



## Research Intelligence

# Metrics Selection Across the Research Lifecycle

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## Research Metrics Can Be Used to...



Analyze the strengths of research at the institution



Determine where research is a good potential investment



Demonstrate ROI (Return On Investment) of research money



Identify rising stars amongst the early career researchers



Tell a better narrative about everything that is happening with research

# Different Researchers Have Different Needs for Metrics



# Research Metrics Throughout the Research Process



# Diverse Needs for Metrics

**F. Qualitative input**  
Expert feedback on quality and impact of my research

Theme	Sub-theme	Metrics in areas of
<b>A. Funding</b>	<b>Awards</b> Can I support my research?	Number, monetary value and duration of awards
<b>B. Outputs</b>	<b>Productivity of research outputs</b> How productive am I?	Number, types and growth of outputs (e.g. articles, books, research data, works of art)
	<b>Visibility of communication channels</b> What is the impact of the channels that my outputs are published in?	Impact of communications channels published in (e.g. citation impact of journals, visibility of data repositories and blogs, prestige of conferences, status of books publisher, accessibility of channel)
<b>C. Research Impact</b>	<b>Research influence</b> How are my outputs used in academia?	Views (usage) impact, citation impact Research reputation: awards, prizes Altmetrics: scholarly activity and scholarly discussion
	<b>Knowledge transfer</b> How are my outputs used in industry?	Commercial use (e.g. number of patents, licenses, and spin outs; extent of consultancy work), translational research
<b>D. Engagement</b>	<b>Academic network</b> How good is my collaboration network within academia?	Collaboration: geographical, cross-sector, cross-disciplinary Network: number of collaborators, centrality, connectedness, geographical extent Crowd-sourcing: collect and analyze data, raise funding (through academic and wider networks)
	<b>Non-academic network</b> How good is my collaboration network outside academia?	
	<b>Expertise transfer</b> How do I transmit knowledge to others within academia?	Who supervised me, and who have I supervised? Where are alumni working? Editorships and peer review (frequency and quality for journals, books and funders). Teaching metrics
<b>E. Societal Impact</b>	<b>Societal Impact</b> What is my wider impact?	Direct and indirect impact on general public's well being and understanding of research (e.g. influence on policy, improvements in health care and outcomes of medical interventions, altmetrics: social impact and media mentions)

## Diverse Needs for Metrics...and Diverse Entities

F. Qualitative input

Metric theme	Metric sub-theme
A. Funding	Awards
B. Outputs	Productivity of research outputs
	Visibility of communication channels
C. Research Impact	Research influence
	Knowledge transfer
D. Engagement	Academic network
	Non-academic network
	Expertise transfer
E. Societal Impact	Societal Impact
	Policy



**Outputs**  
e.g. article, research data, blog, monograph

**Custom set of outputs**  
e.g. funders' output, articles I've reviewed

**Researcher or group**

**Institution or group**

**Subject Area**

**Serial**  
e.g. journal, proceedings

**Portfolio**  
e.g. publisher's title list

**Country or group**



## Examples of Metrics



### Researcher Level

- Document Count
- *h*-Index



### Article Level

- Citation Count
- Citations per paper
- Field-Weighted Citation Impact (FWCI)
- Outputs in top quartile
- Citations in policy and medical guidelines
- Usage
- Captures, e.g. bookmarking
- Mentions
- Social media



### Journal Level

- CiteScore
- Journal Impact Factor
- Scimago Journal Rank (SJR)
- Source Normalized Impact Per Paper (SNIP)

# SciVal Metrics

Slice and dice your data from multiple angles to identify your core strengths and weaknesses

## Productivity metrics

- Scholarly Output
- Outputs in Top Percentiles
- Publications in Top Journal Percentiles

## Citation Impact metrics

- Citation Count
- Citations per Publication
- Cited Publications
- Number of Citing Countries
- h*-indices (*h*, *g*, *m*)
- Field-Weighted Citation Impact
- Citing-Patent Count
- Patent-Cited Scholarly Output
- Patent-Citations Count
- Patent-Citations per Scholarly Output

## Collaboration metrics

- Collaboration (geographical)
- Collaboration Impact (geographical)
- Academic-Corporate Collaboration
- Academic-Corporate Collaboration Impact

## Disciplinarity metrics

- Journal count
- Journal category count

## Usage metrics (Trends module)

- Views Count
- Views per Publication
- Field-Weighted Views Impact



## Users in Different Countries Select Different Metrics

Metric	World	Australia	Canada	China	Germany	Japan	United Kingdom	United States
Field-Weighted Citation Impact	1	1	1	3	2	4	3	1
Outputs in Top Percentiles	2	2	3	1	4	1	1	6
Publications in Top Journal Percentiles	3	4	2	2	6	2	2	5
Collaboration	4	6	6	5	1	3	5	7
Citations per Publication	5	3	7	6	3	5	4	3
Citation Count	6	5	5	4	8	6	6	2
h-indices	7	7	4	8	7	7	7	4

Usage of metrics available in SciVal's Benchmarking module from 11 March 2014 to 28 June 2015.

A partial list of the metrics available at that time is shown, focusing on the most frequently-used. Scholarly Output it excluded since this is the default.

Note that recently added metrics based on e.g. media mentions and awards data were not available at this time and so are not represented in this analysis.

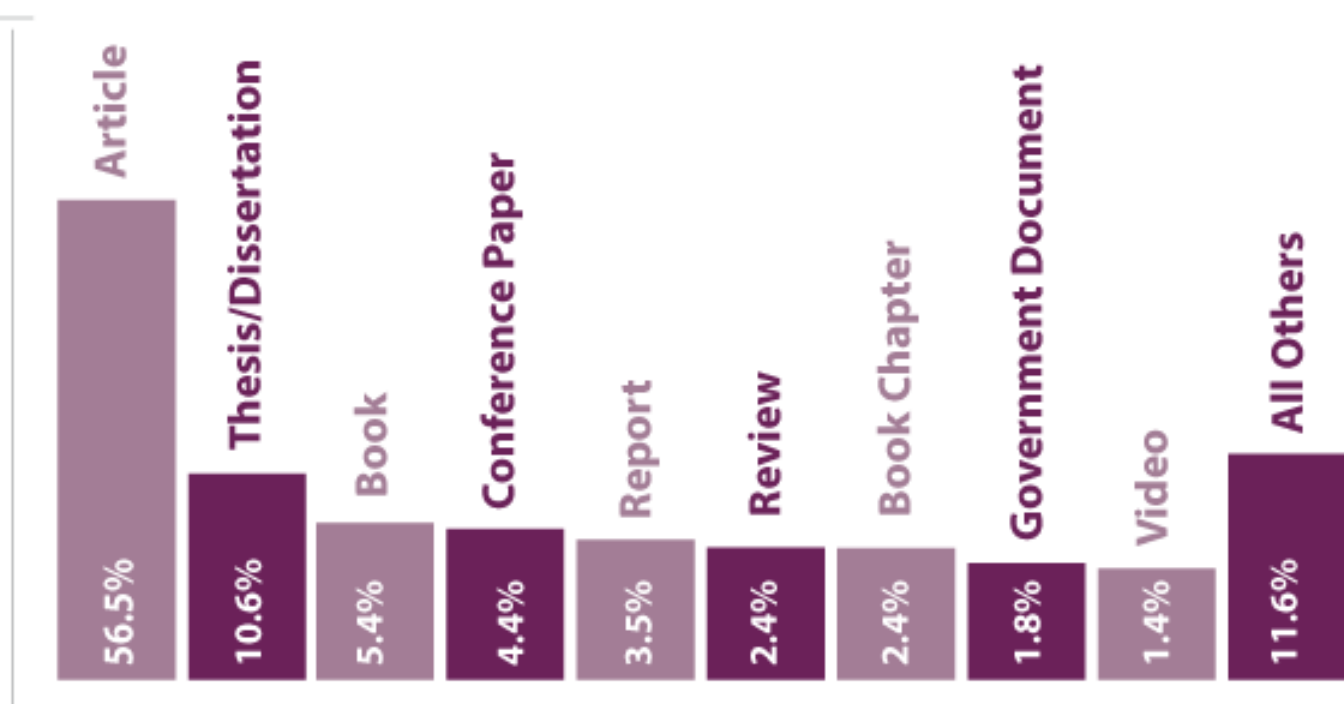
# Types of Research Output

## What is Research Output?

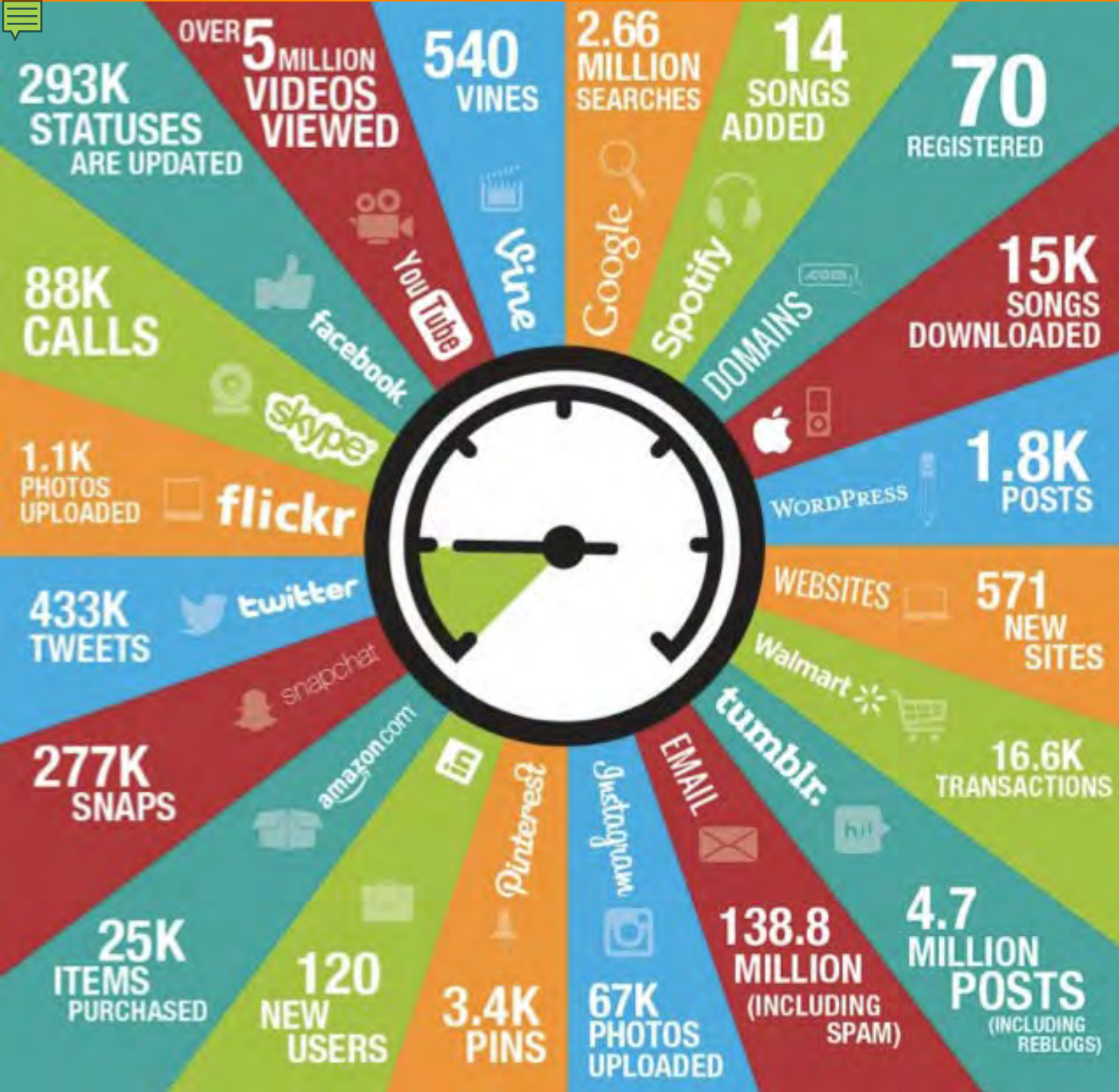
There are  
**67**  
ARTIFACT  
TYPES

Research output is  
more than articles.

Measure  
it ALL



PlumX Customers' Research by Type



ONLINE IN  
**60**  
SECONDS  
A YEAR LATER

**qmee.com**

DATA

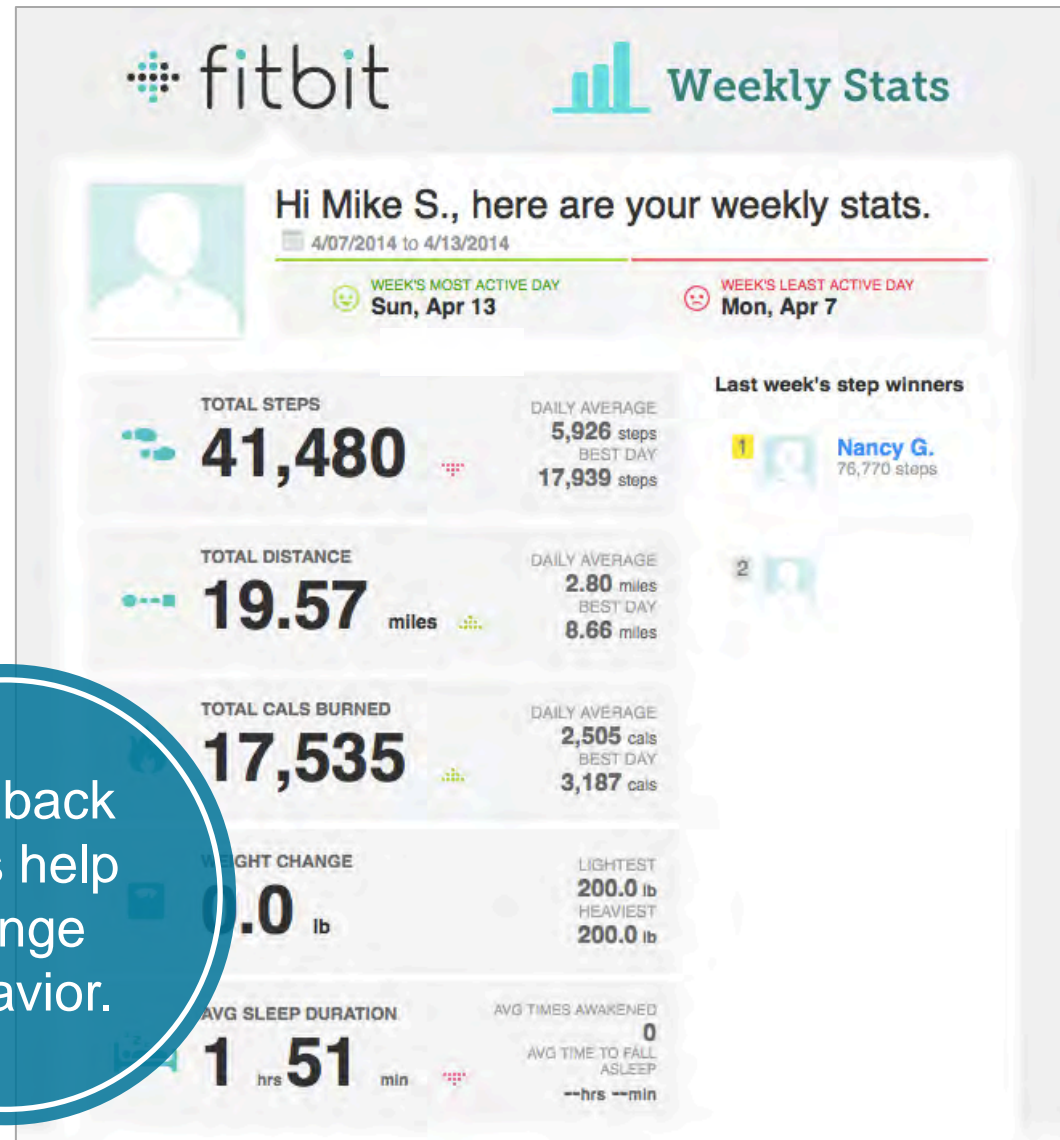
[www.internetlivestats.com](http://www.internetlivestats.com)  
[www.the-social-skinny.com](http://www.the-social-skinny.com)  
[www.econsultancy.com](http://www.econsultancy.com)  
[www.cnn.com](http://www.cnn.com)  
[www.wikibon.org](http://www.wikibon.org)  
[www.flickr.com](http://www.flickr.com)  
[www.wiredart.com](http://www.wiredart.com)

[www.linkedin.com](http://www.linkedin.com)  
[www.tumblr.com](http://www.tumblr.com)  
[www.quora.com](http://www.quora.com)  
[www.amazon.com](http://www.amazon.com)  
[www.lacpsocialmedia.org](http://www.lacpsocialmedia.org)  
[www.flickr.com](http://www.flickr.com)  
[www.mashable.com](http://www.mashable.com)

## Metrics that update in real time provide a Feedback Loop

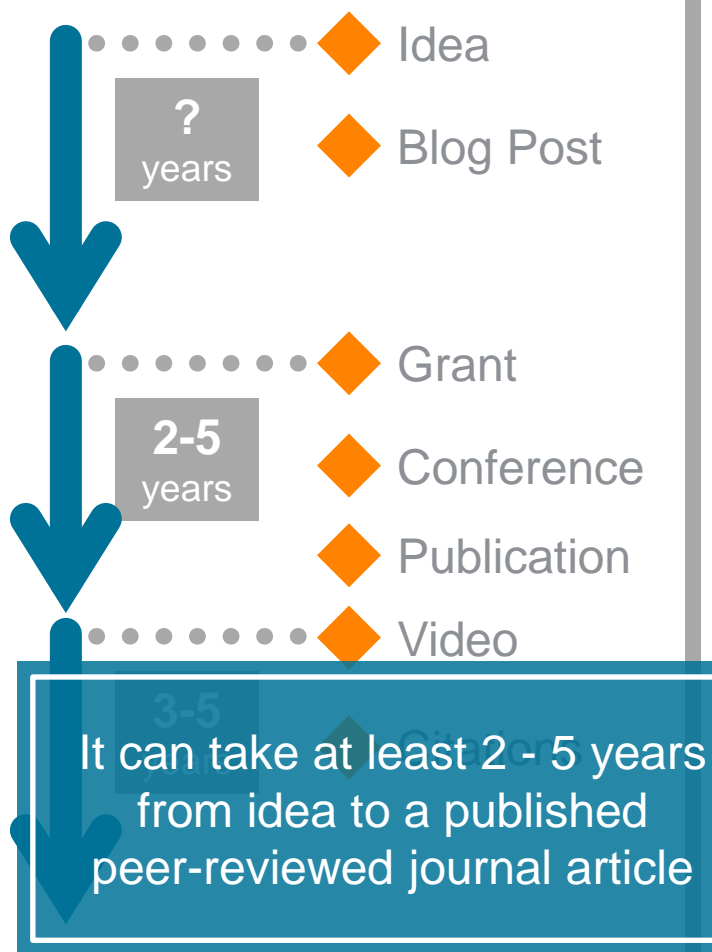


Feedback loops help change behavior.





# Metrics timeline: From Idea to Impact



## Old Paradigm

## New Paradigm

From idea to measurable citation counts can take 5 - 10 years

Due to the pace of scholarly publishing, it takes another 3 - 5 years from the time the work is published to get to critical mass of citation counts

Metrics available immediately



click



tweet



presentation view



dataset download



PDF download



bookmark



save reference



video play



share



citation counts



citation counts

## Sources of Metrics

ACI	Facebook	SciELO
Amazon	figshare	Scopus
Airiti	Github	SlideShare
bepress	Goodreads	SourceForge
bit.ly	Google+	SSRN
CABI	Mendeley	Stack Exchange
CrossRef	NICE NICE (UK)	Twitter
Delicious	PKP OJS Journals	USPTO
Dryad	PLOS	Vimeo
dSpace	PubMed	Wikipedia
DMP DynaMed Plus	PubMed Central	Worldcat
EBSCO	Reddit	(OCLC)
ePrints	RePEc	YouTube

# Identifying Research

- DOI
- URL
- OCLC ID
- ISBN
- SSRN
- Scopus Author ID
- ORCID iD
- VIVO Author ID
- VIMEO Video ID
- YouTube Video ID
- Slideshare Slideshow ID
- RSS Link





# Plum Analytics – Plum Goes Orange



# Categorizing Metrics for Analysis



## USAGE

(clicks, downloads, views,  
library holdings, video plays)



## CAPTURES

(bookmarks, code forks, favorites,  
readers, watchers)



## MENTIONS

(blog posts, comments, reviews,  
Wikipedia links)



## SOCIAL MEDIA

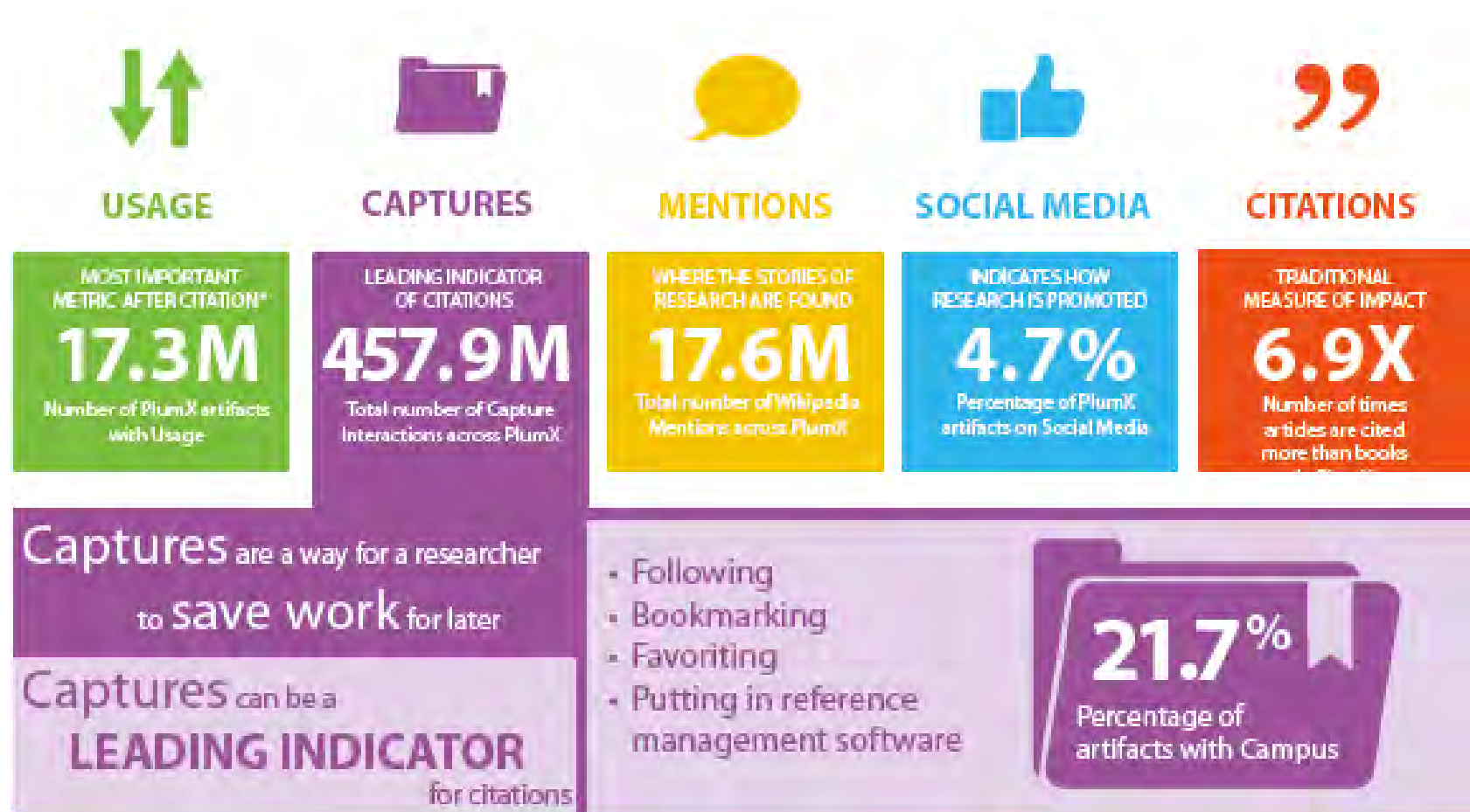
(+1s, likes, shares, tweets)



## CITATIONS

(citation indexes, patents,  
clinical, policy)

# How Do You Measure Research Output



## PlumX is Comprehensive



**52.6**  
MILLION

Total number of artifacts in PlumX



**9.4**  
BILLION

Total number of interactions with  
research in PlumX



**83.2%**

Percentage of customer artifacts  
that have at least one metric

# The Plum Print



- Visualizes scholarly engagement
- Includes 5 categories of metrics
- Designed to communicate engagement without a score

# PlumX Metrics Integration

## PlumX Metrics will integrate with Elsevier products

- Scopus
- SciVal
- Pure
- Mendeley
- ScienceDirect
- Journal Pages



# Golden Rules for Using Research Metrics

Use both **qualitative** and **quantitative** input into your decisions

This is about benefitting from the strengths of both approaches, not about replacing one with the other

Combining both approaches will get you closer to the whole story

Valuable intelligence is available from the points where these approaches differ in their message

Use **more than one** research metric as the quantitative input

A research metric's strengths can complement the weaknesses of others

There are lots of different ways of being excellent

Using multiple metrics drives desirable changes in behaviour



## Responsible Metrics

- **Robustness**: basing metrics on the **best possible data** in terms of accuracy and scope
- **Humility**: recognizing that quantitative evaluation should support – but not supplant – **qualitative, expert** assessment
- **Transparency**: keeping data **collection** and analytical processes open and transparent, so that those being evaluated can test and verify the results
- **Diversity**: accounting for **variation** by field, and using a variety of indicators to support diversity across the research system
- **Reflexivity**: recognizing **systemic** and potential effects of indicators and updating them in response

*<http://www.hefce.ac.uk/pubs/rereports/year/2015/metrictide/>*

## Mechanisms for Gathering Metrics is Important

From the NISO Code of Conduct for altmetrics

Describe all known limitations of the data.

Detail how often data are updated.

Describe how data are aggregated.

Provide a clear definition of each metric.

## Summary

**Diverse and evolving set of metrics for different needs, themes, entities and outputs**

**Select metrics based on goals and timeliness to create a feedback loop for researchers**

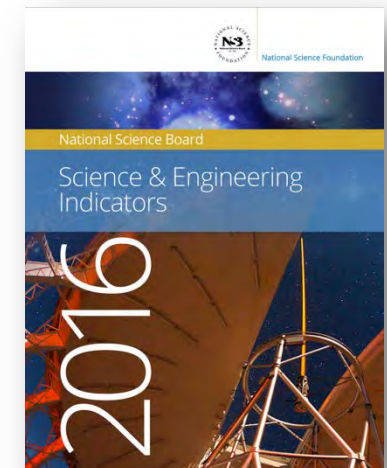
**Categorize metrics for analysis, compare like with like**

**Use more than one metric when making decisions and determinations**

**Both qualitative and quantitative metrics are needed to fully describe research performance**

## A Final Note: Global University Rankings

- Key performance indicators that showcase distinctive strengths of research institutions
- Help students select their university of choice, faculty to make career decisions, and university leaders to discuss strategic priorities
- Accuracy and integrity are crucial
- Must deploy a range of techniques – both qualitative and quantitative



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## Thank you

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