

The Role of Impact Metrics in Researchers' Literature Selection Processes

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January 23, 2022

Need for scalable methods of publication assessment

NEWS BLOG

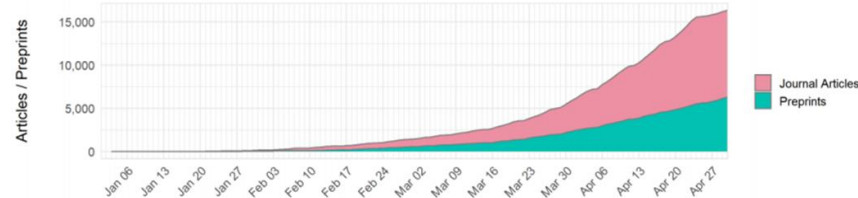
Global scientific output doubles every nine years

.07_May_2014_|_16.46_BST | Posted by Richard Van Noorden | Category: Policy, Publishing

It's a common complaint among academics: today's researchers are publishing too much, too fast. But just how fast is the mass of scientific output actually growing?

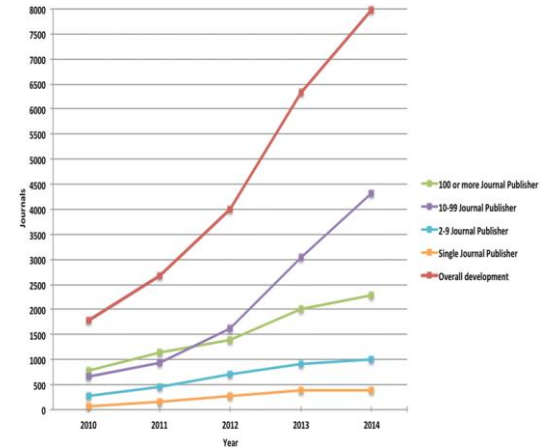
Source: <http://blogs.nature.com/news/2014/05/global-scientific-output-doubles-every-nine-years.html>

Share of preprints among Covid-19-related publications (early 2020)



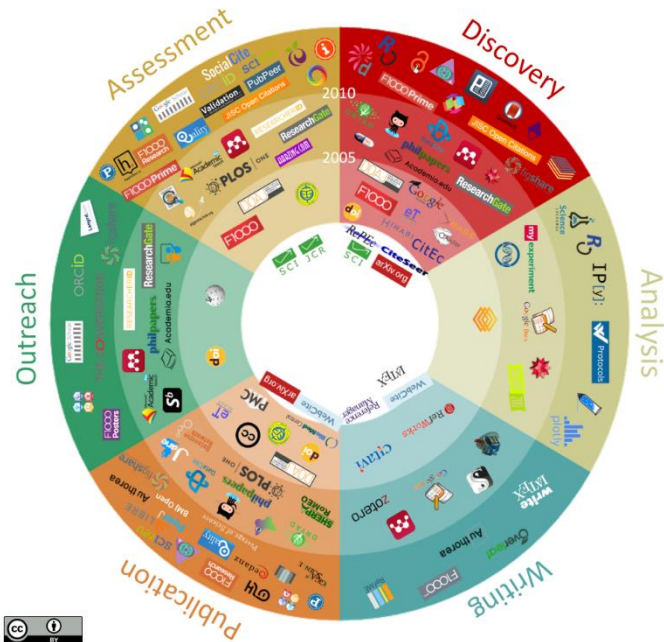
Source: Fraser, N., Brierley, L., Dey, G., Polka, J. K., Pálffy, M., & Coates, J. A. (2020). Preprinting a pandemic: the role of preprints in the COVID-19 pandemic. *bioRxiv*. <https://doi.org/10.1101/2020.05.22.111294>

Development of active predatory open access-journals (2010-2014)



Source: Shen, C., Björk, B. (2015). 'Predatory' open access: a longitudinal study of article volumes and market characteristics. *BMC Med* 13, 230. <https://doi.org/10.1186/s12916-015-0469-2>

Parallel developments in scholarly working habits



- Researchers' everyday work increasingly takes place on online platforms
- As many opportunities to track and analyze various types of usage electronically as never before
- Assessing research based on quantitative data becomes even more tempting



Source: Kramer, B., & Bosman, J. (2016). Innovations in scholarly communication—Global survey on research tool usage. *F1000Research*, 5, 692. <https://doi.org/10.12688/f1000research.8414.1>

Metrics for research evaluation ('impact metrics')

Bibliometrics:

- Traditional indicators of scientific relevance
- Include indicators that apply to
 - individual articles (e.g. citation counts)
 - journals (e.g. *Impact Factor*)
 - researchers (e.g. *h-index*)
- Usually only consider formal publications

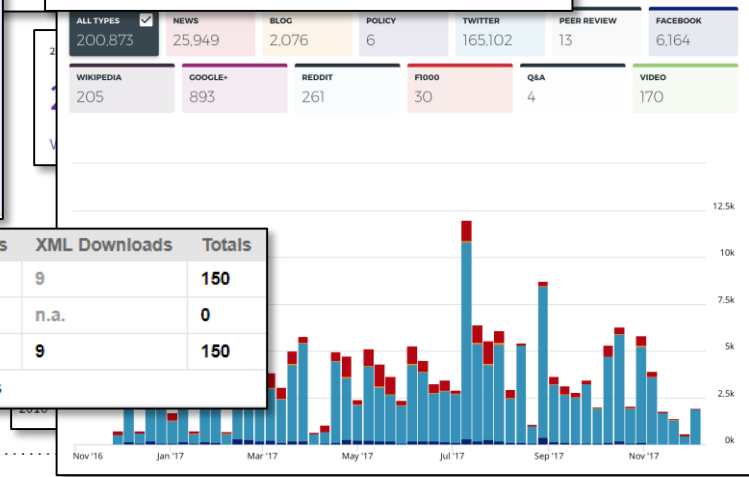
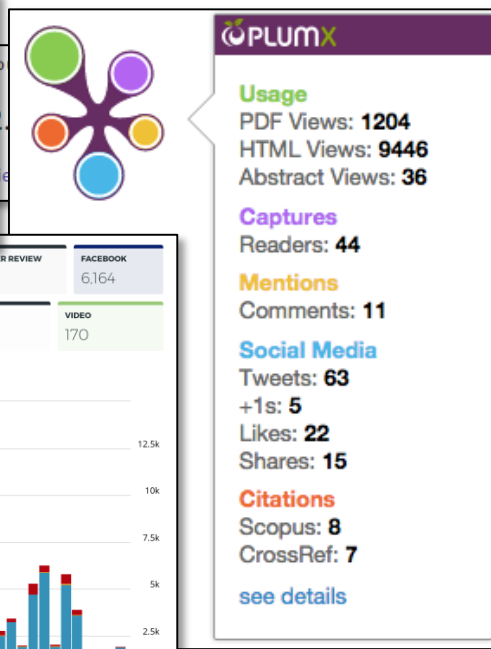
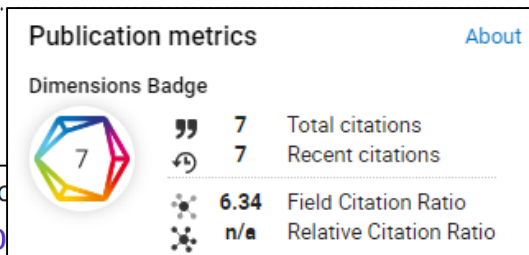
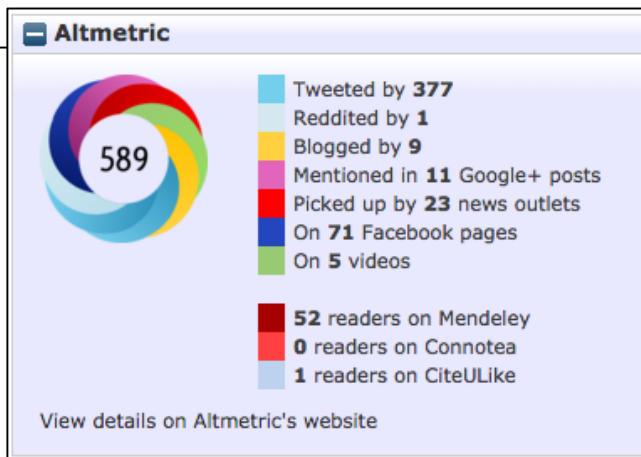
How (often) are scientific articles cited by other scientific articles?

Altmetrics and usage metrics

- Highly heterogeneous, ever-changing set of indicators
- Meant to offset some weaknesses of citations, as web-based metrics usually are
 - faster
 - applicable to more diverse outputs
 - able to reflect more types of impact
 - based on openly available data

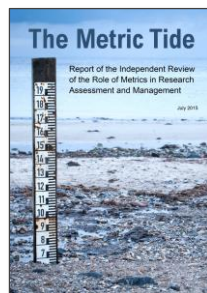
How (often) do users interact with a scientific output online?

More types of research metrics than ever



Debate on metrics use by administration

- Discussed critically in several high-profile publications, e.g.:

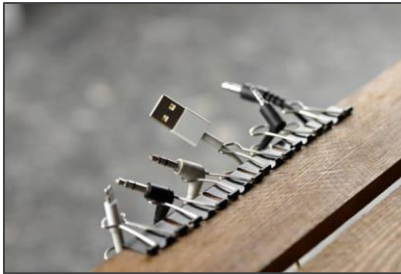


- Consensus: use of impact metrics for micro-level assessments is problematic for a number of reasons, e.g., metrics' biases towards certain disciplines, genders, and languages; substantial differences in publication and citation practices between disciplines; not every research career focuses on publications; etc.

Metrics use by individuals in everyday scenarios

Why is it of interest, how researchers perceive and use metrics?

- Researchers' metrics usage reflects a culture that determines metrics' role within the grander picture
- To develop working strategies on how to advice researchers regarding metrics use, first establishing what they already know and think is important
- And: the *usefulness* of a tool also depends on the subjective perspective of its users: do they understand the tool, do they perceive it as helpful, do they have certain concerns regarding its use?



Context of our studies on researchers' perceptions of metrics

- Part of project **metrics* (2017-2019), which had, among others, the goal to analyze how researchers perceive and use impact metrics
 - Series of focus group interviews and large-scale online surveys (article A)
 - Followed by interactive online experiment and conjoint analysis (article B)
 - Final report summarizing the whole **metrics* project openly available



Article A (Frontiers):
<https://doi.org/10.3389/frma.2018.00039>



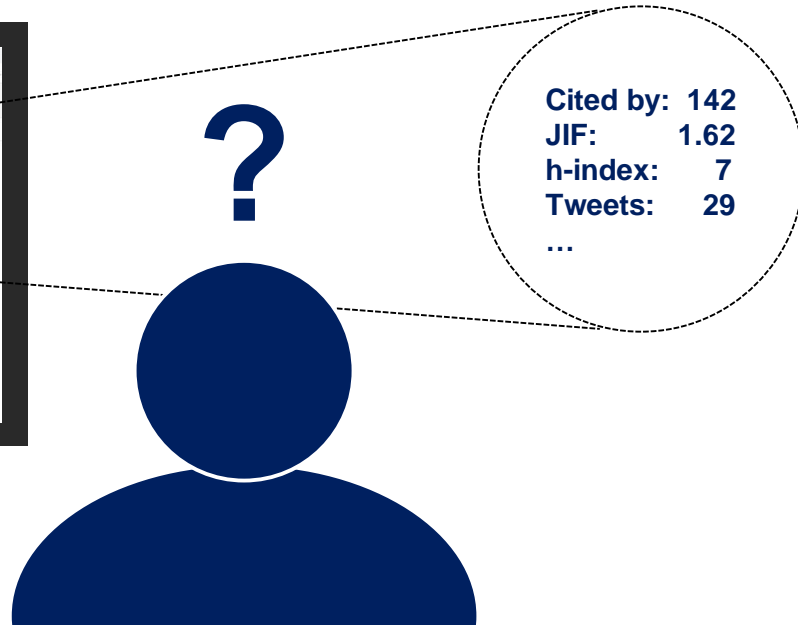
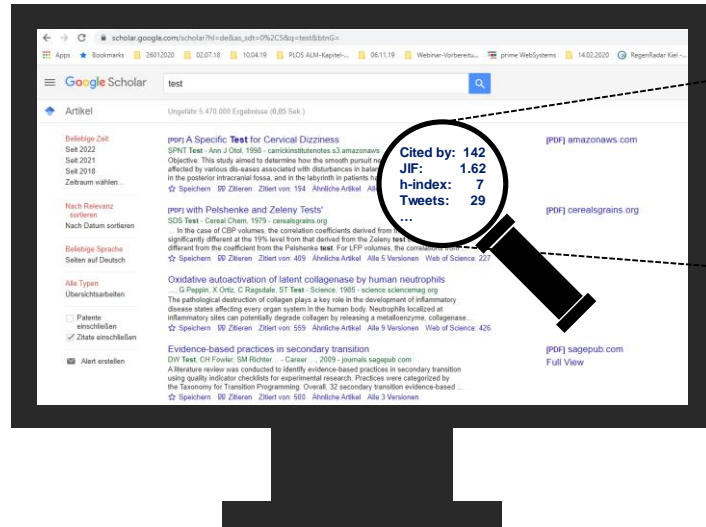
Article B (JASIST):
<https://doi.org/10.1002/asi.24445>



Final project report:
<https://doi.org/10.18452/22242.2>

Our 'everyday scenario': literature selection

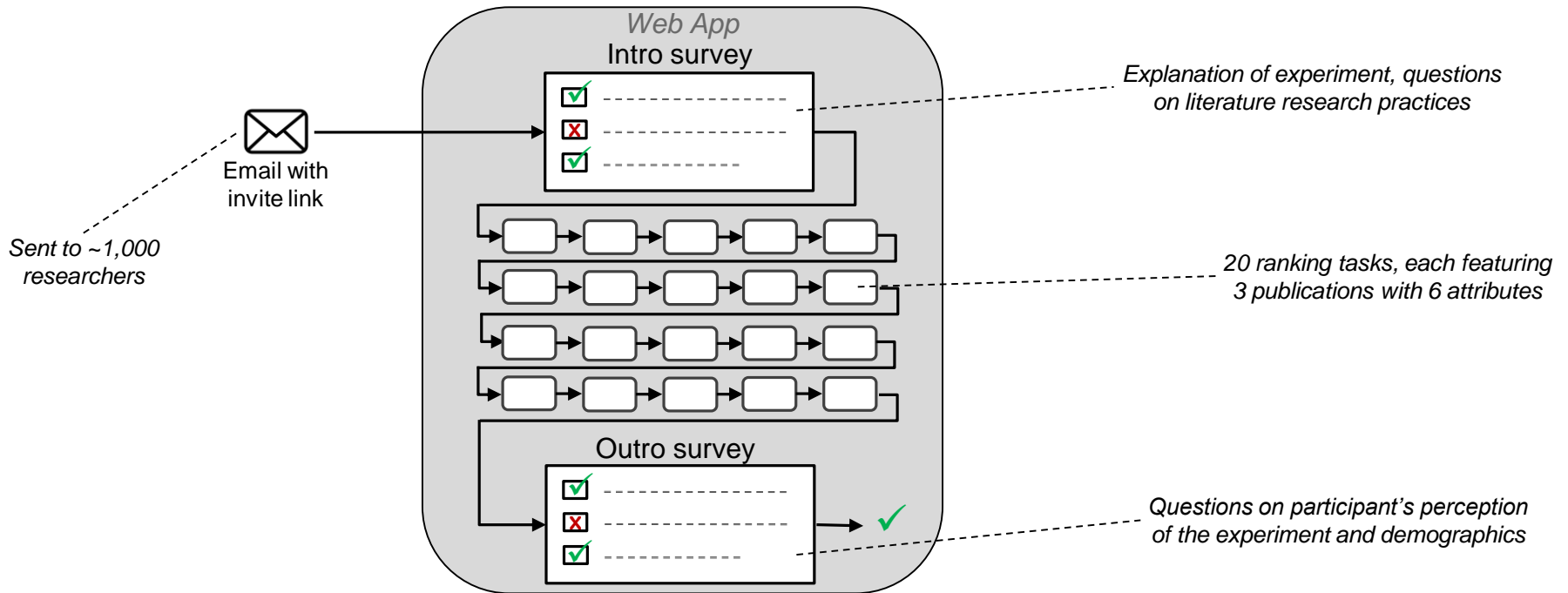
- Use case we examined: metrics use during literature selection



Past research on researchers' literature selection

- Tenopir et al. (2009): analyzed reading patterns of academic staff from US and Australia through survey – found **disciplines** and **work responsibilities** to be important characteristics determining reading behavior
- Niu and Hemminger (2012): framework of demographic, psychological, role-related, and environmental factors affecting scientists' information-seeking behavior; most important determinants are **academic position, gender, and discipline**
- Tenopir et al. (2016): survey on how do researchers determine an article's trustworthiness? by **checking soundness of its arguments and logic, checking if data used in the research are credible, reading the abstract**
- Nicholas et al. (2020): survey aimed at early career researchers found a **journal's prestige, rank and impact factor** as well as **ease of access** to be influential factors for deciding what to read

Online Experiment – Procedure



Free text question from intro survey (n = 205)

“How do you usually determine which search results to read first? Are there publication features you are looking out for?”

Journal (Prestige/Ranking/IF)	84
Citation counts	48
Title	48
Abstract	47
Authors	42
Date of publication/Recency	41
Topical relevance	40
Keywords	24
Other	19
Reference-relations	16
Publisher	11
Order of appearance in search engine	10
Availability/Access	9
Content properties	8
Publication Type	5

Online Experiment – Concept

Idea: participants imagine literature search in unfamiliar field; find three publications along with their metrics – which one would they read first?

Does their selection behavior comply with their statements from surveys?

You are doing literature research for a topic you are not yet familiar with.
Your query in the scholarly search engine of your choice reveals 3 potentially relevant publications alongside their impact metrics.
Please rank those publications in the order in which you would read them by dragging them to the area on the right.
The publication you would read first should afterwards be at the top of the list, the publication you would read last at the bottom.

Publication	Citations (e.g., on GS)	Tweets	Mendeley readers	Downloads	Journal Impact Factor	h-Index
Publication A	5	10	0	100	0	30
Publication B	250	10	0	5000	5.0	30
Publication C	5	500	500	5000	0	5

- Read first -

...

- Read last -

Online Experiment – Attributes

Publication A	
	
	Citations (e.g., on GS) 5
	Tweets 500
	Mendeley readers 500
	Downloads 5000
	Journal Impact Factor 0
	h-Index 5

- the article's *citations* (e.g., on *Google Scholar*) as an article-level bibliometric indicator;
- the publishing journal's *Journal Impact Factor* as a prominent and much-debated journal-level indicator;
- the first author's *h-index* as a widely known author-level indicator;
- the article's number of *downloads* as an article-level usage indicator;
- the article's number of mentions in *tweets* as an altmetric drawn from a social media platform targeted at a general audience;
- the article's number of *readers on Mendeley* as an altmetric drawn from a social media platform targeted at scholars.

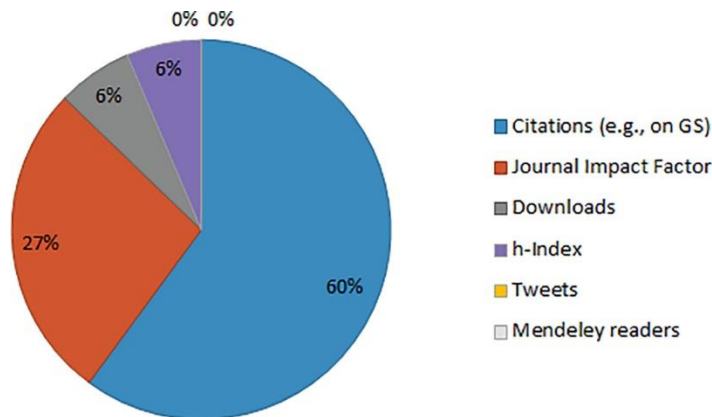
Online Experiment – Results

- Summary of logit regression model based on 7,548 choices made by 247 participants:

Variable	Estimate	SE	<i>p</i>
(intercept)	-0.419	0.016	<.001
Citations (e.g., on Google Scholar)	0.607	0.017	<.001
Journal impact factor	0.468	0.016	<.001
h-index	0.160	0.017	<.001
Downloads	0.247	0.016	<.001
Tweets	0.159	0.016	<.001
Mendeley readers	0.157	0.017	<.001

Online Experiment – Results

- Survey response to *“If you had to choose between the metrics that were presented to you during the previous tasks, which one do you consider most helpful as a tool for deciding which publications to read?”*:



Online Experiment – Results

k-means clustering of participants based on ranking similarities (with *k* = 4):

Variable	Estimates			
	C1	C2	C3	C4
<i>n</i>	65	67	20	53
Citations	0.853 ^{***}	0.302 ^{***}	0.332 ^{***}	0.935 ^{***}
Journal impact factor	0.486 ^{***}	0.808 ^{***}	0.146 ^{**}	0.248 ^{***}
h-index	0.227 ^{***}	0.167 ^{***}	0.086	0.171 ^{***}
Downloads	0.052	0.188 ^{***}	0.603 ^{***}	0.455 ^{***}
Tweets	0.097 ^{**}	0.171 ^{***}	0.148 ^{**}	0.286 ^{***}
Mendeley readers	0.083 ^{**}	0.274 ^{***}	0.104 [*]	0.167 ^{***}
Cluster description	"Bibliometrics-believers"	"IF-fixated"	"Usage evidence enthusiasts"	"Open-minded citation users"



Free text question after the experiment (n = 132)

“Now after having finished the experiment, would you like to add anything to your previous answer?”

Journal (Prestige/Ranking/IF)	84	+39
Citation counts	48	+61
Title	48	+1
Abstract	47	+1
Authors	42	+9
Date of publication/Recency	41	+10
Topical relevance	40	+1
Keywords	24	
Other	19	
Reference-relations	16	+3
Publisher	11	
Order of appearance in search engine	10	
Availability/Access	9	
Content properties	8	+1
Publication Type	5	

New entries – metrics:

Downloads	32
H-Index	24
Mendeley Readers	2
Tweets	4

Key findings

- Many qualitative features are important to researchers for deciding what to read, e.g., titles, abstracts, author names, recency, or topical relevance
- However: quantitative bibliometrics (esp. citations and JIF) were among the most looked out for features as well

Findings from focus group interviews and surveys

Further conclusions from interviews (n=9) and two online surveys (n=1,065; n=1,018):



<https://doi.org/10.3389/frma.2018.00039>

- Most researchers are aware of metrics and many seem to act with metrics in mind, e.g. for deciding what to read or cite and where to submit manuscripts
- Often little knowledge about how metrics are calculated and their relevant shortcomings
- Skepticism towards altmetrics sometimes is not applied to bibliometrics
- More widespread *metrics literacy*¹ (or *metric-wiseness*²) is needed

¹<https://stefaniehaustein.com/metrics-literacy/>

²<https://doi.org/10.3145/epi.2017.may.14>

Suggested resources for achieving metrics literacy

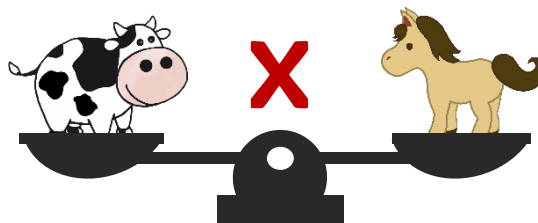
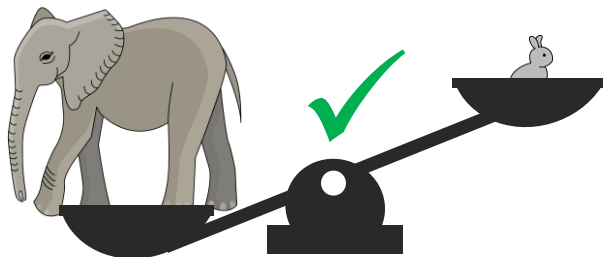
- The *Parthenos Project* can serve as a general introduction to research impact measurement:
<https://training.parthenos-project.eu/sample-page/intro-to-ri/research-impact/>
- The best practices for the use of bibliometrics condensed within the *Leiden manifesto* showcase many relevant pitfalls:
<http://www.leidenmanifesto.org/>
- The *Metrics Toolkit* provides helpful explanations of many indicators and their appropriate handling:
<https://www.metrics-toolkit.org/>
- The *IUPUI* lists more resources for further reading on responsible use of metrics:
<https://researchmetrics.iupui.edu/responsible-metrics.html>

Take away 'in a nutshell'

What should be communicated to any user of impact metrics:

- **In any type of decision-making, ideally metrics only complement but do not replace qualitative review.**

It might be helpful to think of metrics as *a scale that can distinguish an elephant from a bunny, but not a horse from a cow.*



Thank you very much for your attention!
Questions?

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