

An Exploratory Study of Database Evaluation Metrics: Comparison between IF and SJR

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Abstract—The purpose of this study is to explore the metrics comparison between Impact Factor (IF) and SCImago Journal Rank (SJR) for journals indexed in both Web of Science (WoS) and Scopus databases. The study analyses five engineering education journals and seven educational technology journals, which are indexed in both WoS and Scopus. The analysis dates are limited to 2010 through 2011. The results show that the variation between IF and SJR rank for educational technology and engineering education journals is small. Within two years (from 2010 to 2011), a strong, positive relationship continually exists between IF and SJR rank for selected journals.

Keywords—Impact Factor, SCImago Journal Rank, Database Evaluation Metrics

I. INTRODUCTION

Impact Factor (IF) is the most commonly used evaluation metrics for journals indexed in academic databases. The definition of the 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 was to identify important journal articles through an evaluation process [2]. However, after Thomson Reuters Publisher integrated the IF concept into its database called Web of Science (WoS), many journal administrators strongly emphasize the journals’ IFs in an effort to promote journals’ reputations. Currently, researchers can obtain journals’ IFs by subscribing WoS’s service or employing free online tools to calculate journal citations listed in databases.

Compared to the IF, SCImago Journal Rank (SJR) is a new evaluation metrics. The SJR is defined as an indicator aiming to measure “average prestige per paper of journals” by using a specific statistical technique [3]. According to Leydesdorff’s study [4], the SJR can be an alternative evaluation tool to judge journals’ quality. Current reported SJR information only focuses on the journals indexed in Scopus database, one of Elsevier Publisher’s products. Today, any researchers can acquire SJR information by assessing an official website [5] in which one free online tool is provided for data mining.

Similar to past research [6-7], our previous project [8] already examined the database difference between WoS and Scopus for IF evaluation metrics. The finding indicated that a significant relationship existed between WoS and Scopus for

indexed journals’ IF ranking. However, surveying existing literature identifies that little is known about the comparison of two journal evaluation systems for different kinds of academic databases.

Based on above discussions, the purpose of this study is to explore the metrics comparison between IF and SJR for journals indexed in both WoS and Scopus databases. Although the IF and SJR build on different mathematical formulas, it is expected that there is a similar pattern between IF and SJR according to the previous project’s results. One hypothesis of the current study is:

No significant difference exists for indexed journals’ IF and SJR ranking in WoS and Scopus databases.

II. RESEARCH METHOD

A. Journal Sampling Principle

This study adopts a convenience sampling to select two fields of referred journals for further analysis. Based on the researcher’s expertise, the study only focuses on the fields of engineering education and educational technology. Currently, five engineering education journals are indexed in both WoS and Scopus databases. These journals are:

- Journal of Engineering Education (JEE)
- Journal of Professional Issues in Engineering Education and Practice (JPIEEP)
- Computer Applications in Engineering Education (CAEE)
- International Journal of Electrical Engineering Education (IJEEE)
- IEEE Transactions on Education (ITE)

As for educational technology journals, a list of journals indexed in both WoS and Scopus databases is:

- Educational Technology Research and Development (ETRD)
- British Journal of Educational Technology (BJET)
- Educational Technology and Society (ETS)
- Australasian Journal of Educational Technology (AJET)

- Turkish Online Journal of Educational Technology (TOJET)
- Journal of Educational Computing Research (JECR)
- Computers & Education (CE)

B. Data Analysis Principle

WoS and Scopus are targeted databases in which indexed journals' IF and SJR information is obtained from provided online services (WoS subscription service and SCImago free resource). The analysis dates are limited to 2010 through 2011 mainly because some journals begin to be indexed in both WoS and Scopus in 2010. After obtaining indexed journals' IF and SJR, three analysis procedures are conducted. First, each selected journal is ranked by IF and SJR in WoS and Scopus. Second, a change in IF and SJR ranking between WoS and Scopus for each journal is examined. Finally, one correlation technique is performed to test the research hypothesis.

C. Statistical Method

Two statistical methods are employed to analyze the collected data. First, a descriptive statistical method called data sorting is used to compare the ranking information for the selected journals. Second, an infernal statistical method called Spearman rank-order correlation is used to check the ranking change for each selected journal. A 0.05 significance level is set for the correlation technique, which may yield the relationship coefficient (0<r<1). The calculation method of the coefficient is computed as the following formula:

$$r = \frac{\sum_i(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i(x_i - \bar{x})^2 \sum_i(y_i - \bar{y})^2}}$$

where x_i and y_i are ranked variables of raw data (X and Y)

All data analysis described earlier is performed by one statistical software entitled Statistical Package for Social Science (SPSS). The version of the software is 17.0. Once the statistical results reach the targeted significant level, the correlation coefficient (r) will be reported.

III. RESULT

A. Finding in Educational Technology Journals

1. 2010 Data Analysis

Table 1 summarizes the result of IF and SJR comparison between WoS and Scopus for selected journals in 2010.

Table 1 IF and SJR Comparison between WoS and Scopus for Educational Technology Journals (2010)

Journal Title	WoS IF	Scopus SJR	WoS IF Rank	Scopus SJR Rank	Change in Rank
ETRD	1.08	0.044	4	2	+2
BJET	2.14	0.043	2	3	-1

ETS	1.07	0.040	5	4	+1
AJET	1.66	0.038	3	5	-2
TOJET	1.02	0.027	6	7	-1
JECR	0.56	0.033	7	6	+1
CE	2.62	0.055	1	1	0

Spearman rank-order correlation coefficient(r)=0.77, p<0.05

Note: Data retrieval date from WoS and SCImago is September 21, 2012

As the information shown in Table 1, the ranking pattern is partially different between IF and SJR rank. The IF and SJR rank of ETRD and AJET fluctuates widely (change in rank: 2). Regardless of type of database evaluation metrics, CE ranks in the top one. The Spearman rank-order correlation analysis shows that a significant, positive relationship exists between WoS IF and Scopus SJR rank (r=0.77, p<0.05).

2. 2011 Data Analysis

Table 2 lists the summary of IF and SJR comparison between WoS and Scopus for educational technology journals in 2011.

Table 2 IF and SJR Comparison between WoS and Scopus for Educational Technology Journals (2011)

Journal Title	WoS IF	Scopus SJR	WoS IF Rank	Scopus SJR Rank	Change in Rank
ETRD	1.09	0.043	5	3	+2
BJET	1.54	0.045	2	2	0
ETS	1.01	0.038	6	5	+1
AJET	1.52	0.041	3	4	-1
TOJET	0.96	0.029	4	7	-3
JECR	0.44	0.031	7	6	+1
CE	2.62	0.056	1	1	0

Spearman rank-order correlation coefficient(r)=0.91, p<0.01

Note: Data retrieval date from WoS and SCImago is September 21, 2012

From the information reported in Table 2, the journal ranking fluctuates according to different given IF and SJR values. The ranking pattern is similar to the finding in 2010. There is a little difference between IF and SJR rank. Sorting IF and SJR rank identifies a huge change for TOJET (change in rank: 3). Regardless of type of database evaluation metrics, CE is still the top one journal. The Spearman rank-order correlation analysis indicates that a significant, positive relationship is also found between WoS IF and Scopus SJR

rank ($r=0.91$, $p<0.01$). However, the relationship coefficient is extremely stronger than the finding in 2010.

B. Finding in Engineering Education Journals

1. 2010 Data Analysis

Table 3 reports a summary of IF and SJR comparison between WoS and Scopus for engineering education journals in 2010.

Table 3 IF and SJR Comparison between WoS and Scopus for Engineering Education Journals (2010)

Journal Title	WoS IF	Scopus SJR	WoS IF Rank	Scopus SJR Rank	Change in Rank
JEE	2.22	0.057	1	1	0
JPIEEP	0.37	0.033	3	3	0
CAEE	0.32	0.028	4	4	0
IJEEE	0.16	0.028	5	4	+1
ITE	1.17	0.042	2	2	0
Spearman rank-order correlation coefficient($r=0.98$, $p<0.01$)					

Note: Data retrieval date from WoS and SCImango is September 21, 2012

As shown in Table 3, the ranking pattern is extremely similar between IF and SJR rank. A ranking change only exists for IJEEE (change in rank: 1). Regardless of type of database evaluation metrics, JEE receives most attention in 2010. The Spearman rank-order correlation analysis reports that there is a significant, positive relationship between WoS IF and Scopus SJR rank ($r=0.98$, $p<0.01$).

2. 2011 Data Analysis

Table 4 presents the information regarding IF and SJR comparison between WoS and Scopus for engineering education journals in 2011.

Table 4 IF and SJR Comparison between WoS and Scopus for Engineering Education Journals (2011)

Journal Title	WoS IF	Scopus SJR	WoS IF Rank	Scopus SJR Rank	Change in Rank
JEE	1.57	0.041	1	1	0
JPIEEP	0.34	0.031	3	3	0
CAEE	0.33	0.028	4	4	0
IJEEE	0.12	0.027	5	5	0
ITE	1.02	0.039	2	2	0
Spearman rank-order correlation coefficient($r=1$, $p<0.01$)					

Note: Data retrieval date from WoS and SCImango is September 21, 2012

The information listed in Table 4 shows that a highly agreement is found between IF and SJR rank. In other words, the ranking pattern between IF and SJR is the same. Regardless of type of database evaluation metrics, JEE still situates in the top position. The Spearman rank-order correlation analysis shows that a significant, positive relationship is found between WoS IF and Scopus SJR rank ($r=1$, $p<0.01$). However, the relationship coefficient yielded in 2011 is extremely higher than the finding in 2010.

IV. DISCUSSION & CONCLUSION

Based on the findings described earlier, the variation between IF and SJR rank for educational technology and engineering education journals is small. Within two years (from 2010 to 2011), a strong, positive relationship continually exists between IF and SJR rank for selected journals. In other words, no significant difference is found for indexed journals' IF and SJR ranking in WoS and Scopus databases. Thus, the research hypothesis is retained. However, since no related past studies adopted the research design outlined in this study, whether the research results can be applied to other academic fields remains unknown.

Even though IF and SJR are different evaluation metrics, one additional finding shows that the IF and SJR rank of the top journals (CE and JEE) in the fields of educational technology and engineering education is the same in WoS and Scopus from 2010 to 2011. This result indicates that the type of evaluation metrics would not influence the ranking of the prestigious journals. Since the top journals produce high citation counts in any databases, this phenomenon perhaps attributes to IF and SJR's mathematical formulas, which take the citation count into account.

Despite the comparison of two different evaluation metrics in this study, the research results yielded in this study are similar to several past studies' findings. Gary and Hodkinson [6], Pislyakov [7] and Chou [8] attempted to compare the IF for journals indexed both in WoS and Scopus in the fields of economy, ecology and environmental sciences, engineering education, and educational technology. The findings in these three studies show that there is no significant difference for indexed journals' IF ranking in WoS and Scopus, which is similar to indexed journals' IF and SJR ranking in this study.

A recent study conducted by Chou [9] examines the difference of h-index between WoS and Scopus for educational technology journals. The results show that there is a positive relationship between WoS and Scopus for indexed journals' h-index ranking. Such pattern reflects our focus on the comparison between IF and SJR ranking.

The nature of the exploratory study is to identify specific patterns by focusing on specific research areas [10]. Since no closely related past research is identified, the current study, which serves as the exploratory research, only explores the field of engineering education and obtains one relationship pattern between IF and SJR ranking for indexed journals. One

caveat for the finding is that the pattern yielded in this study may attribute to collected data. The pattern may not be true in other academic fields.

For convenience sampling, this study only chooses two databases as the targeted research population and focuses on two academic fields as the targeted research subject. Follow-up studies may extend the research scope (i.e. analysis date and academic field) to verify the findings yielded in this study.

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