

Web Impact (WI): a bibliometric index based on web usage

Network communication and mobile internet have brought about new formats of scientific research and publishing, such as open science and open access. Citations do not reflect the impact of academic research results in a timely and complete manner due to certain lag and limitations that they must be cited by users in published articles. Therefore, it is necessary to find new indicators for supplement. Through international cooperation, the project team tried to introduce the indexes in Altmetric provided by Digital Science and relevant network indexes of the journal databases of CNKI, Wanfang Data and Chinese Medical Journal Network to reflect the comprehensive impact (weight not exceeding 30% in WJCI) of the academic results of journals in the academic community and society. Since the usage of Chinese journals can hardly be illustrated in Altmetric, the pageviews and downloads from CNKI, Wanfang, and Chinese Medical Journal Network are introduced as alternatives to show the function of Chinese journals for Chinese scholars (accounting for 27% of the global scholars). In order to reflect the web impact of international journals in China, the project team calculated pageviews of these journals in CNKI database. The international and Chinese weights are 0.7 and 0.3, respectively.

The web usage data vary greatly among journals, and leading journals enjoy a large number of mentions and downloads. For most journals, this index is approximately equal to 0 if the conventional normalization method (divided by the maximum) is used. In this regard, the project team adopted a segment assignment method, with the WI value divided into ten equal segments, and all journals in the same segment have the same WI value.

The specific method is briefly described as follows:

1. Algorithm principle

Using the segment assignment method, the WI value of journals in each segment is obtained by backward induction from the World Academic Journal Clout Index (WAJCI). Considering the importance of the WAJCI and WI in WJCI in different disciplines, the project team sets different weights for journals in different disciplines according to expert responses: the weight of WI is 0.2 for journals in Science and Technology General, Science and Medicine, while 0.3 for journals in Engineering and Agriculture Science.

2. Calculation process

Journals with “total mentions” in Altmetric or pageviews and downloads in Chinese databases are grouped into different disciplines. The journals in the same

discipline are divided into ten equal segments in descending order of the WAJCI value, and the W value for each segment is calculated.

For journals in Science and Technology General, Science and Medicine:

$$W = 0.2 * (\text{average WAJCI in each segment}/0.8)$$

For journals in Engineering and Agriculture Science:

$$W = 0.3 * (\text{average WAJCI in each segment}/0.7)$$

International attention (Web impact-A, WIA): There are 10,240 journals with Altmetric values (“total mentions” in 2020 of published articles in this year). The journals in each discipline are divided into ten segments in descending order of “total mentions” and then the values of international attention (WIA) are assigned for each segment.

$$WIA=W*0.7$$

The Chinese attention (Web impact-B, WIB) is divided into three parts: ① The usage of international journal bibliography in China mainly refers to the pageviews of international journals in CNKI-Scholar. ② The usage of Chinese journal bibliography in China mainly refers to the sum of pageviews of Chinese journals in CNKI database, Wanfang database and Chinese Medical Journal Network. ③ The usage of full-text Chinese journals in China mainly refers to the sum of full-text downloads of Chinese journals in CNKI database, Wanfang database and Chinese Medical Journal Network. The journals in the three scenarios (with the number of journals being 10,795, 1,508 and 1,494, respectively) are ranked in descending order of usage on the discipline basis and divided into ten equal segments. The Chinese usage score for the three parts:.

① The usage score of international journal bibliography in China: $WIB_1=W*0.1$

② The usage score of Chinese journal bibliography in China: $WIB_2=W*0.1$

③ The usage score of full-text Chinese journals in China: $WIB_3=W*0.1$

The Chinese attention (WIB) is the sum of the above three parts:

$$WIB=WIB_1+WIB_2+WIB_3$$

Web impact (WI) is the sum of international attention and Chinese attention:

$$WI=WIA+WIB$$

Table1 Actual score for each segment--Science and Technology General

Seg ment	Average WAJCI	International attention			Chinese attention								
					The usage score of international journal bibliography			The usage score of Chinese journal bibliography			The usage score of full-text Chinese journals		
		<i>n</i> of jour nals	Range	WIA	<i>n</i> of jour nals	Range	WIB ₁	<i>n</i> of jour nals	Range	WIB ₂	<i>n</i> of jour nals	Range	WIB ₃
1	32.692	11	[16062,1613159]	5.721	10	[13415,226792]	0.81730	6	[97486,250703]	0.81730	6	[45429,120347]	0.81730
2	4.543	12	[1294,10527]	0.795	10	[3303,11804]	0.11358	6	[79842,95227]	0.11358	6	[32406,42561]	0.11358
3	2.809	12	[465,1181]	0.492	11	[1360,3231]	0.07023	6	[71417,79696]	0.07023	6	[26594,28943]	0.07023
4	1.774	12	[344,459]	0.310	10	[795,1234]	0.04435	6	[63062,68991]	0.04435	6	[22541,26245]	0.04435
5	1.394	12	[162,299]	0.244	11	[563,789]	0.03485	6	[51619,62704]	0.03485	6	[18417,22276]	0.03485
6	1.161	11	[85,154]	0.203	10	[357,556]	0.02903	6	[43430,50428]	0.02903	6	[15544,17876]	0.02903
7	0.960	12	[34,70]	0.168	10	[240,333]	0.02400	6	[38789,42004]	0.02400	6	[13393,14686]	0.02400
8	0.732	13	[12,33]	0.128	11	[105,232]	0.01830	6	[27030,36684]	0.01830	6	[10163,12652]	0.01830
9	0.593	14	[3,10]	0.104	10	[35,97]	0.01483	6	[17974,26931]	0.01483	6	[4060,9013]	0.01483
10	0.345	9	[1,2]	0.060	11	[1,31]	0.00863	7	[919,16567]	0.00863	7	[1,3883]	0.00863

Table2 Actual score for each segment--Science

Seg ment	Average WAJCI	International attention			Chinese attention								
					The usage score of international journal bibliography			The usage score of Chinese journal bibliography			The usage score of full-text Chinese journals		
		<i>n</i> of jour nals	Range	WIA	<i>n</i> of jour nals	Range	WIB ₁	<i>n</i> of jour nals	Range	WIB ₂	<i>n</i> of jour nals	Range	WIB ₃

1	6.457	423	[2233,316342]	1.130	433	[7112,220792]	0.16143	38	[135429,600610]	0.16143	37	[52676,274261]	0.16143
2	2.895	424	[885,2232]	0.507	433	[3439,7110]	0.07238	38	[79056,123603]	0.07238	38	[32042,50878]	0.07238
3	2.007	428	[439,884]	0.351	434	[2029,3436]	0.05018	39	[56039,77803]	0.05018	38	[20814,31933]	0.05018
4	1.531	420	[255,438]	0.268	433	[1316,2028]	0.03828	38	[43071,55115]	0.03828	38	[13820,20493]	0.03828
5	1.213	425	[139,254]	0.212	435	[833,1315]	0.03033	39	[30595,42104]	0.03033	38	[9436,13695]	0.03033
6	1.000	423	[76,138]	0.175	432	[519,832]	0.02500	38	[23335,30387]	0.02500	37	[6016,9363]	0.02500
7	0.823	438	[39,75]	0.144	433	[305,518]	0.02058	38	[16710,23212]	0.02058	38	[3604,5963]	0.02058
8	0.639	432	[15,38]	0.112	434	[151,304]	0.01598	39	[9730,16625]	0.01598	38	[1419,3479]	0.01598
9	0.472	421	[5,14]	0.083	434	[56,150]	0.01180	38	[4196,9514]	0.01180	38	[354,1363]	0.01180
10	0.214	404	[1,4]	0.037	433	[1,55]	0.00535	39	[261,4072]	0.00535	38	[1,331]	0.00535

Table3 Actual score for each segment--Engineering

Segment	Average WAJCI	International attention			Chinese attention								
					The usage score of international journal bibliography			The usage score of Chinese journal bibliography			The usage score of full-text Chinese journals		
		n of journals	Range	WIA	n of journals	Range	WIB ₁	n of journals	Range	WIB ₂	n of journals	Range	WIB ₃
1	6.884	270	[724,59757]	2.065	306	[11029,571074]	0.29503	73	[203290,878563]	0.29503	72	[87807,463756]	0.29503
2	3.058	271	[275,721]	0.917	306	[4323,11023]	0.13106	73	[131833,195822]	0.13106	73	[53928,86724]	0.13106
3	2.142	270	[133,274]	0.643	307	[2320,4313]	0.09180	73	[92090,130042]	0.09180	72	[38504,53652]	0.09180
4	1.615	277	[73,132]	0.484	306	[1378,2319]	0.06921	73	[67046,92003]	0.06921	73	[26554,38185]	0.06921
5	1.253	276	[43,72]	0.376	307	[831,1377]	0.05370	73	[53265,66996]	0.05370	72	[21000,26551]	0.05370
6	1.009	267	[26,42]	0.303	306	[490,829]	0.04324	73	[40720,53074]	0.04324	73	[15804,20908]	0.04324
7	0.814	274	[14,25]	0.244	307	[276,489]	0.03489	73	[31264,40663]	0.03489	72	[11350,15681]	0.03489

8	0.606	269	[7,13]	0.182	307	[136,275]	0.02597	73	[22642,31001]	0.02597	73	[7213,11338]	0.02597
9	0.415	289	[3,6]	0.124	310	[41,135]	0.01779	73	[8788,22437]	0.01779	72	[1711,7113]	0.01779
10	0.180	243	[1,2]	0.054	302	[1,40]	0.00771	74	[8,8616]	0.00771	73	[1,1696]	0.00771

Table4 Actual score for each segment--Agriculture Science

Seg ment	Average WAJCI	International attention		Chinese attention									
				The usage score of international journal bibliography			The usage score of Chinese journal bibliography			The usage score of full-text Chinese journals			
		<i>n</i> of journ als	Range	WIA	<i>n</i> of journ als	Range	WIB ₁	<i>n</i> of journ als	Range	WIB ₂	<i>n</i> of journ als	Range	WIB ₃
1	5.297	46	[942,8331]	1.589	47	[7649,59130]	0.22701	14	[166321,401354]	0.22701	14	[75726,190265]	0.22701
2	2.775	47	[346,899]	0.832	48	[2932,7483]	0.11893	14	[115438,165296]	0.11893	14	[50897,67352]	0.11893
3	2.035	46	[198,344]	0.610	48	[1720,2865]	0.08721	14	[100895,115340]	0.08721	14	[43424,50502]	0.08721
4	1.646	48	[126,195]	0.494	47	[1092,1718]	0.07054	14	[85447,100828]	0.07054	14	[34309,43328]	0.07054
5	1.322	46	[78,125]	0.397	48	[724,1070]	0.05666	14	[70282,85187]	0.05666	14	[27815,32658]	0.05666
6	1.104	47	[48,77]	0.331	48	[431,723]	0.04731	14	[56939,69194]	0.04731	14	[23092,27108]	0.04731
7	0.939	46	[25,47]	0.282	47	[238,430]	0.04024	14	[50212,56755]	0.04024	14	[19872,22869]	0.04024
8	0.747	48	[11,24]	0.224	48	[134,227]	0.03201	14	[35606,49890]	0.03201	14	[14221,19315]	0.03201
9	0.548	50	[3,10]	0.164	48	[52,130]	0.02349	14	[20789,35160]	0.02349	14	[5902,13964]	0.02349
10	0.249	41	[1,2]	0.075	48	[1,51]	0.01067	15	[1206,17474]	0.01067	15	[221,5433]	0.01067

Table5 Actual score for each segment--Medicine

Seg ment	Average WAJCI	International attention			Chinese attention								
					The usage score of international journal bibliography			The usage score of Chinese journal bibliography			The usage score of full-text Chinese journals		
		<i>n</i> of jour nals	Range	WIA	<i>n</i> of jour nals	Range	WIB ₁	<i>n</i> of jour nals	Range	WIB ₂	<i>n</i> of jour nals	Range	WIB ₃
1	6.783	426	[3598,937668]	1.187	446	[6156,571074]	0.16958	33	[300705,908697]	0.16958	32	[133682,574947]	0.16958
2	2.591	426	[1445,3582]	0.453	447	[3593,6141]	0.06478	33	[213097,286383]	0.06478	33	[79435,124677]	0.06478
3	1.825	427	[775,1440]	0.319	447	[2378,3592]	0.04563	33	[162702,210044]	0.04563	33	[64234,78976]	0.04563
4	1.426	426	[432,774]	0.250	447	[1617,2377]	0.03565	33	[131450,162303]	0.03565	33	[52635,64225]	0.03565
5	1.168	429	[269,431]	0.204	449	[1163,1614]	0.02920	33	[99777,128419]	0.02920	33	[41890,51697]	0.02920
6	0.971	424	[161,268]	0.170	446	[788,1160]	0.02428	33	[82220,99674]	0.02428	33	[34152,41669]	0.02428
7	0.796	440	[91,160]	0.139	446	[500,787]	0.01990	33	[58392,80463]	0.01990	33	[24471,33690]	0.01990
8	0.617	422	[49,90]	0.108	448	[295,499]	0.01543	33	[35826,58137]	0.01543	33	[12406,24360]	0.01543
9	0.427	426	[19,48]	0.075	446	[131,291]	0.01068	33	[16768,34971]	0.01068	33	[1435,12387]	0.01068
10	0.184	418	[1,18]	0.032	447	[1,130]	0.00460	34	[34,16513]	0.00460	33	[1,1424]	0.00460