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The BIP! Toolbox for Scientific Impact Assessment & Applications

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Published research is exponentially increasing

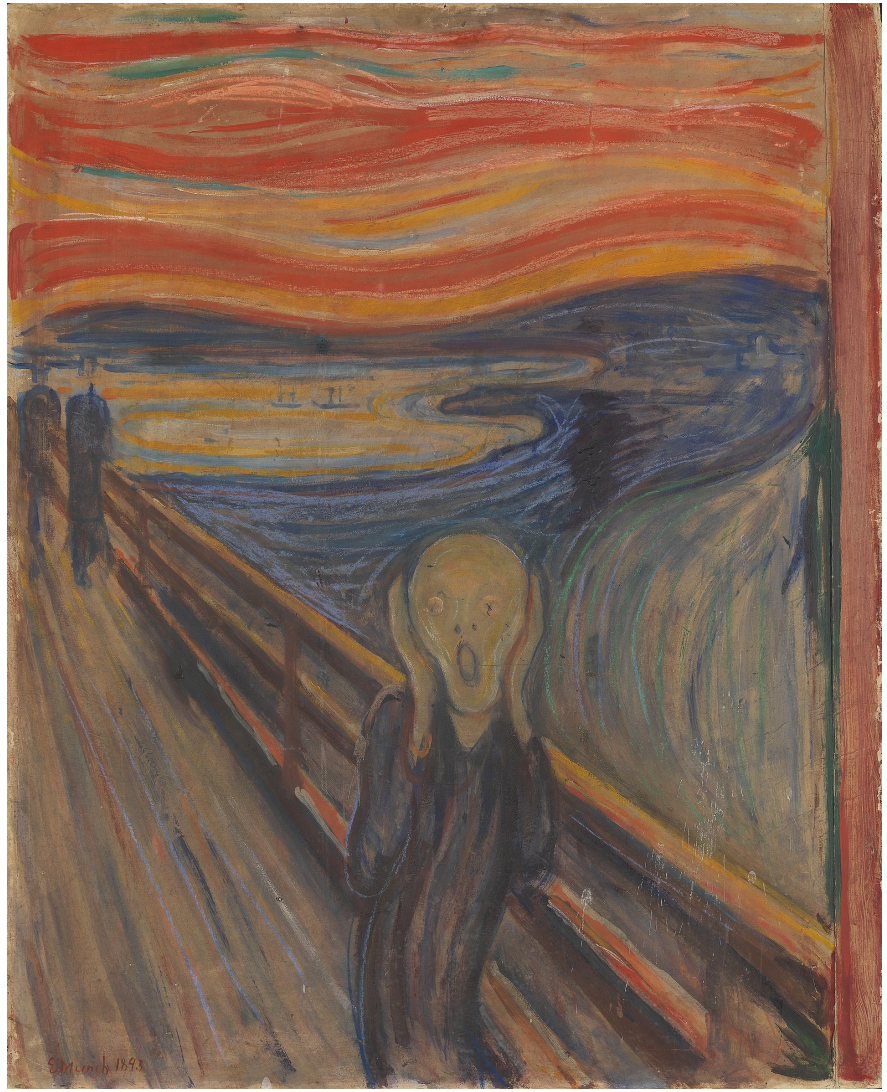
- The ***growth rate*** of the number of published research is ***constantly increasing***.
- Studies suggest that among the vast number of published works many are of ***questionable quality or low impact***.
- Identifying most ***valuable publications*** for any given research topic has become ***tedious & time consuming***.

Photo by Carles Rabada on Unsplash

Why?

- ***Increase in the number of researchers worldwide***.
  - ^20% between 2007-2014*

- ***Publish or Perish***
  - incredible pressure to publish more, especially on young researchers

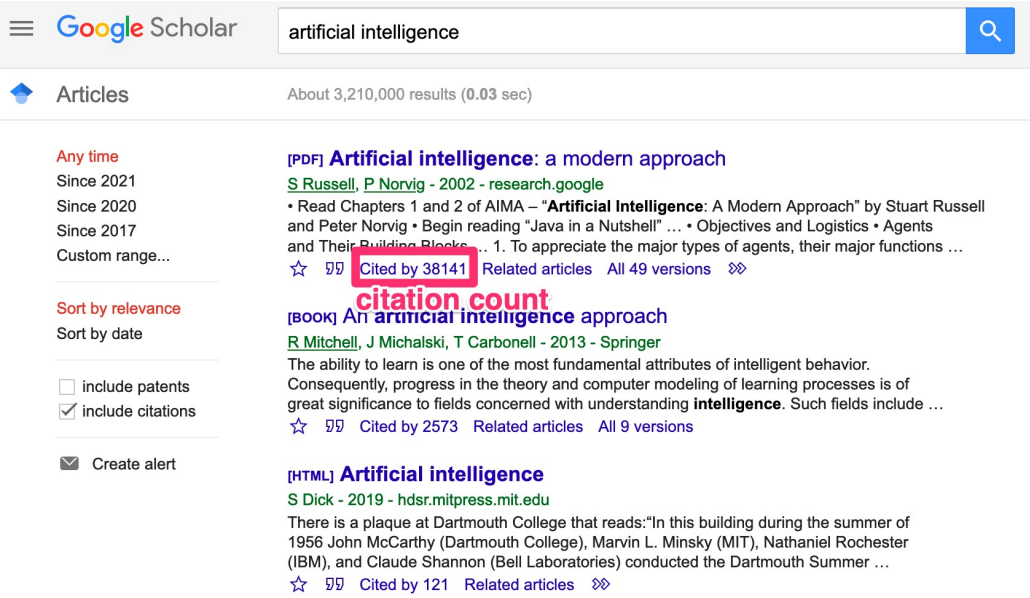


Edvard Munch, "The scream of nature"
https://bit.ly/3dcLbXD

*UNESCO Science Report: towards 2030. UNESCO Publishing, 2015

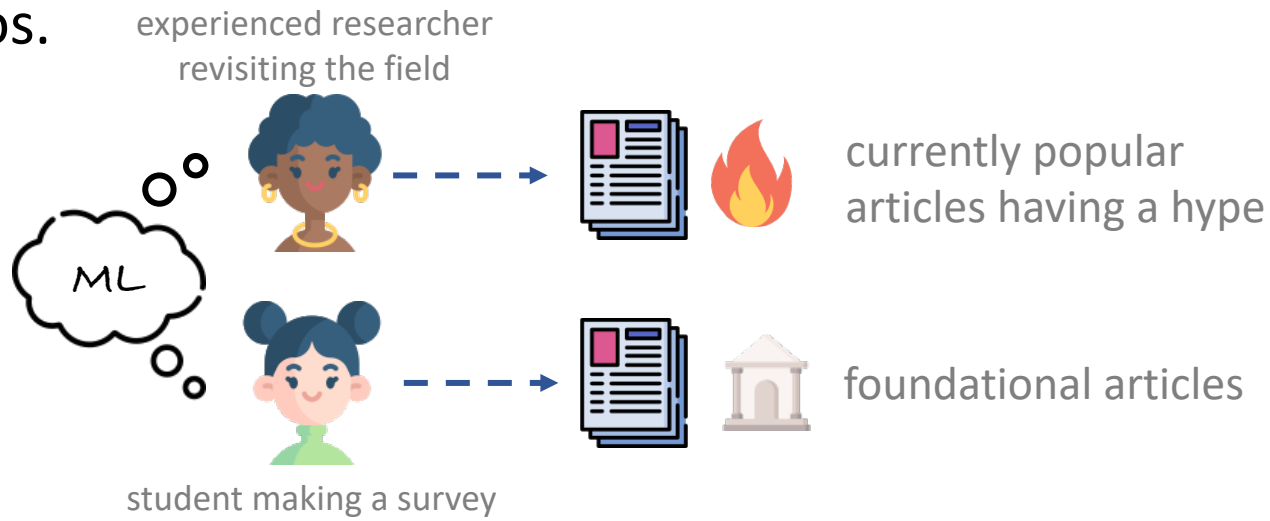
Solution?: impact measures/indicators

- ***Quantifying the impact*** of publications could facilitate the identification of valuable research.
  - ***Open Science inititives***, having momentum make the calculation of such measures possible.
- Academic search engines ***combine keyword-search with a scientific impact measure*** (usually citation counts) to rank publications.
  - possible other applications



Pitfall #1: Scientific impact has various aspects

- It is an ***oversimplification to rely only on one impact measure***, like most academic search engines.
  - There are many ***diverse aspects*** of scientific impact, each most appropriate in different scenarios.

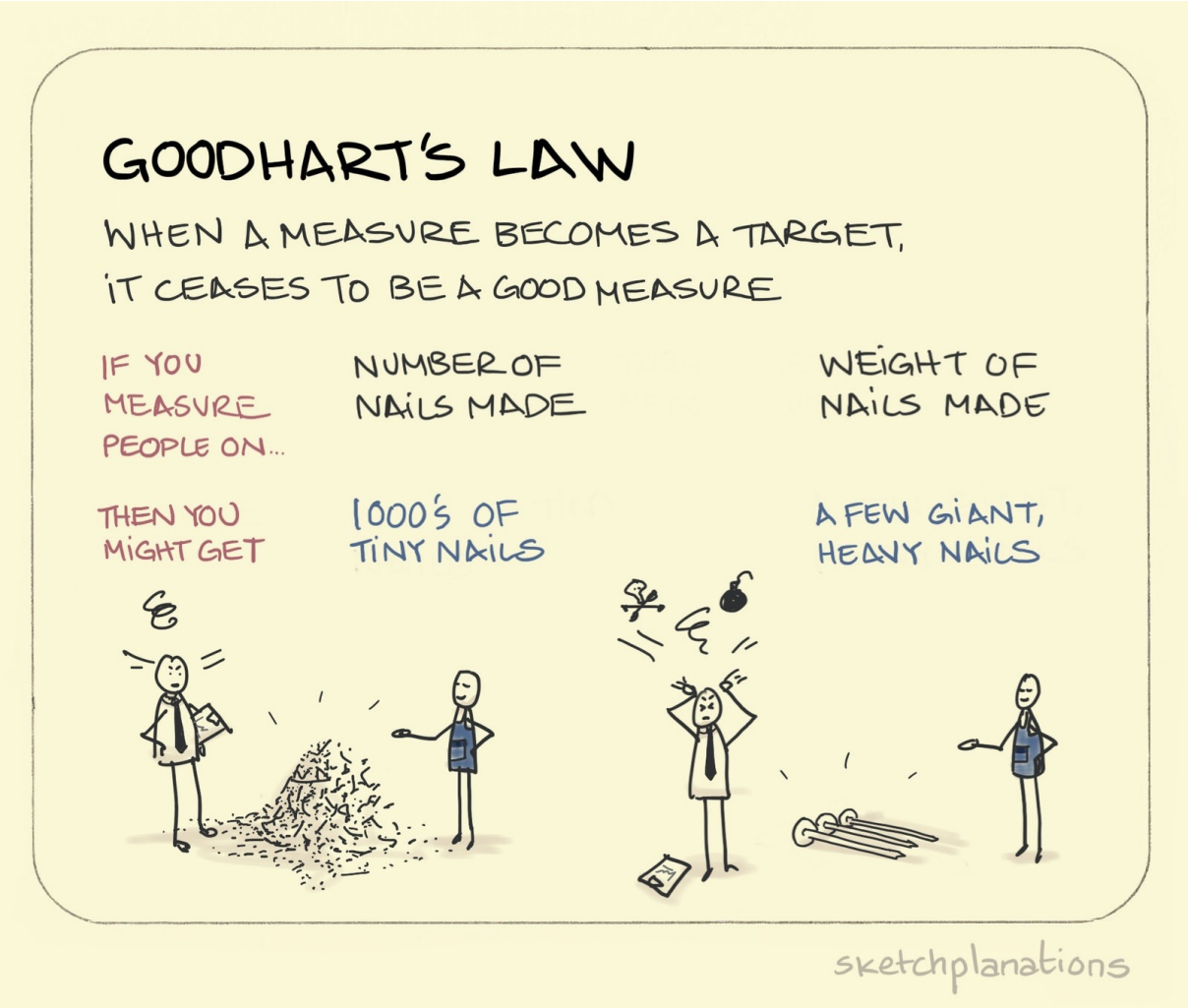


- Also there is ***scientific merit***, not only impact…
  - Merit/quality is not completely correlated with impact

Flame icon Icons made by Vectors Market from www.flaticon.com. Rest icons made by Freepik from www.flaticon.com.

Pitfall #2: Goodhart's/Campell's law

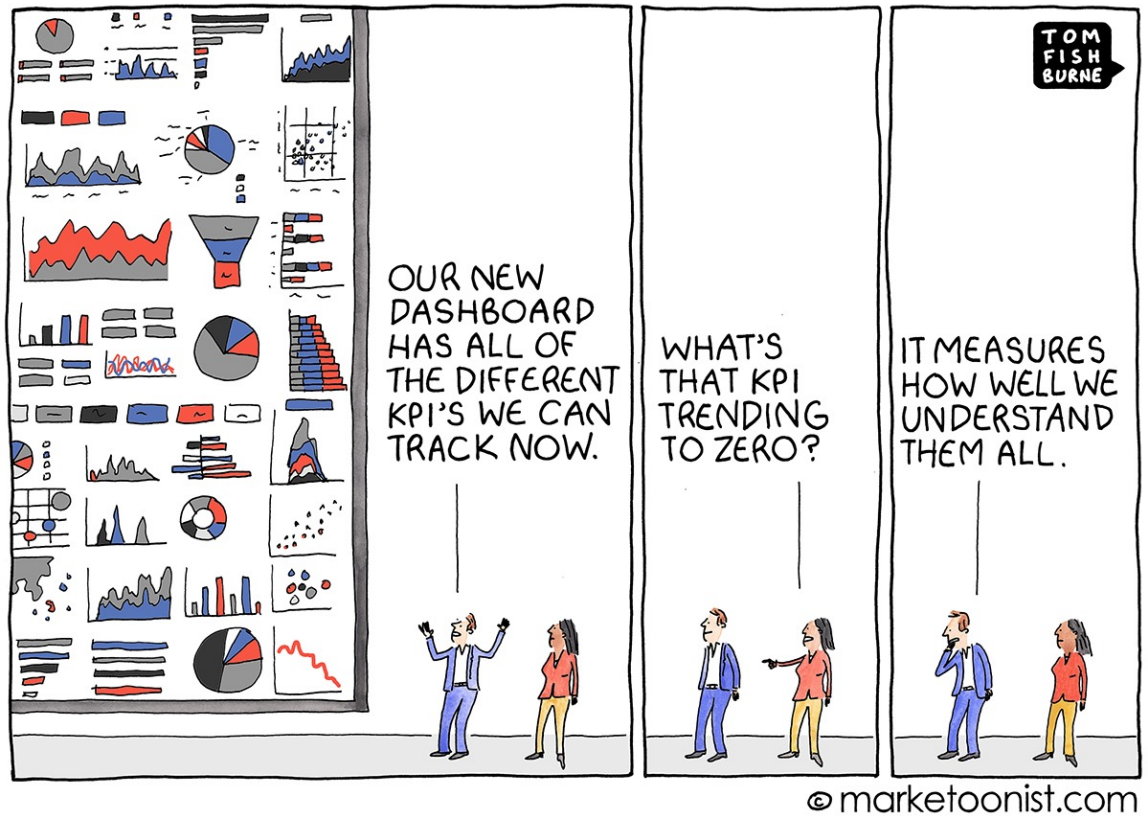
- Scientific impact ***should not be examined through a limited set of measures***.
  - Any individual impact measure has ***limitations***.
  - More measures capture a ***wider range of impact aspects***.
  - **Goodhart's law/Campell's law**: individual measures are vulnerable to attacks & become targets (more measures→increased difficulty for attacks)



https://sketchplanations.com/goodharts-law

Pitfall #3: No proper interpretation

- There is ***a multitude of impact measures***.
- In most cases only the measures are provided ***without the proper interpretations***, best practices, etc.
- ***The landscape is confusing*** and often the measures are not properly used.



https://marketoonist.com/2019/11/kpi-overload.html

BIP! Toolbox motivation

- To create a set of services & resources to offer a ***multi-dimensional view of publications impact***.
  - PaperRanking library
  - BIP! Finder (search engine, impact-based ranking)
  - BIP! API (open API to get the impact measure scores)
  - BIP! DB (open Dataset)
  - BIP4COVID19 (search engine & open dataset with impact scores for COVID-19 papers)
- We hope that ***3rd parties will build useful services on top of this dataset*** to provide useful services to researchers and other professionals in academia.

120M publications

OpenCitations (Sep 2021)
MAG (Jul 2021)
Crossref (May 2021)

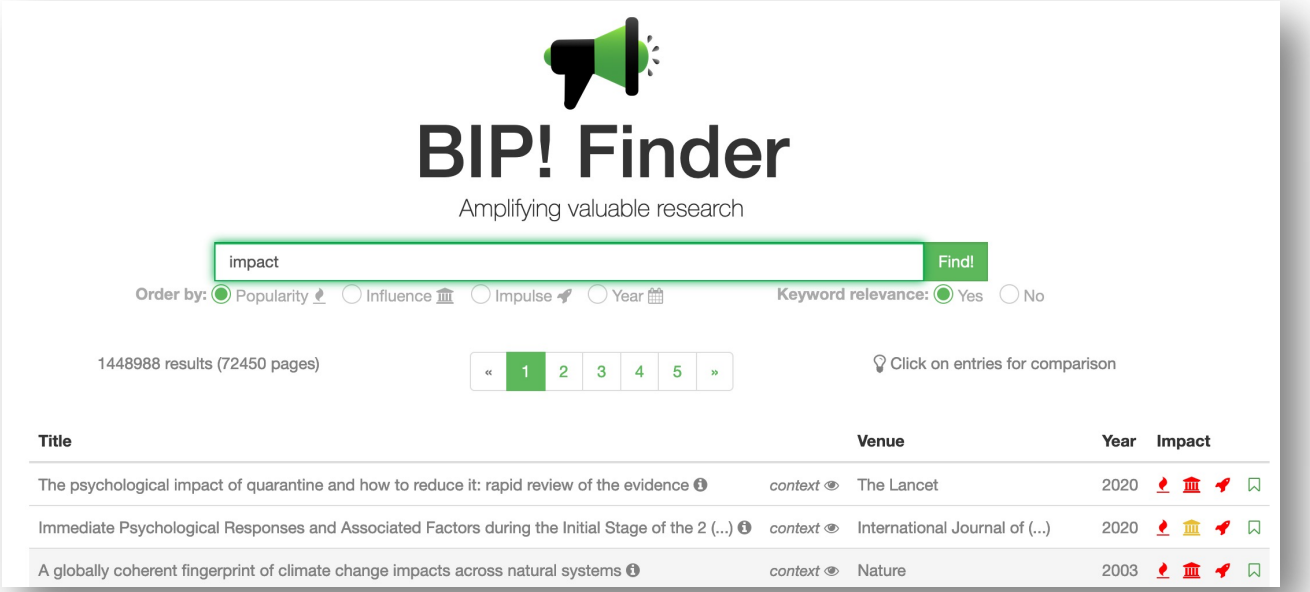
BIP! DB

673 views
93 downloads

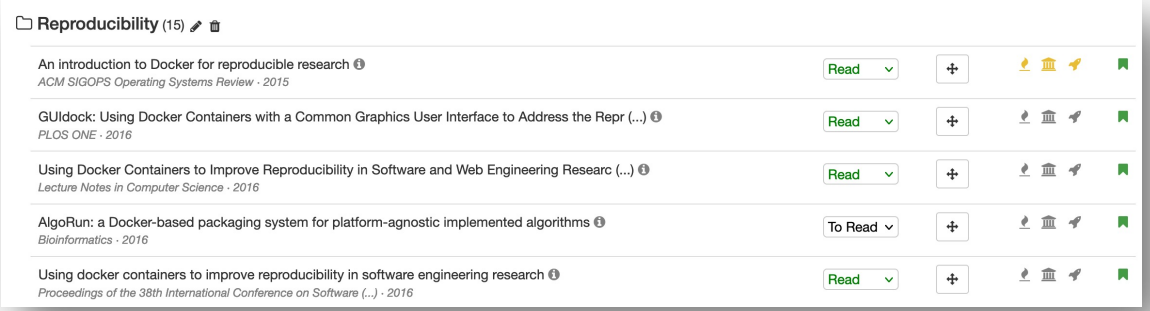
BIP4COVID19

149,312 views
21,132 downloads

BIP! Finder



search, rank & compare papers according to different aspects of their impact



create and manage your reading list

That's all Folks!

email: vergoulis@athenarc.gr
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BIP! Dataset at a glance

- ***5 citation-based measures*** quantifying ***3 distinct aspects of scientific impact*** for ***~117M publications*** from various disciplines.
  - Currently: 5th release (version 3)
- Analysis applied on a ***citation network*** based on a combination of:
  - ***OpenCitations' COCI dataset*** (Dec-2020)
  - ***MAG snapshot*** (Nov-2020)
  - ***Crossref snapshot*** (Jan-2021)
- Openly available (CC-BY license) at Zenodo: https://doi.org/10.5281/zenodo.4386934
- Open API: https://bip-api.imsi.athenarc.gr/documentation
- Search engine: https://bip.imsi.athenarc.gr/ (to be updated soon)

BIP! DB: Currently supported measures

- We ***focused on citation-based measures***.
  - We plan to extend to other types of measures in the future.
- We were ***based on our previous experimental study***:

  Ilias Kanellos, Thanasis Vergoulis, Dimitris Sacharidis, Theodore Dalamagas, Yannis Vassiliou:
  Impact-Based Ranking of Scientific Publications: A Survey and Experimental Evaluation.
  IEEE Trans. Knowl. Data Eng. 33(4): 1567-1584 (2021)

- We tried to include a set of ***measures that capture diverse aspects of scientific impact***:
  - ***Popularity***: a publication's current attention
    - RAM & AttRank
  - ***Influence***: a publication's overall, long-term importance
    - CC & PageRank
  - ***Impulse***: a publication's initial impact during its "incubation phase" (the first years after its publication)
    - "incubation" CC (based on first 3y after publications)

But are they different?

- We measured the ***top-k pairwise correlations*** for the top 1M papers (~1% of the dataset).
- Measures focussing for the ***same impact aspect more correlated to eachother***, in general.

influence measures appear to have moderate correlation (larger for larger k vaules, e.g., 10% of articles)

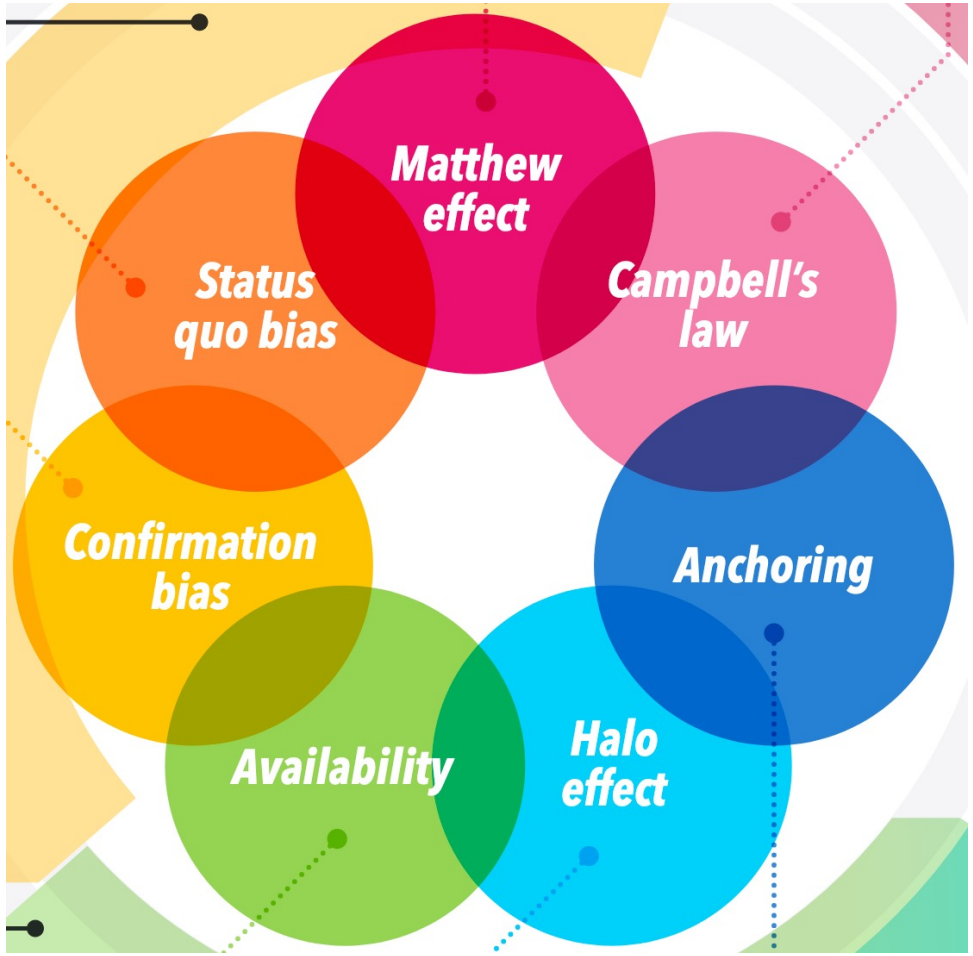
	iCC	CC	PR	AttRank	RAM
iCC	1	0.0985	−0.3468	0.3141	0.3042
CC		1	0.4144	0.4583	0.2774
PR			1	−0.0675	−0.2598
AttRank				1	0.9056
RAM					1

impulse measure seem diverse to other measures

AttRank & RAM (both focussing popularity) are highly correlated

Table 2: Top-1% pairwise correlations of impact measures.

DORA: unitended & cognitive system biases in research assessment

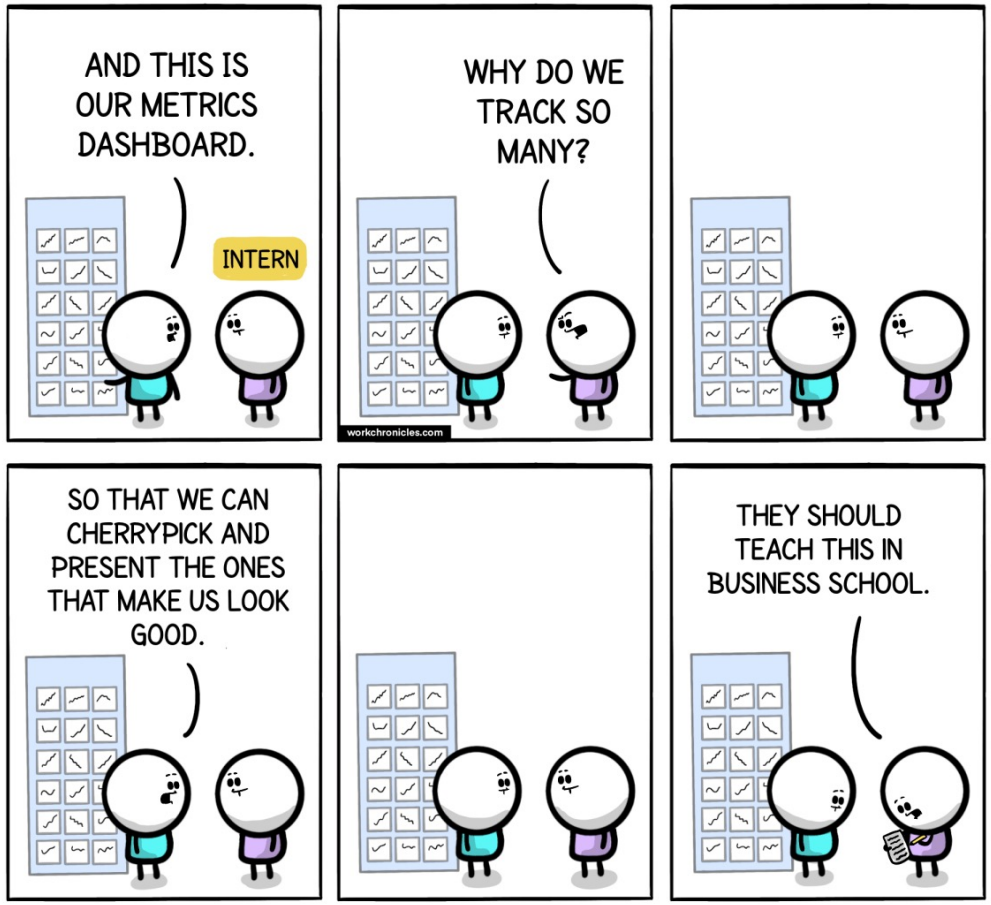


We should ***combine qualitative & quantative information*** for research assessment.

We believe that it is important to also have **quantative information that reflects various, diverse aspects of scientific impact & merit**.

Source: https://sfdora.org/wp-content/uploads/2020/11/DORA_UnintendendedCognitiveSystemBiases.pdf

Even more pitfalls…



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