How to evaluate the quality of research publications: problems and suggestions

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What is the quality of research publications? How we measure it?

Conventional indicators to evaluate publications:





of publications
Article
Review
Proceedings
Book
Book Chapter

Basically counts English publications (Not all Japanese publications)

"Volume" of publications depends on the database.



"Citations" is an essential indicator. *NOTE: "Impact Factor" is not equal to "Citations"

- Differences by literature types
 Different trends in Article and Review
 Review is cited a lot.
- Differences by research field
 Differences in citations by field
 Medical sciences are heavily cited

ONormalized Citation Index: FWCI (Field Weighted Citation Impact) Corrected for literature type and field. The global average is set to 1.

OTop percentile publication ratio : top 1%, 10%

"Quality" is based	
on the number of citations.	



Amane's pubilcation



Neurite arborization and mosaic spacing in the mouse retina require DSCAM







Citations = 5

Differences by research field Differences in citations by field Medical sciences are heavily cited









Normalized "Citations" by scientific field





FIELD-WEIGHTED CITATION IMPACT (FWCI)

of citations received by a document

expected # of citations for similar documents

Similar documents are ones in the same discipline, of the same type (e.g., article, letter, review) and of the same age. An FWCI of 1 means that the output performs just as expected against the global average. More than 1 means that the output is more cited than expected according to the global average; for example, 1.48 means 48% more cited than expected.

https://libraryconnect.elsevier.com/metrics



The Problem of University's FWCI

	University A	University B		Unievrsity C
	120	5.5		6.0
	5.1	5.2		5.9
	3.3	3.5		5.8
	1.2	2.5		5.6
	1.1	2.0		5.5
	0.9	1.7		0.1
	0.8	1.6		0.1
	0.7	1.5		0.1
	0.5	1.4		0.1
	0.4	1.1		0.1
	0.3	1.0		0.1
	12.2	2.5		2.7
	12.2	2.5		

The FWCI takes "Averages" (\sum FWCI / # of publications), so there is a danger that even one outstanding paper will be heavily biased.⁸

Another aspect of a university's research capabilities (調、清家、小泉 2018)

Research capabilities that are missed by traditional indexes of "quality"



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Shirabe, M., & Koizumi, A. (2021). Substantiality: A construct indicating research excellence to measure university research performance. Journal of Data and Information Science, 6(4). https://doi.org/10.2478/jdis-2021-0029

ATSUMI -Substantiality





Shirabe, M., & Koizumi, A. (2021). Substantiality: A construct indicating research excellence to measure university research performance. Journal of Data and Information Science, 6(4). https://doi.org/10.2478/jdis-2021-0029

ATSUMI index: institutional h5-index (5 means the period of 5 years)



University A

Total # of Publications: 9 Total # of Citations: 66 Average Citations per Publications: 7.3 # of Top Percentile Publications: 1



University B

Total # of Publications: 7 Total # of Citations: 47 Average Citations per Publications: 6.7 # of Top Percentile Publications: 0

*# in circles = citations

ATSUMI metrics (for publications): institutional h5-index (institutional h count over the past 5 years)



ATSUMI index: institutional h5-index (5 means the period of 5 years)

Publication Set in Research Field X



University A

Total # of Publications: 9 Total # of Citations: 66 Average Citations per Publications: 7.3 # of Top Percentile Publications: 1 ATSUMI institutional h5-index: 3



University B

Total # of Publications: 7 Total # of Citations: 47 Average Citations per Publications: 6.7 # of Top Percentile Publications: 0 ATSUMI institutional h5-index: 6

*# in circles = citations

Example:

University A



publications

of citations



Five Key Indicators to Measure Research Capability

The combination of these five indicators will be used to understand your university research capability.

Volume (Quantity)

of publications

Quality

FWCI

**Top 10% publication ration ATSUMI

of Top10% publications Institutional h5 index Internatinality

CNI (fractional)

**International collaborati

of researchers **active authors

Koizumi, Shirabe and Toriya (2021) STI Horizon Vol.7. No.1 <u>https://doi.org/10.15108/stih.00248</u> 2021 March 22





ATSUMI (Substantiality) correlates with university's "reputation"



The correlations of substantiality indicators (i.e. h5-index and number of top 1% most cited publications (Kutlača, 2015)) to research reputation scores in the top 50 universities are clearly higher than those of the number and FWCI of publications (Elsevier, Scopus/Scival)

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ATSUMI (Substantiality) has "predictive power" of university's "reputation"



Figure 3. Averages of Spearman's rank correlation coefficient for each indicator.

Spearman's rank correlation coefficient between "reputation" and Quality and ATSUMI research capability indexes (Elsevier, Scopus/Scival)

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Still we have Problems:

• Quality and ATSUMI indexes needs "Citations" You need to wait several years after publication of a paper to determine the number of citations.

Also, the number of years it takes to be cited varies depending on the research field



- We need an index that does not rely on "citations," that can evaluate "quality" instantly, regardless of the field, rather than taking years to evaluate.
- We need early indicators that can predict the number of citations, and reputation in the future.

Non-Citation based "Quality" measurements

• Nature Index by SpringerNature

A database of author affiliation data drawn from primary research articles in a select group of 82 high quality natural science journals.

<u># of publications in 82 high quality natural science</u> journals.

It is a close to real-time indicator of high quality research output and collaboration in the natural sciences at the institutional, national, regional and international level. Preprints might be the game changer, but Questions: How can Preprints ensure the quality of future publications and the impact of research?

- Can we predict the quality of future publications by analyzing their Preprints?
- Can we predict impact by analyzing their Preprints?

Working Hypothesis



Correlation between Downloads and Citations

Access 🖶 Hybrid or closed access 🚔 Immediately open access 🚔 NA



Abdill RJ, Blekhman R. Tracking the popularity and outcomes of all bioRxiv preprints. Elife. 2019 Apr 24;8:e45133. doi: 10.7554/eLife.45133.

Journal

ARVO, JOURNALS

From: Comparing citations and downloads for individual articles at the Journal of Vision Journal of Vision. 2009;9(4):i. doi:10.1167/9.4.i



Figure Legend:

Total downloads vs total citations. We add 1 to citations to allow it to be plotted on a log scale.

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Discussion

- As previous reports have shown, the number of downloads will correlate with the number of citations in the future.
- But in that case, the number of downloads for the preprint can only be substituted for the number of citations in the publication!
- Normalization will be needed for each research field.
- It would be valuable if other preprint analysis metrics could estimate the "quality" of a paper, independent of the number of citations, and directly predict its future reputation.

Working Hypothesis



The publication of preprints should be considered as a process of research activities and not a research result.



How much can we trust "peerreview"? That is another question.



I appreciate your comments and suggestions.

連絡先:

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