Open Science: Altmetrics and Rewards

Kim Holmberg
Senior researcher, PhD
RUSE - Research Unit for the Sociology of Education
University of Turku, Finland
(e) kim.j.holmberg@utu.fi
(w3) http://kimholmberg.fi
@kholmber
Scholarly communication encompasses all communicative activities of scholars, including **formally** publishing and citing articles in scientific journals and **informally** discussing research and sharing research outputs on various forums.
Peer-reviewed **scientific journals** (in the beginning published often by scientific societies) replaced earlier personal correspondences and became the platform for **dissemination** and **registration of one’s contribution to science**.

*Journal de Sçavans* and *Philosophical Transactions* in 1665
Increase in scientific publishing: example case arXiv

https://arxiv.org/ Open access to 1,300,901 e-prints in Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance and Statistics
Citation index

“It would not be excessive to demand that the thorough scholar check all papers that have cited or criticized such papers, if they could be located quickly. The citation index makes this check practicable.”


**Eugene Garfield** founded the Institute for Scientific Information (ISI) in 1960. It is now known as Clarivate Analytics. **Web of Science**, an online scientific citation indexing service, is part of it.
Bibliometrics

“the study of quantitative aspects of the production, dissemination, and use of recorded information”

The research field develops mathematical models and measurements for these processes that can be used for prognoses of the future and to support decision making.

Number of records about **bibliometrics** as indexed by Web of Science
Sociology of Science

“Instrumentally, it [the reference] tells us of work we may not have known before, some of which may hold further interest for us; symbolically, it registers in the enduring archives the intellectual property of the acknowledged source by providing a pellet of peer recognition of the knowledge claim, accepted or expressly rejected, that was made in that source.”

Disciplinary differences in Twitter scholarly communication

Authors
Kim Holmberg, Mike Thelwall

Citations
WEB OF SCIENCE™: 42
Scopus®: 49
Google Scholar: 104
Microsoft Academic: 94

Altmetric Attention Score: 43
"Citation frequency is a measure of research activity, or of communication about research activity. The measure is a sociometric device. In itself, the number of citations of a man’s work is no measure of significance. [...] it must be used along with other scales to obtain anything useful or meaningful, particularly if the object of the evaluation is in any way qualitative."

Journal Impact Factor is the yearly average number of citations to recent articles published in that journal. It is used as a proxy for the relative importance of a journal within its field.

However, the term “impact factor” has gradually evolved to describe both journal and author impact...

Total number of times its articles were cited during the two previous years

\[ \div \] \hspace{2cm} \text{Total number of citable articles in the journal during those two years} \]

\[ = \] \hspace{2cm} \text{A journal’s Impact Factor for a particular year} \]
The \( h \) index

“I propose the index \( h \), defined as the number of papers with citation number \( \geq h \), as a useful index to characterize the scientific output of a researcher.”


There are, however, a number of situations in which \( h \) may provide misleading information about a scientist's output!
publish or perish...

in high impact journals
Complexity of scientific activities
Open science is
“the idea that scientific knowledge of all kinds should be openly shared as early as is practical in the discovery process.”

OPEN; meaning broader understanding of impact, reflecting the “need to update standards in order to better incentivize researchers to produce quality work instead of quantity of research papers.”

Altmetrics
the study and use of scholarly impact measures based on activity in online tools and environments

“...altmetrics presents an alternative to the current practice of relying only on citation counts and journal impact factors for the quantitative analysis of impact by introducing new complementary approaches and sources of data.”

Possibilities with altmetrics
Altmetrics can be used to map how researchers are engaging with the public (and others)


Altmetrics can reflect different types of impact, such as impact that research have had on health, culture, education, economy, environment, and including science.
Altmetrics can reflect different levels of impact or engagement
Challenges with altmetrics
The **meaning and applicability** of altmetrics generated on different platforms is still **unclear**
Goodhart’s Law: When a measure becomes the target, it ceases to be a good measure

Goodhart, 1975

Altmetrics are easily manipulated!
Mutual Learning Exercise – Open Science: Altmetrics and Rewards
MLE on Open Science

Jan 2017 – Jan 2018, 13 countries

Three topics:

1. The potential of altmetrics – alternative (i.e. non-traditional) metrics that go beyond citations of articles – to foster Open Science

2. Incentives and rewards for researchers to engage in Open Science activities

3. Guidelines for developing and implementing national policies for Open Science

Goals of Mutual Learning Exercise

1. Address challenges related to the implementation of Open Science
2. Identify good practices, lessons learned and success factors by analysis and discussion of member states’ experiences
3. Promote policy learning from each other
4. Provide high level advice and assistance from external experts in fine-tuning or implementing change in the design of current policy system
5. Follow a modular approach with country visits, workshops, etc.
Overview of different types of altmetrics currently used or investigated in research assessment, and their benefits and challenges.

Review of the situation in the participating countries.

Conclusions:
- Altmetrics are not yet being used for research evaluation purposes.
- Altmetrics hold a lot of promise, but it is too early to use them for research evaluation and decision making.
- More research is needed.

Altmetrics could
- promote Open Science by broadening our understanding of impact
- contribute to the academic reward system
- promote wider adoption of Open Science (Open Access Altmetrics Advantage)

Issues are:
- Not enough evidence
- Limitations of (proprietary) data sources
- Methods are not yet open

This report provides
- systematic overview of the advantages and challenges of supporting OS activities
- incentives and rewards that most effectively encourage the adoption and implementation of OS policies.
- a summary of the main advantages and disadvantages of each type of incentive

The report suggests that incentives and rewards should be applied to three groups of key stakeholders: (1) researchers; (2) research-performing institutions and funding bodies; and (3) national governments.

This report
- proposes a National Roadmap for the Implementation of Open Science
- outlines key priorities and principles underpinning the implementation of Open Science at the national level
- reviews existing experiences in developing and supporting OS activities and related policies
- summarises the strategies, lessons learnt and models proposed to date.
Obstacles to Making Science Open

1. Evaluation and credit systems
2. Diversity in research cultures
3. Costs and accountabilities
4. Skills and training
5. Intellectual property regimes
6. Semantic ambiguity
7. Ethical and social concerns
8. High resource bias
Incentives and rewards for researchers

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Career &amp; Research Evaluation</td>
<td>Fairer assessment of research efforts (that take the complexity of scientific activities into account)</td>
</tr>
<tr>
<td>OS Training &amp; Education Resources</td>
<td>Better training and support for research dissemination (OA), data curation (OD) and public engagement</td>
</tr>
<tr>
<td>Citation, Authorship &amp; Publication system</td>
<td>Shifts in publishing and citation cultures, and recognition (and rewarding) of other activities, such as peer review</td>
</tr>
<tr>
<td>Long-Term Sustainability</td>
<td>Reliable Open Science infrastructures, that guarantee long term support and sustainability (e.g., data repositories)</td>
</tr>
<tr>
<td>OS Role Models</td>
<td>Visible recognition of Open Science activities (e.g., OS prizes)</td>
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Open Science Career Assessment Matrix (OS-CAM)

RESEARCH OUTPUT
Research activity, Publications, Datasets and research results, Open source, Funding

RESEARCH PROCESS
Stakeholder engagement / citizen science, Collaboration and Interdisciplinarity, Research integrity, Risk management

SERVICE AND LEADERSHIP
Leadership, Academic standing, Peer review, Networking

RESEARCH IMPACT
Communication and Dissemination, IP (patents, licenses), Societal impact, Knowledge exchange

TEACHING AND SUPERVISION
Teaching, Mentoring, Supervision

PROFESSIONAL EXPERIENCE
Continuing professional development, Project management, Personal qualities

https://ec.europa.eu/research/openscience/
Incentives and rewards for research institutions and funding bodies, national governments

<table>
<thead>
<tr>
<th>RRI &amp; Public Engagement</th>
<th>Promotion of responsible research and innovation and improved public engagement (citizen science); Enhancing educational resources</th>
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<tr>
<td>Transparency &amp; Accountability</td>
<td>Transparency of research assessments, through for instance Open Peer Review.</td>
</tr>
<tr>
<td>International Coordination &amp; Science Diplomacy</td>
<td>Enhancing international visibility and reputation; Enhanced international and diplomatic relations</td>
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**MLE findings: OPEN SCIENCE incentives and rewards**

<table>
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<tr>
<th>Shifts in...</th>
<th>Career &amp; Research Evaluation</th>
<th>OS Training &amp; Education Resources</th>
<th>Citation, Authorship &amp; Publication system</th>
<th>Long-Term Sustainability</th>
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<th>International Coordination &amp; Science Diplomacy</th>
</tr>
</thead>
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<tr>
<td><strong>Required conditions</strong></td>
<td>Overhaul of evaluation procedures at research institutions &amp; funders</td>
<td>Resources and personnel to provide training locally and nationally</td>
<td>Overhaul of evaluation procedures and traditional publishing formats</td>
<td>Complex coordination among stakeholders and long-term commitment to infrastructures</td>
<td>Establishment of criteria for successful open science within each field; buy-in from learned societies and science academies</td>
<td>Rewards for social interaction and non-traditional outputs; co-design of research with relevant stakeholders</td>
<td>Systems for tracking, visualizing and discussing the organization, outputs and funding of research.</td>
<td>Clear points of contact and communication channels/venues to debate Open Science implementation.</td>
</tr>
<tr>
<td><strong>Pros</strong></td>
<td>Most important set of incentives and rewards for researchers</td>
<td>Enables researchers to practice Open Science effectively; produces innovative (education) tools</td>
<td>Recognition of currently invisible efforts to support Open Science</td>
<td>Crucial incentive for researchers; ensures the long-term fruitfulness of current investments</td>
<td>Exemplifying advantages of Open Science, and ways to successfully implement it; enhance international status of research institutions. Relatively inexpensive.</td>
<td>Embedding of research in society, towards devising ethical and responsible solutions to global challenges.</td>
<td>Improved documentation and scrutiny of research processes and resources. Improved reproducibility of results and evaluation of accountabilities for given outcomes.</td>
<td>Enhanced international visibility, networking and diplomatic relations across institutions and nation states.</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td>Time-intensive evaluation procedures</td>
<td>Investment in training provision and related staff; needs inclusion in researchers workload</td>
<td>Requires new policies tailored to each publication venue</td>
<td>Complex coordination among stakeholders and long-term financial support</td>
<td>Mobilize learned societies and science academies to actively promote Open Science.</td>
<td>Risk of less investment in fundamental research. Increased accountability for all research activities (including privately funded).</td>
<td>Increased administration and more investment in data analysis and qualitative assessments.</td>
<td>Increased national research budgets; need for coordination between science and foreign policy.</td>
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<tr>
<td><strong>Challenges</strong></td>
<td>Administrative, cultural and financial</td>
<td>Administrative, financial and cultural</td>
<td>Cultural and logistical</td>
<td>Logistical and financial</td>
<td>Logistical</td>
<td>Cultural, administrative, logistical, financial</td>
<td>Administrative, cultural, logistical</td>
<td>Administrative, logistical, political</td>
</tr>
<tr>
<td><strong>Who implements this? Researchers and ...</strong></td>
<td>Research institutions, funding bodies, libraries</td>
<td>Research institutions, funding bodies, editors, publishers, learned societies</td>
<td>EU, National governments, research institutions, libraries</td>
<td>National governments, funding bodies, learned societies</td>
<td>National governments, funding institutions, EU, National governments</td>
<td>Funding bodies, research institutions, EU, National governments</td>
<td>National governments, policy-makers, research managers</td>
<td></td>
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# Roadmap for Open Science Implementation

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<tr>
<th>Map</th>
<th>Identify key stakeholders and Open Science champions</th>
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<tr>
<td>Plan</td>
<td>Devise national strategy through consultation with stakeholders</td>
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<tr>
<td>Incentivize</td>
<td>Change reward system to incentivize all aspects of Open Science</td>
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<tr>
<td>Promote</td>
<td>Encourage critical and informed thinking</td>
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<tr>
<td>Support</td>
<td>Participate in international initiatives</td>
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<tr>
<td>Implement</td>
<td>Implement strategy, starting from Open Access</td>
</tr>
<tr>
<td>Monitor</td>
<td>Monitor and tackle emerging issues as they arise</td>
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MLE conclusions

The implementation of Open Science is part of a bigger picture. Now is the time to discuss roles and functions of science in society, setting agenda and missions for science and innovation based on openness. **National strategies for the implementation of Open Science are essential.** We need to better understand and align the links between Open Science policies and general STI policies. **We need Open Science champions and role models** to foster the uptake of Open Science practices and to create a sustainable transition towards more openness. **Open Science is enhancing knowledge markets and improving innovation.** Synergies of scholarly commons and the commercial exploitation of research outputs need systematic study.
Grazie per la tua attenuazione

Kim Holmberg
kim.j.holmberg@utu.fi
http://kimholmberg.fi
@kholmber

http://europa.eu/!bj48Xg