner (2017), and Yeung (2019) show that WoS is inaccurate in correctly identifying review papers. These three studies, however, were conducted three (Yeung, 2019) to nine years ago (Harzing, 2013). This study intends to revisit that specific issue and provide answers to the following research questions (RQs):

RQ1: Is the WoS still incapable of correctly identifying review papers?

RQ2: What are the implications of this inability for journals, publishers, researchers, and universities (if the answer is yes)?

RQ3: What are the potential solutions to this recurring problem?

Background and related work

Scholarly journals publish many documents, including research papers, review papers, invited commentaries, editorials, letters to the editor, book reviews, biographical notes, errata, etc. Research and review articles are the most common types of these documents (Donner, 2017).

What is a review article?

According to Blümel and Schniedermann (2020, p.713), "[o]ne of the biggest challenges for studying review articles in science is that there is no commonly accepted definition of the review article".

Publishing houses use their nomenclatures and definitions of review papers (Donner, 2017). Table 1 shows a selection of five definitions of review articles from five well-known publishers.

Table 1

Definitions for Review Articles According to Five Renowned Publishers

Publisher	Definition	Source
Cambridge University Press	Review articles provide a comprehensive summary or discussion of an area of scientific research alongside a new perspective or conclusion.	https://www.cambridge.org/core/services/open-access-policies/read-and-publish-agreements/article-type-definitions
Elsevier	Writing a review article is about more than seizing on an interesting topic and gathering the relevant references. It is an opportunity for you to contribute to the development of your field by creating a synthesis of the best resources available and potential new research areas to explore in the future.	https://www.elsevier.com/connect/authors-update/six-things-you-should-keep-in-mind-when-writing-a-review-article
Emerald	Essentially, it is a description of work that has already been published in a particular field or on a specific topic.	https://www.emeraldgroupublishing.com/how-to/authoring-editing-reviewing/write-a-literature-review#what-is-literature-review
Springer Nature	A review article is written to summarize the current state of understanding on a topic.	https://www.springer.com/gp/authors-editors/authorandreviewertutorials/howtopeerreview/reviewing-

Publisher	Definition	Source
		review-articles/10286414
Taylor & Francis	A review article, also called a literature review, is a survey of previously published research on a topic. It should give an overview of current thinking on the theme and, unlike an original research article, won't present new experimental results.	https://authorservices.taylorandfrancis.com/publishing-your-research/writing-your-paper/how-to-write-review-article/

Each bibliometric database has its definition of what constitutes a review paper (Yeung, 2019). Because this study focuses on the WoS, Table 2 includes not one but three definitions of review articles used by Clarivate in recent years. The WoS's constant reshaping of the definition of review articles points to a recurring issue that this bibliometric database has been dealing with for the last few years. It could also be the result of prior researchers' communications with/criticisms of Clarivate regarding the misclassification of review papers (see Harzing, 2013, p.33; Miranda and Garcia-Carpintero, 2018, p.1017; Yeung, 2019, p.1912).

Table 2

Three Definitions of Review Articles Used by Clarivate During the Last Few Years

Year	Definition	Criteria	Source
2021	Detailed, critical surveys of published research. A review article may summarize previously published studies and draw some conclusions but will not present new information. Includes Reviews, Review of Literature, Mini-reviews, and Systematic reviews.	If an article is listed under the review section in a journal and/or <i>Review of Literature</i> appears in the title it will be assigned a review. Suppose the journal does not assign an article a review but Review, Systematic Review or Mini-review appears in the title. In that case, it must also appear somewhere else in the article (abstract/summary or introduction) to be assigned the document type review. NOTE: If the article(s) meet the above criteria - they must have References to be tagged as a Review item.	https://webofscience.help.clarivate.com/en-us/Content/document-types.html
2020	A renewed study of material previously studied. Includes review articles and surveys of previously published literature. Usually will not present any new information on a subject.	Not provided	https://images.webofknowledge.com/images/help/WOS/hs_document_type.html
2018	A renewed study or survey of previously published literature providing new analysis or summarization of the research topic.	Not provided	https://images.webofknowledge.com/WOKRS531OR13/help/WOK/hs_document_types.html

Why do review papers matter?

A growing number of studies in the library and information science literature have focused on review papers (Wagner et al., 2021; Blümel & Schniedermann, 2020). This surge in interest in these papers appears to be driven by an increase in the proportion of review papers in the scientific literature (Miranda & Garcia-Carpintero, 2019; Moussa, 2021).

Review papers (narrative, systematic, or meta-analytic) summarize much information on a research topic. They also have extensive bibliographies. Given these two characteristics, review papers are widely consulted and, as a result, are strong candidates for receiving numerous citations. Prior studies indicate that review papers receive much more citations than research articles (Lei & Sun, 2020; Miranda & Garcia-Carpintero, 2018; Moussa, 2021; Valderrama, Jiménez-Contreras, Valderrama, Escabias & Baca, 2019). According to Miranda and Garcia-Carpintero's (2018) large-scale study, review papers are, on average, cited 2.95 times more than research papers. Moussa (2021) found that review papers published in "elite" business and economics journals are cited about 1.750 to 2.678 times more than research papers. Moussa (2021) even questioned whether the trend toward publishing more review papers is a way to boost journal-level citation-based indicators, such as Clarivate's Journal Impact Factor (JIF). Lei and Sun (2020) recommended that review papers be excluded from JIF calculations because they are outliers regarding received citations. Lei and Sun (2020, p.1700) even proposed an equation. However, review papers must be correctly identified for this solution to be effective.

Prior studies on WoS' document type misclassification

Anne-Wil Harzing is one of the most critical researchers of WoS. Harzing (2013, p.31) reported in her 2013 study that on an average of 27 journals in nine disciplines, 52–78 % of publications labeled as reviews by WoS were not review publications. According to Harzing (2013, p.29), the reason for such a high level of misclassification was that "[e]very article with more than 100 references was classified as a review article".

Donner (2017) found a 13 % mislabeling of review papers by WoS using a set of 791 randomly selected documents (including 185 reviews). Donner (2017, p.231) also demonstrated that the misassignment of review papers significantly impacted normalized citation scores. Yeung (2019, p.1909) reported WoS imprecision ratios for review papers identification of 14.1 % after investigating 400 papers published in biomedical journals. As Yeung (2019, p.1910) states, "document type is an important data label for bibliometric analyses as researchers often rely solely on the classification by the databases for detailed analyses, such as to compare citation counts between original articles and reviews". Have Clarivate's editorial team members considered previous researchers' comments/criticisms? Have they found a solution to this long-standing issue? This is the type of question that this study seeks to answer.

Materials and Methods

Journals selection

Three journals were selected for the study reported in this paper. These three journals are the *Journal of the Association for Information Science and Technology* (JASIST), the *Journal of Informetrics* (JOI), and the *Online Information Review* (OIR). These journals were chosen because they are: (a) indexed in the WoS; (b) included in the Journal Citation Reports (JCR), and thus are Journal Impact Factor-carrying publication venues; (c) indexed in the Social Sciences Citation Index (SSCI); (d) included in the same WoS category, namely Information

Science & Library Science (in the SSCI); and (e) accessible to the author through an institutional subscription.

Though these three journals bear some similarities in terms of their aims and scopes, they are published by different publishers. The JASIST is a Wiley title. The JOI is an Elsevier journal. As for the OIR, it is published by Emerald. The reason for selecting journals published by different publishing houses is to see if the nomenclatures of review articles used by these publishers contribute to WoS' (in)accuracy in identifying review papers.

WoS search queries

Accessed via an institutional subscription, the WoS search queries for these three journals were conducted on December 15 and 16, 2021. A Basic Search was performed in the WoS for each journal by:

- (a) typing and then selecting the journal's title with the "Publication Titles" field; and
- (b) selecting "Review" in the "Document Type" field.

For example, using the earlier query, the WoS returned results categorizing 19 JOI papers as reviews (published between July 2007 and February 2021). The most recent of these 19 alleged JOI review papers is the article by Kosztyán, Csizmadia and Katona (2021) entitled "SIMILAR-Systematic, iterative multilayer literature review method".

The WoS classified 38 OIR papers and 40 JASIST papers³ as reviews using the same procedure for the remaining two journals. So, according to the WoS, these three journals have published 97 review papers. Furthermore, if the WoS is to be believed, JASIST and OIR have published roughly twice as many review articles as JOI.

Independent check of review paper status

To see if the WoS (in)correctly assigned the "Review" document type to the 97 papers under consideration, the author went to each journal's webpage and looked at which journal section the paper was in. According to the WoS, the paper by Colebunders, Kenyon and Rousseau (2014) is JASIST's oldest review paper. That paper was published in the Brief Communication section of JASIST. That article's PDF file was also consulted. It has the heading "BRIEF COMMUNICATION" in capital letters. Colebunders et al. (2014) five-page paper includes a method and a result section. It contains six figures and 14 references. The WoS should have assigned this paper to the "Article" document type. As WoS defines, the article document type "includes research papers, brief communications, technical notes, chronologies, full papers, and case reports". The paper by Colebunders et al. (2014) continues to be incorrectly assigned to the document type "Review", with the trademark blue-paper icon, simply because the title contains the word "review". Although time-consuming, this thorough checking process was repeated for most of the 97 papers. The findings of this independent check are presented in the following section.

Results

Number and ratio of misclassifications

Forty of the 97 papers reviewed were incorrectly classified as reviews. In other words, the WoS was incorrect (correct) in 41.237 % (58.763 %) of the cases. Thirty-seven research articles, brief communication, case studies, and media reviews are among the 40 papers mislabeled as reviews. In the supplementary material, the title, the Digital Object Identifier, the type of

document according to paper/publisher, and the number of cited references are provided for each of the 40 misclassified papers. The ratio of misclassification varied between journals, as shown in Table 3. It reached its highest (lowest) level for OIR (JASIST) with 52.631% (30%) misclassifications.

Table 3

Ratios of Misclassification/Precision in Review Paper Identification

	JASIST	OIR	JOI	Total
No. of review articles according to the WoS (A)	40	38	19	97
No. of correct classifications according to independent check (B)	28	18	11	57
No. of Misclassifications (or $C=A-B$)	12	20	8	40
The ratio of misclassification ($D=C/A$)	30%	52.631%	42.105%	41.237%
The ratio of precision ($E=B/A$)	70%	47.369%	57.895%	58.763%

The JASIST's relatively low misclassification ratio is quite remarkable. It could be attributed to journal section names appearing on the top-left of the first pages of papers published in JASIST, just above the titles. The HTML versions of JASIST papers are the same. In contrast, while each OIR paper has a paper type, the paper type only appears at the end of the structured abstract of the paper's PDF file. For the HTML versions of OIR papers, Emerald does not provide paper-type information. In the case of the JOI, four of the eight misclassified papers have no paper type in either their HTML or PDF versions.

Causes of misclassifications

Empirical research on online consumer reviews is mislabeled as a review. According to the independent review, 23 (or 57.5 %) of the 40 misclassified papers reported empirical studies on online consumer reviews. OCRs (online consumer reviews) are an electronic word of mouth. They are broadly defined as positive, neutral, or negative evaluations of a product, service, brand, or company that is (presumably) posted by former customers on consumer review websites such as Amazon Consumer Reviews, TripAdvisor, or Goodreads (Jia & Liu, 2018). For the OIR, 16 of the 20 misclassified papers are about OCRs. For the JASIST, half (i.e., six) of the 12 misclassified papers deals with OCRs. As for the JOI, Wang, Liu & Han's (2019), research paper on OCRs of books was mislabeled as a review.

Empirical studies on peer review processes are mislabeled as reviews. The independent check also revealed that nine (or 22.5%) of the 40 misclassified papers investigated peer-review processes for journals or grant-making institutions. Four of these were published in the JOI. Three of them appeared in the OIR. The remaining two are JASIST papers.

Bibliometric studies of review articles and methodological papers on literature review are incorrectly classified as reviews. Six (or 15%) of the misclassified papers propose bibliometric studies of review articles or literature review methods. As previously stated, the WoS assigned the JASIST paper by Colebunders et al. (2014), which reports findings from a bibliometrics study on the increase of review articles, to the review document type. The same thing happened with Belter's (2016) JASIST paper, which proposes a citation-based method for conducting systematic reviews. Three other JOI papers suffered the same fate. Miranda and Garcia-Carpintero's (2018) bibliometric study titled "overcitation and overrepresentation of review

articles in the most cited papers" is one of these three JOI papers. One OIR paper analyzing the macro-level discourse structure of literature reviews was also incorrectly tagged as a review.

Even a movie review is mislabeled as a review paper. Another surprising discovery was that a documentary film review published in the JASIST was mislabeled as a review (see Figure 1). The paper in question was published in the JASIST's Media Review section in 2020 (Seadle, 2020). It's about Netflix's documentary *The Great Hack*. The WoS should have assigned that paper to the Film Review document type.

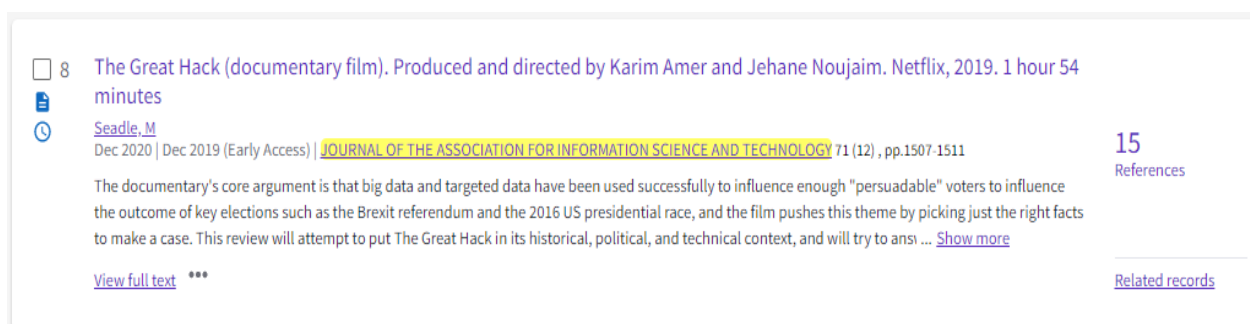


Figure 1: Screenshot Indicating that a JASIST Documentary Review is Misclassified as a Review (as highlighted by the blue paper icon)

Is the criterion of more than 100 references still in use? Cleverly, Burnett and Muir's (2017) JASIST paper is one of the 40 papers mislabeled as reviews. The paper includes hypotheses, research questions, methods, results sections, and up to eight tables and seven figures. Cleverly et al.'s (2017) paper is unmistakably an article. Neither the title nor the abstract contains the word "review". Nonetheless, the WoS classified that article as a review, and it still is. The only thing distinguishing that paper from the other 40 misclassified papers is that it cites over 100 references (143 references, to be more precise). Hence, despite Harzing's (2013) criticism, the >100 references criterion appears to be used in the WoS to identify review papers (see Figure 2).

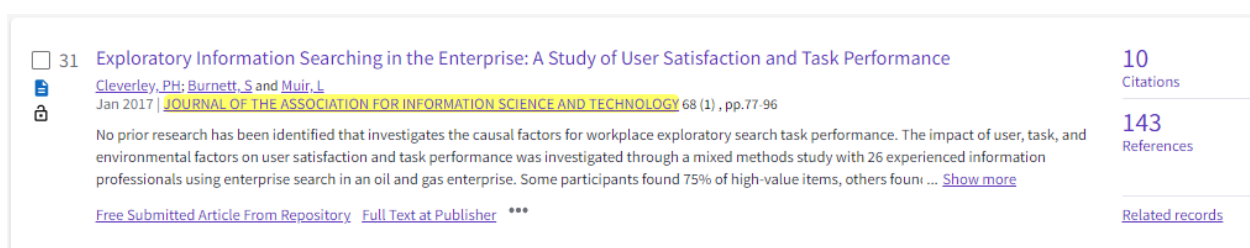


Figure 2: Screenshot Showing that a Research Article is Misclassified as a Review (the >100 references criterion)

Discussion

The study's main conclusion is that the WoS is still incapable of correctly identifying review papers. The WoS precision ratio for identifying review papers was only 58.763%. Donner (2017, p.229) and Yeung (2019, p.1909) reported WoS precision ratios for identifying 87% and 85.9% of review papers, respectively. This study's relatively low precision ratio could be attributed to it covering papers published in information and library science journals rather than biomedical journals (Yeung, 2019) or a set of randomly selected papers (Donner, 2017).

Journals in information and library science publish more papers on online consumer *reviews*, peer *review* processes, and bibliometric studies of *review* articles.

Misidentification of review papers is a serious problem because it can have far-reaching consequences for various stakeholders in the scholarly ecosystem. Since 2018, Clarivate has included a citation distribution histogram in the JCR that shows the article citation median and the review citation median for each journal and the ratio of articles to reviews in each citation count interval.

According to the JCR, Miranda and Garcia-Carpintero's (2018), JOI paper received eight citations that counted toward the 2020 JIF. That article is mislabeled as a review paper in the JCR. It appears at the top of the eighth citation count interval in the citation distribution histogram. Dondio, Casnici, Grimaldo, Gilbert & Squazzoni's (2019) JOI article, partially titled "The 'invisible hand' of peer review", is also mislabeled as a review paper with three citations that counted toward the 2020 JIF. Another JOI paper mislabeled as a review paper is Bianchi, Grimaldo and Squazzoni's (2019) article on the F3-index, partially titled "valuing reviewers for scholarly journals". The same applies to Wand et al.'s (2019) article on Goodreads book reviews. As a result, and in the case of the JOI, the 2020 citation distribution histogram and the associated metrics are wholly incorrect and completely misleading. The JASIST's and OIR's citation distribution histograms for the previous three years (2018, 2019, and 2020) are also entirely incorrect.

Articles and reviews, according to Clarivate, are citable items that contribute to the JIF denominator. Like Seadle's (2020) JASIST paper, film reviews are non-citable. This non-citable item is indexed as a review in the WoS database and was then incorrectly included as a citable item in the denominator of the JIF calculations for 2021 (with no citations received). Thus, JASIST's 2021 JIF value is an inaccurate and downwardly biased estimate of its JIF. Instead of 251, the number of citable items for JASIST's 2021 JIF calculations should have been 250. The correct JIF value for JASIST in 2021 is $822/250=3.288$ (instead of 3.275). In a context where the JIF, or a ranking based on it, determines a journal's fate (i.e., from the number of submissions to subscription fees), providing an incorrect and underestimated JIF value for a journal could have disastrous consequences. Clarivate is cordially but urgently invited to fix this error before the next JCR release (June/July 2023).

For researchers who want to conduct reviews of only research articles, the WoS inconsistency in review paper identification may be a problem. For example, researchers who want to limit their studies to research articles on OCRs may be misled by the WoS because many OCR research articles are classified as reviews. Researchers attempting to conduct bibliometric analyses on review articles may find this WoS inconsistency extremely difficult to overcome. WoS's inaccuracy in document-type assignments impedes review paper research (Blümel & Schniedermann, 2020). Researchers who publish research articles mislabeled as reviews may also suffer consequences. In many countries, only research articles are considered for tenure, promotion, and grant awards (Harzing, 2013).

Misclassification of document types may also skew international university rankings (Harzing, 2013). The Shanghai University Ranking, for example, is one of the most influential yet contentious university rankings (Pavel, 2015). That ranking's methodology webpage⁴ openly admits that review papers are excluded. It also implies that the WoS database is used to locate publications of the type "Article." The people in the Shanghai University Ranking must know this WoS caveat. Researchers and their institutions must report any misrepresentation of

their research articles to the WoS editorial team. Clarivate employees must listen and correct these errors if they are proven to be true.

The WoS is a commercial bibliographic database, unlike Microsoft Academic or Google Scholar. Individual and institutional subscribers who are able and willing to pay its (quite substantial) subscription fees anticipate receiving what they pay for. Misidentification of review papers is a problem that threatens not only the integrity of the data provided by the WoS or the JCR but also Clarivate's reputation, along with its legacy of 60 years of existence.

Possible solutions

Clarivate must stop assigning the review document type to every paper with the word "review" in the title. According to researchers' communications with Clarivate (see Yeung, 2019, p.1912), "the Journal Citation Reports production team [is] responsible for assigning the document type labels and the assignment [is] based on the document's actual bibliographic characteristics, but not of the editorial intention of the publishers". The WoS's editor-in-chief and the JCR's editorial team members must devise solutions to this recurring issue. A first solution is to use/create text mining and machine learning procedures that classify a paper after searching its full text for keywords such as sample, experiment, method, analysis, hypothesis, and so on (see, e.g., Salloum, Al-Emran, Monem, & Shaalan, 2018). This solution requires publishers to collaborate with Clarivate and provide full-text access to their journal articles. A second solution involving Clarivate and journal publishers is making document assignments as simple and precise as possible. This could be accomplished if all publishers clearly and unambiguously indicate the document type in their journal papers' PDF and HTML versions. According to the findings, the JASIST was found to have the lowest misclassification rate because its papers have journal section names that appear on the top-left of their first pages, just above the titles, in both the PDF and HTML versions of these papers. Because Clarivate also owns ScholarOne Manuscripts (i.e., the manuscript submission/journal management platform) and Publons (i.e., the peer reviewer rewards platform now rebranded WoS Reviewer Recognition Service), a third solution is to use a manuscript's metadata to determine its document type when the authors submit the manuscript and/or the reviewers' comment on it.⁵

Conclusion

Despite the limited number of journals covered (three journals) and papers analyzed (97 papers), the study presented here sheds new light on a recurring issue in the WoS database. However, other bibliometric databases (such as Scopus) appear to have the same problem (Yeung, 2019). The reported study concentrated on three journals in a single WoS category. Since most misclassified papers (57.5%) are about OCRs, future research should concentrate on the Business and Management WoS categories. The reported study has proposed several solutions involving Clarivate, publishers, researchers, and their institutions. Hopefully, Clarivate will resolve this issue. Otherwise, because its title contains the word "review", this *article* (if accepted) will be misclassified as a *review* in the WoS database.

Research ethic statement

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Declaration of conflicting interests

The author declares no potential conflicts of interest regarding this paper.

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Endnotes

1 <https://clarivate.com/webofsciencegroup/solutions/the-history-of-isi/> (last accessed 19/10/2022).

2 <https://webofscience.help.clarivate.com/en-us/Content/document-types.html> (last accessed 19/10/2022).

3 Articles published in the JASIST (previously *Journal of the American Society for Information Science and Technology*) before its title change in 2014 were not included in the analysis.

4 <https://www.shanghairanking.com/methodology/arwu/2021> (last accessed 19/10/2022).

5 The author would like to express gratitude to an anonymous reviewer who suggested this solution.

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