

Database Comparison between Web of Science and Scopus: A Case of Educational Technology Journals

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Abstract—This study aims to explore the differences of Impact Factor and h-index between Web of Science and Scopus for educational technology journals. The study analyses seven educational technology journals indexed both in Web of Science and Scopus. Through the statistical analysis, no significant difference is found for indexed journals' Impact Factor and h-index ranking in Web of Science and Scopus. A strong positive relationship exists between Web of Science and Scopus rank.

Index Terms—Impact factor, h-index, database comparison, educational technology journals.

I. INTRODUCTION

The definition of the impact factor (IF) is “calculated by dividing the number of current year citations to the source items published in that journal during the previous two years” [1]. The original purpose of the IF developed by Eugene Garfield was to identify important journal articles through an evaluation process [2]. However, due to its heavy use in the academic field, several scholars began to question the value of the IF [3-5].

Compared to the IF, h-index developed by Jorge Hirsch is a new idea to evaluate the journal quality. The definition of the h-index is “the largest number h such that at least h articles in that publication were cited at least h times each” [6]. After the invention of the h-index, some scholars argued that h-index is better than IF for judging researchers' scholarly productivity [7-9].

Currently, two large databases, Thomson Reuters' Web of Science (WoS) and Elsevier publisher's Scopus, can show indexed journals' IF and h-index. WoS's reported IF and h-index are payment-based, whereas Scopus's reported IF and h-index are free resources. Any researchers may obtain specific journals' IF and h-index by logging in the WoS (through payment subscription) or using a free online tool (Scimago Lab) powered by Scopus.

Past studies had already compared the database differences between WoS and Scopus. However, of those related studies, none attempted to analyze the IF and h-index altogether. Gary and Hodgkinson [10] only compared the IF of ecology and environmental sciences journals indexed both in WoS and Scopus. Pisyakov [11] only discussed the IF of twenty economic journals indexed both in WoS and Scopus. Chou [12] only examined the IF of engineering education and educational technology journals indexed both in WoS and

Scopus.

In order to add knowledge base regarding the IF and h-index issues in the field of educational technology, this study aims to explore the differences of IF and h-index between WoS and Scopus for educational technology journals. Based on previous research' findings, one assumption of the current study is that indexed journals' ranking in IF and h-index may not fluctuate wildly in WoS and Scopus. The research hypothesis of the study is:

No significant difference exists for indexed journals' IF and h-index ranking in WoS and Scopus.

II. RESEARCH METHOD

A. Journal Analysis Principle

Based on the researcher's expertise, the study only focuses on the field of educational technology. Seven educational technology journals indexed both in WoS and Scopus are selected for further analysis. For the IF issue, analysis dates are limited to 2010 through 2011 mainly because some journals begin to be indexed in both WoS and Scopus in 2010. As for the h-index issue, analysis date is limited to journals' indexed time through 2011.

B. Journal Selection List

Currently, seven educational technology journals are indexed both in WoS and Scopus. The list of these indexed journals is:

- 1) Educational Technology Research and Development (ETRD)
- 2) British Journal of Educational Technology (BJET)
- 3) Educational Technology and Society (ETS)
- 4) Australasian Journal of Educational Technology (AJET)
- 5) Turkish Online Journal of Educational Technology (TOJET)
- 6) Journal of Educational Computing Research (JECR)
- 7) Computers & Education (CE)

C. Data Analysis Principle

After obtaining indexed journals' IF and h-index, three analysis procedures are conducted. First, each selected journal is ranked by IF and h-index in WoS and Scopus. Second, a change in IF and h-index ranking between WoS and Scopus for each journal is examined. Finally, the Spearman rank-order correlation technique, whose purpose is to compare two rank-order variables, is performed to test the research hypothesis.

D. Data Analysis Method

A descriptive statistical method (data sorting) is used to

compare the ranking information for the selected journals. Subsequently, an internal statistical method (data correlation) is employed to check the ranking change for each selected journal. A.05 significance level is set for the Spearman correlation. All data analysis is performed by SPSS software.

III. RESULT

A. Finding in H-index

TABLE I: reports a summary of h-index comparison between WoS and Scopus for selected journals.

TABLE I: H-INDEX COMPARISON BETWEEN WOS AND SCOPUS

| Journal Title | WoS h-index | Scopus h-index | WoS Rank | Scopus Rank | Change in Rank |
|--|-------------|----------------|----------|-------------|----------------|
| ETRD | 43 | 37 | 2 | 2 | 0 |
| BJET | 28 | 29 | 4 | 3 | +1 |
| ETS | 23 | 25 | 5 | 5 | 0 |
| AJET | 12 | 9 | 6 | 6 | 0 |
| TOJET | 6 | 5 | 7 | 7 | 0 |
| JECR | 34 | 27 | 3 | 4 | -1 |
| CE | 46 | 46 | 1 | 1 | 0 |
| Spearman rank-order correlation coefficient=0.96, $p<0.01$ | | | | | |

Note: Data retrieval date from WoS and Scimago is August 14, 2012

As shown in TABLE I, the numerical value of h-index between WoS and Scopus is extremely similar even though the time for journals indexed in WoS or Scopus is different. Regardless of type of database, CE receives the highest h-index; TOJET owns the lowest h-index. Sorting journals by h-index identifies a change in rank for BJET and JECR. A correlation analysis shows that a significant relationship exists between WoS and Scopus rank (coefficient=0.96, $p<0.01$).

B. Finding in 2010 IF

A summary of IF comparison between WoS and Scopus for selected journals in 2010 appears in TABLE II:

TABLE II: COMPARISON BETWEEN WOS AND SCOPUS IN 2010

| Journal Title | WoS IF | Scopus IF | WoS Rank | Scopus Rank | Change in Rank |
|--|--------|-----------|----------|-------------|----------------|
| ETRD | 1.08 | 1.89 | 4 | 4 | 0 |
| BJET | 2.14 | 1.95 | 2 | 3 | -1 |
| ETS | 1.07 | 1.64 | 5 | 5 | 0 |
| AJET | 1.66 | 2.08 | 3 | 2 | +1 |
| TOJET | 1.02 | 1.07 | 6 | 6 | 0 |
| JECR | 0.56 | 0.62 | 7 | 7 | 0 |
| CE | 2.62 | 3.71 | 1 | 1 | 0 |
| Spearman rank-order correlation coefficient=0.96, $p<0.01$ | | | | | |

Note: Data retrieval date from WoS and Scimago is July 11, 2011

The information listed in TABLE II: shows that a change rank is found for BJET and AJET. CE articles receive most attention in 2010. JECR articles obtain the lowest IF in 2010. The result of Spearman rank-order correlation shows that

there is a significant relationship between WoS and Scopus rank (coefficient=0.96, $p<0.01$).

C. Finding in 2011 IF

TABLE III: lists the information regarding the IF comparison between WoS and Scopus for selected journals in 2011.

TABLE III: COMPARISON BETWEEN WOS AND SCOPUS IN 2011

| Journal Title | WoS IF | Scopus IF | WoS Rank | Scopus Rank | Change in Rank |
|--|--------|-----------|----------|-------------|----------------|
| ETRD | 1.09 | 0.87 | 5 | 3 | +2 |
| BJET | 1.54 | 1.05 | 2 | 2 | 0 |
| ETS | 1.01 | 0.66 | 6 | 6 | 0 |
| AJET | 1.52 | 0.83 | 3 | 4 | -1 |
| TOJET | 0.96 | 0.75 | 4 | 5 | -1 |
| JECR | 0.44 | 0.42 | 7 | 7 | 0 |
| CE | 2.62 | 1.93 | 1 | 1 | 0 |
| Spearman rank-order correlation coefficient=0.93, $p<0.01$ | | | | | |

Note: Data retrieval date from WoS and Scimago is August 14, 2012

From the information reported in Table 3, the journal ranking fluctuates according to different given IF values. Compared to the 2010 IF, the 2011 IF ranking identifies a change for three journals: ETRD, AJET and TOJET. CE is still the top journal. JECR situates in the lowest position. The correlation analysis reports that a significant relationship is found between WoS and Scopus rank (coefficient=0.93, $p<0.01$).

IV. DISCUSSION AND CONCLUSION

Regarding the h-index and IF issues, the findings described earlier indicate that the variation between WoS and Scopus rank for seven educational technology journals is small. A strong positive relationship exists between WoS and Scopus rank. In other words, no significant difference is found for indexed journals' IF and h-index ranking in WoS and Scopus. Therefore, the research hypothesis is retained. This result supports previous research which focused on IF comparison between WoS and Scopus [10-12]. However, since no past studies compared the difference of h-index between WoS and Scopus, whether the finding yielded in this research can apply to other academic fields remains unknown.

Even though IF and h-index are different evaluation metrics, the findings also report that the IF and h-index rank of the top journal (CE) is the same in two databases. It can be extrapolated that the type of databases would not influence the rank of the prestigious journals. One additional finding is that database coverage would not affect the numerical values of IF and h-index. Generally, the journal coverage in Scopus is larger than that in WoS. From the Table information, the numerical values of IF and h-index in Scopus are seldom higher than the information in WoS.

Currently, many scholars and librarians strongly emphasize the role of WoS, especially for journals indexed in Social Science Citation Index (SSCI) or Science Citation

Index (SCI). The findings from this study decrease the effect of the database type. In other words, the IF and h-index rank of the famous journal does not fluctuate widely among different databases. For educators, the important issue is the number of citation rather than database type.

For convenience sampling, this study only chooses WoS and Scopus as the targeted databases and selects the field of educational technology as the targeted subject. Future studies may extend the research scope to find potential research variables. For instance, Google Company has already launched an h5-index (similar to h-index) project to evaluate journal quality. Future studies may use this metric system to compare other databases for specific journals.

REFERENCES

- [1] Thomson Reuters. (2011). [Online]. Available: http://www.thomsonreuters.com/products_services/science/free/essay/s/impact_factor/.
- [2] R. Monastersky, "The number that's devouring science: The impact facto, once a simple way to rank scientific journals, has become an unyielding yardstick for hiring, tenure, and grants," *The Chronicle of Higher Education*, vol. 52, no. 8, pp. A12, 2005.
- [3] R. Coleman, "Impact factors: use and abuse in biomedical research," *The Anatomical Record*, vol. 257, pp. 54-57, 1999.
- [4] T. Opthof, "Sense and nonsense about the impact factor," *Cardiovascular Research*, vol. 33, no. 1, pp. 1-7, 1997.
- [5] P. O. Seglen, "Why the impact factor should not be used for evaluating research," *BMJ*, vol. 213, pp. 498-502, 1997.
- [6] J. E. Hirsch, "An index to quantify an individual's scientific research output," *PNAS*, vol. 102, no. 46, pp. 16569-16572, 2005.
- [7] W. Glänzel, *On the opportunities and limitations of the h-index*, vol. 1, pp. 10-11, 2006.
- [8] A. Harzing and R. Wal. (2008). [Online]. Available: http://www.harzing.com/h_indexjournals.htm.
- [9] R. J. Hyndman. (2012). [Online]. Available: <http://robjhyndman.com/researchtips/google-scholar-metrics/>
- [10] E. Gary and S. Z. Hodkinson, "Comparison of journal citation reports and Scopus impact factors for ecology and environmental sciences journals," *Issues in Science and Technology Librarianship*, vol. 54, Online Version, 2008.
- [11] V. Pislyakov, "Comparing two thermometers: Impact factors of 20 leading economic journals according to Journal Citation Reports and Scopus," *Scientometrics*, vol. 79, no. 3, pp. 541-550, 2009.
- [12] P. N. Chou, "A comparison study of impact factor in Web of Science and Scopus database for engineering education and educational technology Journals," *The Journal of Issues in Informing Science & Information Technology*, vol. 8, pp. 187-194, 2012.



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