REQUISITE VARIETY IN SCHOLARLY METRICS

Novel forms of scholarly impact: Seeking validation in an open metric market

CASSIDY R. SUGIMOTO
INDIANA UNIVERSITY
“Two years on since the publication of altmetrics manifesto, little has changed in academia. Social media has not been taken up as an integral part of the academic measurement of scientific achievement. There seems to be a lot of skepticism concerning its real value. Resistance to such change is rooted in that these new evaluation methods have not sufficiently been validated to be ready for adoption.”
Criticism: Wouters & Costas (2012)

Altmetrics need a “far stricter protocol of data quality and indicator reliability and validity” before they can be appropriately applied to impact assessment.
Leiden Manifesto (2015)

“Metrics have proliferated: usually well intentioned, not always well informed, often ill applied.”
Beyond validity and reliability
The vision of altmetrics: Priem (2014)

1. “an approach to uncovering previously invisible traces of scholarly impact by observing activity in online tools and systems”

2. “agues that citations, while useful, miss many important kinds of impacts”

3. “citations are products of a slow rigid formal communication systems, while scientific ideas themselves are born, nursed, and raised in messy, fast-moving informal invisible colleges”
The promise of altmetrics

Graphic by Stefanie Haustein
The critique of citations
The reality of altmetrics
Correlational analyses
REQUISITE VARIETY

rather than “alt”metrics
Law of requisite variety

If a system is to be stable,

the number of states of its control mechanism must be greater than or equal to

the number of states in the system being controlled.
Data
Thesis
Conf. paper
Jrnl article
Book
Blog
Role of the publisher
WHO ARE THE PRODUCERS?
What does it matter who is speaking?
Changing notions of authority
**PRODUCERS**

**INTERNET BASED SOURCES**

**PRIMARY SOURCES**
- Selection
- Production
- Distribution

**SECONDARY SOURCES**
- Analysis & storage
- Dissemination

**TERTIARY SERVICES**
- Evolution
- Compression
- Consolidation

**INTERNET BASED SOURCES**

**E-LIBRARIES**

**ABSTRACTING & INDEXING SERVICES**

**PUBLISHERS EDITORS PEER-REVIEW**

**PREPRINT DATABASES**

**SEARCH ENGINES/META SEARCH TOOLS AND VIRTUAL LIBRARIES/DIRECTORIES/LEARNING HOUSES**

**PRIMARY SOURCES**
- Selection
- Production
- Distribution

**SECONDARY SOURCES**
- Analysis & storage
- Dissemination

**TERTIARY SERVICES**
- Evolution
- Compression
- Consolidation

- Dictionaries, thesaurus
- Reviews, Syntheses, etc.
- Special Bibliographies, Translation
- OPACS
- Abstracts & Index Journals
- Thesis, reports
- E-mail, List servers, UseNet news newsgroups, Electronic meeting/webcam conferencing

**REVISED UNISIST**

(Sondergaard, Andersen, & Hjørland)
NEW MODEL
Reconceptualizing (micro)attribution in an era of hyperauthorship
Gender differences in authorship
Cinderella Effect

Odds of females relative to males

- Analysis: 0.90
- Design: 0.90
- Material: 0.84
- Perform experiments: 1.52
- Write: 0.92

Note: The data indicates a higher odds ratio for females performing experiments compared to males.
To each scholar, her platform
Pretty, but not professional
What we know

Producers are diverse and vary significantly by platform. Producers vary in how they contribute (and how much).

What we can do

Create mechanisms to capture the diversity of producer input.
WHAT IS BEING PRODUCED?
MakerSpaces

the MAKERSPACE
a space dedicated to creating, making and idea generating
Diversifying genres (Thelwall)
Preprints replacing articles?
Preprints replacing articles?
Academic genealogy

The MPACT Project is an academic genealogy project devoted to defining and assessing mentoring as a scholarly activity, examining the emergence and interaction of disciplines, and identifying patterns of knowledge diffusion. MPACT is a joint project between Indiana University Bloomington and the University of North Carolina at Chapel Hill.
## Interdisciplinarity

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What we know

There is a proliferation in new types of products being created and used.
New forms are not replacing the old.

What we can do

Create mechanisms to capture the diversity of input in the system.
Link production with producers.
HOW IS IT BEING REVIEWED?
#SixWordPeerReview

- Your bibliography is a giant selfie
- I don’t get paid for this
- Too much data, too little evidence
- How could you not cite Wellman? [tweeted by Wellman]
- Have you tried a linear regression?
- Taking my time. Love, your Competitor
- Contradicts my findings. Can’t be true.
- I thought of this in 1973
- Please do more experiments for me
Distributed labor and microtasks
Publishers?
What we know

Open peer review projects have failed. Scholarship is becoming more interdisciplinary and may require great variety in review.

What we can do

Create mechanisms to incentivize reviewing.
Create systems to operationalize micro-reviewing.
HOW IS IMPACT MEASURED?
Cognitive control is defined by a set of neural processes that allow us to interact with our complex environment in a goal-directed manner. Humans regularly challenge these...
Individual

ImpactStory
Open carrots for Open science

Funders bring the sticks, we add carrots. ImpactStory helps open scientists tell the full story of their research impact: we reveal diverse metrics of engagement and reuse for articles, datasets, software, and more.

Embed on your CV

Custom persistent URL

Context for your metrics

Open data, open source

ImpactStory is a non-profit built around open tools to support web-native scholarship.
Institutional
Global (social impact?)
ARE THE METRICS VALID?
# Meanings and motivations

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<th>Article</th>
<th>Journal</th>
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<td>Hess et al. (2011). Gain of chromosome band 7q11 in papillary thyroid carcinomas of young patients is associated with exposure to low-dose irradiation</td>
<td>PNAS</td>
<td>9</td>
<td>963</td>
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<td>Yasunari et al. (2011). Cesium-137 deposition and contamination of Japanese soils due to the Fukushima nuclear accident</td>
<td>PNAS</td>
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<td>Sparrow et al. (2011). Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips</td>
<td>Science</td>
<td>11</td>
<td>558</td>
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<td>Onuma et al. (2011). Rebirth of a Dead Belousov–Zhabotinsky Oscillator</td>
<td>Journal of Physical Chemistry A</td>
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<td>Silverberg (2012). Whey protein precipitating moderate to severe acne flares in 5 teenaged athletes</td>
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<td>Reaves et al. (2012). Absence of Detectable Arsenate in DNA from Arsenate-Grown GFAJ-1 Cells</td>
<td>Science</td>
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<td>323</td>
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<td>Bravo et al. (2011). Ingestion of Lactobacillus strain regulates emotional behavior and central GABA receptor expression in a mouse via the vagus nerve</td>
<td>PNAS</td>
<td>31</td>
<td>297</td>
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Meanings and motivation

Score in context:
Is one of the highest ever scores in this journal (ranked #1 of 440)

Mentioned by:
- Richard P Grant (@rpg7twit)
  3,040 followers
  Via @skdh: Best. Abstract. EVER http://t.co/T24ynptn
  14-Oct-2011
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  14-Oct-2011
Meanings and motivations

Variation in Melanism and Female Preference in Proximate but Ecologically Distinct Environments

Although association preferences documented in our study theoretically could be a consequence of either mating or shoaling preferences in the different female groups investigated (should we cite the crappy Gabor paper here?), shoaling preferences are unlikely drivers of the documented patterns both because of evidence from previous research and inconsistencies with a priori predictions. Our methods closely followed those of published mate choice experiments in this system (Tobler et al. 2009a, b; Plath et al. 2013),
Who is tweeting?

- **initiator**
  - person
  - organization

- **Twitter account**
  - human
  - cyborg
  - bot

- **tweeting criteria**
  - selective qualitative human judgment
  - non-selective automated

---

engagement dissemination
Levels of engagement

**low engagement**

- Percentage (%) represents similarity between paper title and tweet text

  - **A unification of RDE model and XCDM model**
    - hep articlebot @heptwit
    - 100%
    - arxiv.org/abs/1212.5790

  - **On the calculation of percentile-based bibliometric indicators**
    - JASIST @JASIST
    - 100%
    - ow.ly/h8Kzp

  - **Hysteretic response characteristics and dynamic phase transition via site dilution in the kinetic**
    - C @physarxiv
    - 87%
    - arxiv.org/abs/1206.5425

**high engagement**

  - Sarah Kendrew @sarahkendrew
    - 36%
    - Burkert & Hartmann on star formation thresholds, should be good. arxiv.org/abs/1212.4543 with nod to newly be-doctored @alunacentroid too!

  - Jan Hattenbach @JanHattenbach
    - 16%
    - Richard Ellis about possible detection of z=11.9 galaxy in Hubble data: "While definitively real, we remain cautious of its nature" #AAS221

  - Julian Taub @JulianTaub
    - Any links to learn more about the galaxy?

  - Jan Hattenbach @JanHattenbach
THE FUTURE OF SOCIAL MEDIA METRICS

Challenges and opportunities ahead
Open <fill in the blank>
Standardization and unification
Providing access or amplifying disparities?

The Geographically Uneven Coverage of Wikipedia

While it is an invaluable resource of knowledge for numerous users, Wikipedia's articles have a strong bias in their geographic distribution. Below map is based on 3,336,473 geotagged articles in November 2012 data dumps of 44 language versions. Each article is represented by an orange dot.

There are more Wikipedia articles inside this circle than outside of it

This map is part of the Information Geographies project at http://geography.oxon.ac.uk.

Data sources: Wikipedia, Natural Earth
Campbell’s Law

“The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor.”
THANK YOU!

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SUGIMOTO@INDIANA.EDU
WITH QUESTIONS