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Guest Editorial:

Open Access

The importance of Open Science in Business research

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"The scientific enterprise is built on a foundation of trust. Society trusts that scientific research results are an honest and accurate reflection of a researcher's work. Researchers equally trust that their colleagues have gathered data carefully, have used appropriate analytic and statistical techniques, have reported their results accurately, and have treated the work of other researchers with respect." (National Academy of Sciences, 2009, pp. 9)

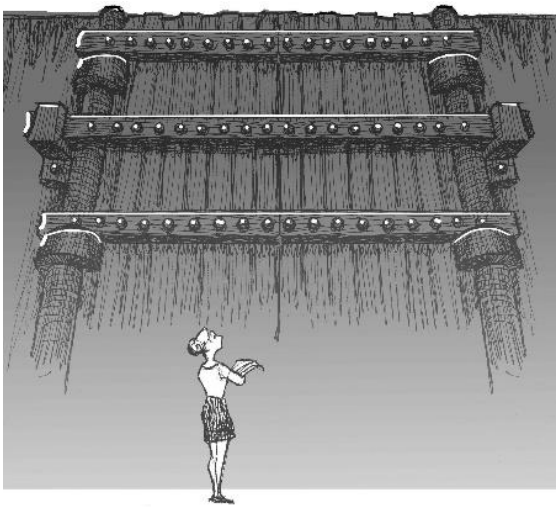

Figure 1. Cartoon illustrated by John R. McKiernan (http://whyopenresearch.org/ retrieved in November 01, 2019)

We all should trust science is a common saying among scientists, but also among practitioners and society. However, science is facing a credibility and trust crisis (Bergh, Sharp, Aguinis, & Li, 2017), and we are aware of such a crisis, at least, since 2000 (Millstone & Zwanenberg, 2000). In the last few years, we have seen an increasing discussion about how to counterattack this credibility and trust crisis (Peng, 2015). One idea is getting more and more traction over these past few years: Open Science (OS).

First of all, what is Open Science (OS)?

The very first important aspect of discussing Open Science (OS) is to define what it is. To the best of my knowledge, there is no single definition, but one can argue that it is a community movement to make research (and all its environment and cycles) available and accessible to anyone. It is a commitment that comes from researchers to the public (including universities, funding institutions, and other researchers) to disseminate freely and openly the inputs and outputs of research in an understandable, reusable, and informative manner, and to allow reproducibility[1].

The OS movement had a beginning in 1991 when Physicist Paul Ginsparg created the arXiv depository to share preprints in the physics field (Open Access, 2019). Later in 2002, OS momentum increased with the Budapest Open Access Initiative (https://www.budapestopenaccessinitiative.org/ retrieved in November 01, 2019), and in 2003 with the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (https://openaccess.mpg.de/Berlin-Declaration retrieved in November 01, 2019). Over the last few years, several institutions and projects were created to support OS, and several scientific fields adopt OS concepts. In the social sciences fields, we already have a community of stakeholders supporting it (Aguinis, Cascio, & Ramani, 2017; Mendes-Da-Silva, 2019; Miguel et al., 2014).

What does OS involve?

OS involves a broad range of practices and concepts based on the main idea of making science transparent and accessible. The most famous concept is Open Access and consists of the practice of making published articles accessible without restrictions. More recently, the debate shifted to practices that can change the future of scientific publications, such as preregistration and Open Peer Review, for instance. I offer below a summary of the OS practices.

Open Access: refers to online access to scientific published articles without restrictions (including financial restrictions). There are two primary forms of Open Access. Gold open access refers to the unrestricted access in all kinds; publication costs shift from the readers to the authors by the time of publication. Green open access refers to access that is available from authors during an embargo period; at the end of the embargo period, the research is available to anyone without restrictions.

Open Data and Open Materials: refers to data and research materials that are promptly available to anyone, without technical or legal restrictions. Individuals can use and reuse data at their will. This provides the means to researches extend, replicate, and estimate alternative hypotheses using the same dataset.

Open Source: refers to software and packages promptly available to anyone without technical or legal restrictions. Open source software can be customized and shared by users, without limitations of copyrights.

Open Peer Review: it is a variation of peer review. An article usually is published after the peers' approval that its content is relevant and does not contain errors. The peer-review process is traditionally double-blinded, so authors do not know the identity of reviewers and vice-versa. Open Peer Review makes reviewers' and authors' to see the identity of each other. Additionally, the reviewers' reports and author's responses are available publicly alongside the published article. Thus, authors, reviewers, and the public all know each other and can access the article's reviewing history (Ross-Hellauer, 2017).

Preregistration of research: it refers to the authors' commitment to plan and specify the research before gathering data. The primary benefit is that hypothesis-generating is separate from hypothesis-testing, increasing the quality and transparency of authors' research. It also eliminates *harking* (hypothesizing after the results are known). Preregistered research may be submitted, peer-reviewed, and accepted by journals, in spite of future results. As such, journals commit to publish the accepted preregistered research even if theory or hypotheses are not confirmed.

What are the benefits of OS?

There are countless arguments in favor of OS. There are benefits for either the scientific community, the research institutions, and the public. To **researchers**, OS enhances the visibility of their work, personal recognition, and credibility, increases the ability to network and to find new collaborators, the probability of funding, the likelihood that the general public will read his/her research, and the number of citations, and media attention. To the **research community**, it decreases the cost of collecting and manipulating data, reduces technical inefficiencies, enhances collaboration by connecting data-collectors to data-users, enables replicability of research, and benefits the creation of teaching materials. To **funding organizations**, it helps to understand how scientists allocate public and private resources, and to evaluate the return of investments in science; it also helps to allocate resources better and to prevent double-spending in same-investigations or similar experiments. Finally, to the **general public**, it helps politicians to create and improve social and economic agendas, it promotes the public democratic right of accessing knowledge and enhances public engagement with the directions science should take in the future (Aguinis et al., 2017; McKiernan et al., 2016; Pampel & Dallmeier-Tiessen, 2014; Piwowar & Vision, 2013).

Who is involved with OS?

Several organizations, from all fields, are involved in this movement. The OS community includes super-national organizations, such as the European Union and the OECD, private organizations, universities, peer-reviewed journals, among others. To name a few of these stakeholders:

European Union (EU): EU, through its executive branch the European Commission, released several recommendations related to OS, such as the "Towards better access to scientific information: Boosting the benefits of public investments in research" (European Union [EU], 2012) and the "recommendation on access to and preservation of scientific information" (European Union [EU], 2018).

OECD: the (Organization for Economic Co-operation and Development) OECD supports OS and has a full report explaining the Open Science Movement (Organization for Economic Co-operation and Development [OECD], 2015). OECD's goal is to promote open science and to assess their impact on research and innovation.

FOSTER: is a 2-year, EU-funded project, carried out by 11 partners across 6 countries. The project's primary goal is to contribute to a real shift in the behavior of European researchers to ensure that Open Science (OS) becomes the norm in the scientific community **(**https://www.fosteropenscience.eu retrieved in November 01, 2019**).**

F1000Research: is an Open Research publishing platform for scientists, scholars, and clinicians offering immediate publication of articles and other research outputs without editorial bias. All articles benefit from open peer review. Moreover, data from all articles are public (https://f1000research.com retrieved in November 01, 2019).

Data in Brief: is an academic open access journal that publishes data articles. Data articles are articles that describe databases collected by the authors that has been either used in a follow-up study or that has been collected with the purpose of being used in future research. The data are free to the use of everyone (https://www.journals.elsevier.com/data-in-brief retrieved in November 01, 2019).

Center for Open Science: is an organization with the mission to increase openness, integrity, and reproducibility of research. It offers several products, such as research preregistration, datasets' crowdsourcing, and several initiatives to enhance reproducibility (https://cos.io/ retrieved in November 01, 2019).

Academic Journals: in later 2019, there were several Academic Journals with specific guidelines for open data. Journals can either (a) Encourage data sharing, (b) Encourage data sharing and require a statement from the authors about their decision, (c) Require data sharing, and (d) Require data sharing and peer-review of data before publication. In the Management, Accounting, Finance, and Strategy fields, the standard, for now, is option A or B.

A non-exhaustive list of journals on these fields that have guidelines for open data includes:

- Finance and Stochastics;
- International Entrepreneurship and Management Journal;
- Journal of Corporate Finance;
- Journal of Economics and Finance;
- Journal of Management & Governance;
- Operations Management Research;
- Review of Accounting Studies;
- Review of Quantitative Finance and Accounting.

What are the arguments contrary to OS?

An essential pillar of OS is transparency. However, transparency always calls for more transparency, and we need to ask: how much transparency should we create in science? Are all kinds of transparency good? How much is enough?

For example, consider the Open Peer Review process where both authors and reviewers know each other. This is certainly an increase in transparency. However, reviewers can be less critical and provide less scrutinized reports when they know their identity will become available to authors. Also, authors may focus on working on suggestions provided by reviewers that have more reputation or more status in the field instead of working on suggestions that are more important to the development of the research. At the extreme, Open Peer review can lead to worse reports and worse improvements in articles.

Also, Open Data and Materials can provide incentives for unethical behavior and enhance ideological discussions. Consider a situation when the data provide evidence against the interests of an activist group. Some scientists already have become the target of such groups because their results do not corroborate activists' positions (Camarata, 2019). At the extreme, these behaviors can hurt the debate of essential topics in society and can hurt democracy.

Moreover, making data available to non-expert or non-scientists can lead to wrong conclusions due to inadequate data analysis. In other words, people using scientific data must be competent and must operate in an institutional context of accountability. Because scientists cannot control the environment of data reusing, this also can hurt the scientific process.

Finally, press releases and media-type communications, more often than not, do not communicate the complexity and the uncertainties of the scientific process. In the benefit of increasing comprehension, communication may decrease precision and complexity. It is easy to see that this also may lead to the wrong interpretation and use of science.

All these examples call attention to arguments contrary to OS that can lead to inefficiencies and undesired outcomes. Overall, we need a system of checks and balances that makes science more transparent without hurting scientists' freedom and without creating incentives for unethical behavior from non-scientists.

How is RAC supporting OS?

More often than not, more established authors have been practicing the "closed science" in the past few years and, despite this, were able to build a reputation based on the quality of their work. Thus, a cultural change is needed to make OS a reality. We all need to change old habits for the benefit of OS. Perhaps, the very first action we can take is to discuss OS with our students and to make a self-reflection about how can we contribute to the movement.

Furthermore, it is common for publishers to charge a fee for Gold Open Access material that often can reach USD 1.000, USD 1.500, or even higher. Alternatively, the Green Open Access is usually allowed only after an embargo period that can reach as long as 24 months. These are substantial barriers for authors and institutions that support OS. Thus, publishers too need to review economic strategies in order to make research more accessible.

The editorial board of RAC believes that OS is a step into the future and supports data and materials sharing. We understand that sometimes data may be non-shareable due either to legal rights or to sensitive content (for instance, interviews with children or interviews with anonymous sources). Thus, we invite authors to make a statement about their decision justifying the reasons why they can't share data. If the article contains non-shareable data but also contains shareable data (for instance, data from public records or that are already open to the community), we encourage authors to share the latter portion of data. On top of that, we strongly encourage authors to share openly and freely programming codes (such as do-files, r-scripts, etc.) or any shareable file.

Since 2018, RAC's editorial team guides authors of accepted articles to deposit their data and materials in a public depository, such as Zenodo or Mendeley. These depositories create a reference (and a permanent DOI) for the data and materials that can be cited in future studies. To foster the public's access and visibility of our authors, we include the reference in the published article. Additionally, we provide and add in the published article a QR code that is linked to the published data, helping the use of smartphones and tablets to manage readers' bases of references. On top of that, alongside several top journals, we use the Dataverse public depository, funded by Harvard University, to deposit articles' open materials. You can find it at: <https://dataverse.harvard.edu/dataverse/rac>. This makes the authors' data available to the global community and enhances the potential visibility of authors' work.

Additionally, RAC is committed to enhance authors' visibility and to increase the potential of OS. We believe open access materials, and OS as a whole, have the potential to become a source of high-quality citations in the future, visibility for authors and, perhaps more importantly, to foster the debate between academics and practitioners.

Finally, I would like to mention that, in late 2019, I have joined RAC's editorial team as the first Tutorials and Open Data Editor. My main goal is to advocate in favor of OS, sharing its benefits for authors and society, and to coordinate the journals' activities related to OS. I am also heading a new section of RAC that will publish Tutorial-articles of quantitative and qualitative research. The main goal of this new section is to provide to our readers a framework and a guide of specific empirical topics that are of interest to our community.

It is, at the same time, a challenge and a pleasure to join one of the most prestigious journals in Brazil. I am confident that by debating OS, we can spread the movement throughout RAC's readers and shape future scholar's behavior to create a more inclusive, transparent, and efficient scientific community.

Note

[1] In the OECD's) report Making Open Science a Reality (OECD, 2015, the term refers to efforts by researchers, governments, research funding agencies or the scientific community itself to make the primary outputs of publicly funded research results – publications and the research data – publicly accessible in digital format with no or

minimal restriction as a means for accelerating research; these efforts are in the interest of enhancing transparency and collaboration, and fostering innovation.

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