

OPEN SCIENCE AND EVALUATION

*Paola Galimberti**

*University of Milan – Milan, Italy.

Abstract

The aim of this contribution is to investigate how open science can influence/support research evaluation and whether and how open science practice can be evaluated in its effort to avoid what is predicted by Goodhart's law (When a measure becomes a target, it ceases to be a good measure). The enterprise is not simple, as it focus on giving up points of reference that have been part of common practice of hard sciences for years while we are now trying to implement them in humanities and social sciences. We must accept that the internet has changed the way science is produced, disseminated, validated and evaluated and has multiplied its channels of communication. For this reason the traditional bibliometric indicators, which refer to articles published in peer reviewed journals, preferably in English, as the only viable publication channel, become inapplicable. In an open environment, the role of peer review, in particular the idea of blind (single or double) peer review must also radically change.

Keywords

Open science, Bibliometrics, Research evaluation, Unintended effects, Open peer review

1. *Quantitative evaluation and unintended effects*

The quantitative evaluation of the research has strongly entered into the daily practice of our researchers, heavily (and often not virtuously) orienting their actions and sometimes creating perverse or unintended effects. The literature on the unintended effects of quantitative evaluation systems, especially in performance-based systems, is endless¹.

Due to a number of reasons related to accountability and assignment of resources only to those who are truly deserving them, the use of quantitative indicators has become increasingly popular and convenient, in time of scarcity of funds. The reasoning is based on an idea of science born from New Public Management: scientific research is a production process, subject to the same rules as production processes, and universities are assimilated to companies. Research evaluation, once a prerogative of the scientific community, is now entrusted more and more to administrators and bureaucrats, who, not being experts in the domains they are going to evaluate, rely on algorithms, confident that a

number is going to solve their only problem: a reasonable distribution of resources according to merit.

Hence the emphasis on quantity placed in recent years and in particular on the application of bibliometric indicators, both at national or local evaluation.

Quantitative evaluation, in a performance-based system as the Italian one, has thus led to an alignment of the scientific communities to the criteria and indicators used by the National Evaluation Agency (ANVUR) for its evaluation exercises, with the result that what it should have been a mean for the improvement of science and for its effective usefulness for society, has become instead the ultimate and unique goal of research. The researcher's ultimate goal is to meet the requirement, whatever it is, needed to make a career or to get funding.

Such a picture is not at all reassuring, as most researchers and decision-makers are unaware of the consequences of this situation and the effects of the policies applied and the decisions taken can only be verified² after years. A study published in

¹ See among others the articles of P. Ioannidis, D. Fanelli, M. Biagioli, J.Z Mueller, C. O'Neil etc.

² A list of publications that track the distorting effects of using a single indicator, the IF

Research policy in 2018 demonstrates how, after the entry into force of Law 240/2010 (Legge Gelmini), Italian scientists have been citing themselves in a very opportunistic manner³.

Law 240/2010 defines how to access to professorship using a set of quantitative bibliometric indicators (different for Hard sciences and SSH). The study conducted by Marco Seeber et al. observed a significant increase (greater than in other research systems) in self-citations after 2010 in fields that adopted the citation metrics. A second study carried out by Baccini, De Nicolao, Petrovich, confirmed this trend. This means that communities have reacted in an adaptive and opportunistic way to the rules imposed at a national level, with the main purpose of reaching the target rather than doing good research.

That's the first point.

The second important point is that this emphasis on quantitative indicators feeds and strengthens the monopoly of those commercial entities (Elsevier just to name one) that are not only gatekeepers and controllers in the process of production of research but also now manage the data analytics for the meta-analysis and the evaluation of research⁴. All these data are obviously closed and accessible only under a subscription based model.

The scientific communities have therefore given up not only the management of the process of research validation and communication, but also its evaluation, preferring to leave this privilege to commercial subjects and to university or to ministry administrators.

The European Commission has produced many guidance and recommendation documents on openness, but has not applied same recommendations in its evaluation procedures. The next EU Framework programme (FP9) could offer an opportunity to the EC to take a stronger position on the implementation of evaluation criteria and on monitoring their application.

<https://www.scienceopen.com/search#collection/e4870106-eea5-4ba3-88cf-e769c7d49ebe>

³ Seeber, M. Cattaneo, M. Meoli, P. Malighetti (2018), Self citations as strategic response to the use of metrics for career decisions, *Research Policy*, 48(2) pp. 479-491. Baccini, A. De Nicolao, G. Petrovich E. (2019) Citation gaming induced by bibliometric evaluation: a country level comparative analysis, *PLoS one* 10.1371/journal.pone.0221212

⁴ SPARC (2019) Landscape analysis. The changing academic publishing history- Implications for academic institutions. <https://sparcopen.org/our-work/landscape-analysis/>

In a recent publication by the European Commission it is stated:

*For the practice of Open Science to become mainstream, it must be embedded in the evaluation of researchers at all stages of their career (R1-R4). This will require universities to change their approach in career assessment for recruitment and promotion. It will require funding agencies to reform the methods they use for awarding grants to researchers. It will require senior researchers to reform how they assess researchers when employing on funded research projects. This is about changing the way research is done, who is involved in the process and how it is valued; evolving from a closed competitive system to one that is more open and collaborative. Overall, a cultural change is needed in organizations and in the research community for the promotion of and engagement in Open Science.*⁵

These are recommendations of the European Commission to all those concerned. It seems that it is primarily a question of cultural change, of enhancing cooperation rather than competition. But it is difficult to understand (and it is not explained) who should start this new course in the evaluation systems, whether it should be the Commission, the Member states or the institutions. A cultural change is necessary, which has not yet taken place (not in Italy at least) and there are no signs that it will take place in the immediate future.

2. The Italian landscape

Italy lacks a National plan on open science whereas other countries such as Netherlands⁶ or France⁷ have adopted one and have established a roadmap to open science for the next years. Without a top-down mandate it is very difficult for certain practices to be established.

The evaluation of research is conducted by ANVUR (the National Agency for the Evaluation of the University and the Research) following principles (proprietary quantitative indicators

⁵ European Commission, WG on rewards under open Science, (2017) Evaluation of Research Careers fully acknowledging Open Science Practices

https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport_final.pdf

⁶ <https://www.openscience.nl/en/national-platform-open-science/national-plan-open-science>

⁷ <https://libereurope.eu/blog/2018/07/05/frenchopenscienceplan/>

and anonymous peer review) that do not match in any way with the principles of Open Science: the evaluation process is closed, the data used for the evaluation are closed and accessible only upon explicit request for access.

With regard to the evaluation of research, Italy is a latecomer country on the international scene and it is reproducing all the mistakes previously made by other more advanced countries. Open science is not an issue in Italy.

In a situation in which quantitative indicators occupy the agendas of researchers and these indicators are firmly in the hands of a few monopolists (Elsevier, Clarivate), it is difficult to talk about cultural change just as it is difficult to develop criteria and evaluation procedures in which openness finds a role at a local level.

So it is a priority that, before addressing open science and research evaluation or evaluation of openness in research practices, open science becomes part of the daily workflow of researchers and changes the way in which research is produced, validated, communicated and evaluated.

It is not possible to apply what the European Commission recommends if someone does not first inform researchers (institutions) that it is important to work in an open environment, that publications should be publicly available, that data must be always accessible, better if open, that the course materials must also be open, that openness matters. Therefore, policies are needed.

If there are no policies at a national level, at least they should be implemented at local level.

Institutions need local policies on open access to scientific publications, which define the road institutions intend to follow and support (green, gold, diamond, all three), and also establish which tools are made available to support researchers (centralized funds, institutional archives, e-publishing platforms, technical and legal support), and how open access practices will be rewarded. Several Italian universities have such a policy⁸, but with one exception⁹, none monitors the researchers' response rate to these policies and to what extent they are put into practice.

Institutions need a policy on research data management defining which data is to be retained, how it is to be processed, how it is to be described and where it is to be stored so that it can be accessed at all times, according to the FAIR principles¹⁰.

This is necessary in order to comply with the European Commission's directives that are becoming increasingly rigorous on data and data management. The commission requires that the data of the funded projects are "as open as possible as closed as necessary" and that they are processed in accordance with the FAIR guiding principles of findability, accessibility, interoperability and reusability, formulated and promoted by the group Force 11¹¹.

3. Possible roadmap

Open science can make evaluation more transparent for the scientific communities and society, and the evaluation process that rewards open science establishes a virtuous circle where open science becomes the way science is produced, validated and evaluated.

An evaluation system that rewards openness cannot be developed unless a research environment, which contemplates openness as a routine practice, has been previously built. The latter requires, motivation, dedication, determination in order to be implemented.

A possible (desirable) roadmap for Italy could be:

- 1) A plan for the implementation of open science policies at the national level and subsequent monitoring of this implementation by third parties (Conference of Rectors?)
- 2) The creation of a National Open Access repository
- 3) The creation of a critical mass of free of charge citations for quantitative evaluation exercises
- 4) Implementation of local and national data repositories
- 5) Adoption of open-peer review systems for qualitative evaluation

⁸ List of Italian universities having a policy on Open Access to research publications
http://wikimedia.sp.unipi.it/index.php?title=OA_Italia/Regolamenti_e_Policy_sull%27Open_Access

⁹ The University of Milan includes open science in its strategic plan and publishes a report on the state of the art of

open science at the end of each year
<https://www.unimi.it/it/node/1207>

¹⁰ <https://www.force11.org/group/fairgroup/fairprinciples>

¹¹ <https://www.force11.org/groups>

6) Marginalisation of quantitative and proprietary evaluation criteria.

1) The Ministry should take a position on the issue of open science and define rules for its implementation, monitoring and funding in institutions. Goals and targets must be defined for the next years and third parties (for instance the Conference of Rectors) should monitor the implementation of this plan.

2) Currently, the Ministry of University and Research has a repository not only closed to the public but also to the institutions themselves, accessible only to individual researchers and the Ministry.

The data entered into the repository by the researchers are not validated, but on the basis of these data, indicators are developed and are used for evaluation of researchers, for admission to promotion and for data analysis of the national research system.

A first step could be to finally implement a national open access repository for scientific publications¹². This could be easy in Italy due to the fact that almost all institutions have the same institutional repository based on DSpace (IRIS). Data and full text papers could be harvested from the local systems and subsequently undergo an appropriate deduplication process giving priority to data from certified repositories.

3) As far as the quantitative evaluation of publications is concerned, a reasonable action could be to create a critical mass of open-access publications that would allow the automatic collection of citations, free of charge from commercial operators¹³. This would allow access to data on which indicators are built to everyone.

4) Data repositories must be implemented that process the data according to FAIR principles and therefore make the data always available open or on request in case they are to be used to validate the publications.

5) But the real cultural change would be to move from blind (single or double) peer review to

open peer review, eliminating the farce of anonymity and making the reviewers responsible for their judgments. Those who have to sign a review are very attentive to what they write, while those who hide behind anonymity can afford to make hasty or poorly meditated judgments. Anonymous peer review provides coverage for behaviors that may be inappropriate.

There are plenty of examples of ex ante peer review: from that practiced in preprint archives (arxiv, biorxiv) to ex post peer review as practiced in *Frontiers* journals¹⁴ or Wellcome open research¹⁵.

6) A further action could be to sign (Ministry and Institutions) the San Francisco Declaration on research assessment¹⁶ and carefully implement its recommendations, trying to introduce a system of rewards in internal calls for proposals for those who practice open science.

4. Conclusions

In short, open science and research evaluation are practices that proceed and evolve together. One supports the other, but to grow they need a change of context, a cultural change that is hard to achieve. Institutional decision-makers are not yet fully aware of the fact that governance by numbers damages science and find it convenient to rely on algorithms, on the other hand researchers are struggling to leave a consolidated system of references for one yet to be built.

The internet has actually expanded (and not reduced as those who have to evaluate at all costs and in a short time wish to) the channels through which research is communicated, open access has made many articles available immediately to a wide audience. Not taking into account these epic changes would be a mistake made by both researchers and by the builders of evaluation systems, who in their effort to lead to a synthesis a system that is multiform, mortify and inhibit its potential.

¹² Law 1/2009 Anagrafe nazionale dei professori ordinari e associati e dei ricercatori

¹³ The i4oc is such an initiative <https://i4oc.org/#>

¹⁴ <https://www.frontiersin.org/about/review-system>

¹⁵ <https://wellcomeopenresearch.org/>

¹⁶ <https://sfdora.org/> The only Italian signers are the Department of economic and management of the University of Ferrara and the INFN so far.

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