



Letter to the editor: Journal indicators from a dimensionality perspective

Gangan Prathap¹

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Leydesdorff (2009) compared the new journal indicators that accompanied the launching of Scopus and Google Scholar with one another and with the older ones, to identify the dimensions that are covered and their correlations among themselves? The main dimensions were termed: size, impact, influence and reach, each having varying levels of size-dependence.

In this Letter we shall revisit the nine indicators offered by recent editions of the Scimago Journal Ranking (SJR) portal (<https://www.scimagojr.com/journalrank.php>) along with three new indicators: the p-index (Prathap 2010a, b), and two Influence Weight (IW) type indicators (Pinski and Narin 1976) based on available SJR indicators, which are needed to complete the comparative studies (Table 1). The size-dependence and dimensionality (Prathap 2018) are also indicated. The p-index (Prathap 2010a, b) has been introduced here to complement the H-index (Hirsch 2005); where P documents earn C citations, $p = C^{2/3}/P^{1/3}$ is a special case of the Glanzel–Schubert formula (Glanzel 2006; Schubert and Glanzel 2007). The indicators Cites (3 years)/Ref. (2018) = Total Cites (3 years)/Total Refs. (2018) and Cites (2 years)/Ref. (2018) = (Cites/Doc. (2 years))/(Ref./Doc. (2018)) are based on the existing SJR indicators and introduced here because they are related to the Pinski–Narin Influence Weights proposed as an alternative indicator of journal status (Pinski and Narin 1976). Note that eleven of these indicators, i.e. with the exception of the SJR indicator, are non-network indicators, unlike the Pinski–Narin Influence Weight (IW) and PageRank (PR) which are network indicators; hence we will not use IW or PR for comparative purposes in this exercise.

If the count of documents P has the dimensions P , then C , which is a total of the citations that P documents have, has the dimensions P^2 . The p-index and the H-index are composite indicators combining C and P and have the dimensions of P (Prathap 2018). Note that in Leydesdorff's classification (Leydesdorff 2009), P is size, $i = C/P$ is impact, C is influence and H is reach.

We shall present only one example (others are available with the author and can be shared on request) which is based on the SJR 2018 data for 45 leading journals each from India and China, of which 31 are Open Access and the remaining 14 are not in India, and correspondingly for China, 17 are Open Access while another 28 are non-Open Access. We look at the Pearson's correlations between the indicators and after carefully interpreting the

✉ Gangan Prathap
gangan_prathap@hotmail.com

¹ A P J Abdul Kalam Technological University, Thiruvananthapuram, Kerala 695016, India

Table 1 The nine journal indicators available in Scimago Journal Rankings along with three additional indicators for comparative purposes

Indicator	Provenance	Size-dependence	Dimensionality
Total Docs. (2018)	SJR	Dependent	P
Total Docs. (3 years)	SJR	Dependent	P
Citable Docs. (3 years)	SJR	Dependent	P
Total Refs. (2018)	SJR	Dependent	P ²
Total Cites (3 years)	SJR	Dependent	P ²
Ref./Doc. (2018)	SJR	Independent	P
SJR	SJR	Not directly evident	Not directly evident
Cites/Doc. (2 years)	SJR	Independent	P
Cites (3 years)/Ref. (2018)	New	Independent	1
Cites (2 years)/Ref. (2018)	New	Independent	1
H index	SJR	Composite	P
p-index (3 years)	New	Composite	P

results, we can classify them into 5 distinct groups (Tables 2, 3, 4, 5, 6), which clearly reflect the dimensionality angle.

In Table 2 we show the Pearson's correlation coefficients between the three size-dependent journal indicators of dimensionality P available in Scimago Journal Rankings for the three cases: All journals, Open Access and non-Open Access, from India and China respectively. The size-dependence of dimensionality P of this group of indicators is reflected in the high values of the correlation coefficients. Next, we take up the two size-dependent journal indicators of dimensionality P² available in Scimago Journal Rankings for the three cases: All journals, Open Access and non-Open Access from the two countries in Table 3. Again, high values of correlation coefficient are seen.

In Table 4 we take up the three size-independent impact factor type journal indicators of dimensionality P as well as the SJR indicator. Since the derivation of the SJR is based on network principles and so its dimensionality aspects are not self-evident, we infer from the high correlation between the impact factor type indicators SJR and Cites/Doc. (2 years) that it is also size-independent and has a dimensionality of P. It is also clear from these results as well as from results not shown here that Ref./Doc. (2018) is not an impact indicator.

Table 2 The three size-dependent journal indicators of dimensionality P available in Scimago Journal Rankings for the three cases: All journals, Open Access and non-Open Access, from India and China

India		China					
ALL—2018 (<i>n</i> = 45)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)	ALL—2018 (<i>n</i> = 45)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)
Total Docs. (2018)	1.00	0.92	0.90	Total Docs. (2018)	1.00	0.87	0.87
Total Docs. (3 years)	0.92	1.00	0.95	Total Docs. (3 years)	0.87	1.00	1.00
Citable Docs. (3 years)	0.90	0.95	1.00	Citable Docs. (3 years)	0.87	1.00	1.00
Open Access—2018 (<i>n</i> = 31)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)	Open Access—2018 (<i>n</i> = 17)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)
Total Docs. (2018)	1.00	0.88	0.79	Total Docs. (2018)	1.00	0.95	0.95
Total Docs. (3 years)	0.88	1.00	0.89	Total Docs. (3 years)	0.95	1.00	1.00
Citable Docs. (3 years)	0.79	0.89	1.00	Citable Docs. (3 years)	0.95	1.00	1.00
Non Open Access—2018 (<i>n</i> = 14)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)	Non Open Access—2018 (<i>n</i> = 28)	Total Docs. (2018)	Total Docs. (3 years)	Citable Docs. (3 years)
Total Docs. (2018)	1.00	0.95	0.95	Total Docs. (2018)	1.00	0.95	0.95
Total Docs. (3 years)	0.95	1.00	1.00	Total Docs. (3 years)	0.95	1.00	1.00
Citable Docs. (3 years)	0.95	1.00	1.00	Citable Docs. (3 years)	0.95	1.00	1.00

Table 3 The two size-dependent journal indicators of dimensionality P^2 available in Scimago Journal Rankings for the three cases: All journals, Open Access and non-Open Access from India and China

India			China		
ALL—2018 ($n=45$)	Total Refs. (2018)	Total Cites (3 years)	ALL—2018 ($n=45$)	Total Refs. (2018)	Total Cites (3 years)
Total Refs. (2018)	1.00	0.91	Total Refs. (2018)	1.00	0.87
Total Cites (3 years)	0.91	1.00	Total Cites (3 years)	0.87	1.00
Open Access—2018 ($n=31$)	Total Refs. (2018)	Total Cites (3 years)	Open Access—2018 ($n=17$)	Total Refs. (2018)	Total Cites (3 years)
Total Refs. (2018)	1.00	0.75	Total Refs. (2018)	1.00	0.92
Total Cites (3 years)	0.75	1.00	Total Cites (3 years)	0.92	1.00
Non Open Access—2018 ($n=14$)	Total Refs. (2018)	Total Cites (3 years)	Non Open Access—2018 ($n=28$)	Total Refs. (2018)	Total Cites (3 years)
Total Refs. (2018)	1.00	0.95	Total Refs. (2018)	1.00	0.85
Total Cites (3 years)	0.95	1.00	Total Cites (3 years)	0.85	1.00

We had introduced two new Pinski–Narin type journal indicators in a non-network context, i.e. no iterative, recursive or repeated improvement is performed. Since in each case, the denominator and numerator are of dimensionality P^2 , these indicators are actually size-independent and dimensionless, i.e. P^0 . Table 5 shows positive and moderately high correlation for all the cases considered from India and China.

Finally, we look at the last group of two indicators which can be classified as belonging to the “reach” category proposed by Leydesdorff (2009). Table 6 shows the Pearson’s correlation coefficient for the H-index and the p-index, both of which are size-dependent composite journal indicators of dimensionality P . Again, modestly high positive correlations are seen.

Our results seem to suggest that the dimensionality angle gives a reliable perspective to classify journal indicators: some are size-independent and some are size-dependent. The two Pinski–Narin type indicators are dimensionless. Size-dependent indicators can also be of different dimensionality, e.g. the counts of Total Docs. and Citable Docs., whether for a year as in 2018, or over a 2 year or 3 year period is of dimensionality P , whereas the count of Total Refs. and Total Cites over all the documents is of dimensionality P^2 .

Table 4 The three size-independent impact factor type journal indicators of dimensionality P available in Scimago Journal Rankings for the three cases: All journals, Open Access and non-Open Access from India and China

	India			China			
	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)	ALL—2018 (n = 45)	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)
ALL—2018 (n = 45)				ALL—2018 (n = 45)			
Ref./Doc. (2018)	1.00	0.18	0.22	Ref./Doc. (2018)	1.00	0.17	0.28
SJR	0.18	1.00	0.93	SJR	0.17	1.00	0.77
Cites/Doc. (2 years)	0.22	0.93	1.00	Cites/Doc. (2 years)	0.28	0.77	1.00
Open Access—2018 (n = 31)	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)	Open Access—2018 (n = 17)	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)
Ref./Doc. (2018)	1.00	0.24	0.26	Ref./Doc. (2018)	1.00	0.21	0.21
SJR	0.24	1.00	0.96	SJR	0.21	1.00	0.75
Cites/Doc. (2 years)	0.26	0.96	1.00	Cites/Doc. (2 years)	0.21	0.75	1.00
Non Open Access—2018 (n = 14)	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)	Non Open Access—2018 (n = 28)	Ref./Doc. (2018)	SJR	Cites/Doc. (2 years)
Ref./Doc. (2018)	1.00	0.26	0.19	Ref./Doc. (2018)	1.00	0.07	0.24
SJR	0.26	1.00	0.83	SJR	0.07	1.00	0.76
Cites/Doc. (2 years)	0.19	0.83	1.00	Cites/Doc. (2 years)	0.24	0.76	1.00

Table 5 The two newly introduced Pinski–Narin type but non-network journal indicators of zero dimensionality, i.e. P^0 for the three cases: All journals, Open Access and non-Open Access from India and China

India		China	
ALL—2018 ($n=45$)	Cites (3 years)/Ref. (2018)	Cites (2 years)/Ref. (2018)	Cites (3 years)/Ref. (2018)
Cites (3 years)/Ref. (2018)	1.00	0.51	1.00
Cites (2 years)/Ref. (2018)	0.51	1.00	0.70
Open Access—2018 ($n=31$)	Cites (3 years)/Ref. (2018)	Cites (2 years)/Ref. (2018)	Cites (2 years)/Ref. (2018)
Cites (3 years)/Ref. (2018)	1.00	0.44	0.70
Cites (2 years)/Ref. (2018)	0.44	1.00	0.70
Non Open Access—2018 ($n=14$)	Cites (3 years)/Ref. (2018)	Cites (2 years)/Ref. (2018)	Cites (3 years)/Ref. (2018)
Cites (3 years)/Ref. (2018)	1.00	0.70	1.00
Cites (2 years)/Ref. (2018)	0.70	1.00	0.80

Table 6 The two size-dependent composite journal indicators of dimensionality P for the three cases: All journals, Open Access and non-Open Access, from India and China

ALL—2018 (<i>n</i> =45)	H index	p-index (3 years)	ALL—2018 (<i>n</i> =45)	H index	p-index (3 years)
H index	1.00	0.53	H index	1.00	0.77
p-index (3 years)	0.53	1.00	p-index (3 years)	0.77	1.00
Open Access—2018 (<i>n</i> =31)	H index	p-index (3 years)	Open Access—2018 (<i>n</i> =17)	H index	p-index (3 years)
H index	1.00	0.50	H index	1.00	0.92
p-index (3 years)	0.50	1.00	p-index (3 years)	0.92	1.00
Non Open Access—2018 (<i>n</i> =14)	H index	p-index (3 years)	Non Open Access—2018 (<i>n</i> =28)	H index	p-index (3 years)
H index	1.00	0.77	H index	1.00	0.74
p-index (3 years)	0.77	1.00	p-index (3 years)	0.74	1.00

References

Glanzel W (2006) On the h-index—A mathematical approach to a new measure of publication activity and citation impact. *Scientometrics* 67:315–321

Hirsch JE (2005) An index to quantify an individual’s scientific research output. *Proceedings of the National Academy of Sciences of the USA* 102:16569–16572

Leydesdorff L (2009) How are new citation-based journal indicators adding to the bibliometric toolbox? *Journal of the American Society for Information Science and Technology* 60(7):1327–1336

Pinski G, Narin F (1976) Citation influence for journal aggregates of scientific publications: Theory, with application to the literature of physics. *Information Processing and Management* 12(5):297–312

Prathap G (2010a) Is there a place for a mock h-index? *Scientometrics* 84:153–165

Prathap G (2010b) The 100 most prolific economists using the p-index. *Scientometrics* 84:167–172

Prathap G (2018) Dimensionless citation indicators. *Scientometrics* 115:1433–1435

Schubert A, Glanzel W (2007) A systematic analysis of Hirsch-type indices for journals. *Journal of Informetrics* 1:179–184