
Open Science Practices Adopted by Latin American & Caribbean Open Access Journals

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Introduction

- 1 This study is part of a research which aims to investigate to what extent and how open science (OS) values and practices have influenced open access (OA) journals publishers. It focuses on Latin American and the Caribbean countries (LA&C), considering that this region has adopted OA as the main scholarly publishing model since the late 1990s due the fact that their scientific research and scholarly communication infrastructures are mainly publicly funded.
- 2 For this study, we selected a set of OS values and practices based on a previous work on scientific journals (Appel, Albagli & Maciel, 2017), as well as on an update of the literature review. They include the adoption of: alternative metrics for measuring journals' influence and diffusion, open peer-review, open research data, Creative Commons licenses, articles' full-text in machine-readable formats, and emerging OA business models. Considering this scenario, this research aims to contribute to answer the following question: to what extent are these practices being adopted by LA&C journals?
- 3 In order to get an overview of the opinions of LA&C journals publishers about the aforementioned issue, we conducted a survey with a sample of LA&C journals selected from the Directory of Open Access Journals (DOAJ) database. The design and methodology to select this sample and to carry out the survey are described in the section Design and Methodology of this paper. The results reveal that many journals are somewhat aware of

or informed about most of open science practices being discussed, but just some of them have already successfully implemented some practices.

OA and OS practices

- 4 The open access movement emerged officially from the Budapest Open Access Initiative (BOAI) with a focus on the liberation and opening of the scholarly literature, by making it freely available on the public internet so that users should be able to use, transform, and distribute this literature, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself (Chan *et al.*, 2002). More recently, open science emerged as an umbrella-term introducing new agendas in the OA movement and the academic publishing environment, considering the full knowledge production cycle, thus presenting new challenges for journal's editors to stay in tune with demands from their readers, authors, maintainers, disseminators, and others.
- 5 According to the FOSTER taxonomy¹, open science is defined as “the movement to make scientific research, data and dissemination accessible to all levels of an inquiring society.” It can be defined as a grouping of principles, such as increased transparency, re-use, participation, cooperation, accountability, and reproducibility for research, and practices, such as access to research publications, data-sharing, open notebooks, transparency in research evaluation, ensuring the reproducibility of research (where possible), transparency in research methods, open source code, software and infrastructure, citizen science, and open educational resources (Bezjak *et al.*, 2018). Other definitions of OS as well as extensive and detailed discussions regarding this topic can be found on the works of Fecher & Friesike (2014) and Albagli, Maciel, & Abdo (2015).
- 6 For the purpose of this study, we focused on the analysis of OS principles and practices that could be adopted by or adapted for journals publishing environment. One of these practices regards the use of alternative metrics, a.k.a. altmetrics (Priem, Taraborelli, Groth, & Neylon, 2010), as a complement to assess article impact and how it is being discussed, shared and used. Another one regards open peer-review, which relates to the adoption of open identities, open reports, open participation, open interaction, open pre-reviewed manuscripts, open final-version commenting, and open platforms (Ross-Hellauer, 2017; Ross-Hellauer, Deppe, & Schmidt, 2017). Open research data, in the context of journal publishing, calls for the definition of guidelines and policies that encourage authors to openly archive and disclose, along with the published article, all data supporting the research, allowing for maximum study scrutiny, transparency, and reproducibility. Creative Commons² allows for the legally sharing of knowledge and creative works through the adoption of standard and internationally recognised licensing schemes. The distribution of articles' full-text in machine-readable formats, e.g. Hypertext Markup Language (HTML) and Extensible Markup Language (XML), is especially important for the re-use of previously published text as “chunks” of data to be analysed through processes of Text and Data Mining (TDM). Finally, we also took into account the adoption of Article Processing Charges (APC), which, has emerged as a strategy for OA economic sustainability but also a business model for OA at article level. However, this practice has been seen as a way to gain profitability and of economic exploitation from OA and thus it has been object of controversy regarding OA and OS principles.

- 7 Some initiatives are responsible for “translating” and systematising OS principles and practices to journal’s editorial standards and policies. The most significant we can point out, at the moment, are the works of DOAJ, which establishes a criteria range to define OA journals (Olijhoek, Bjørnshauge, & Mitchell, 2015)—which include many concepts and values being advocated as open science—and the work of Björk, Paavola, Ropponen, Laakso and Lahti (2018) for the Open Science and Research Initiative in Finland.
- 8 DOAJ is the largest database of fully OA scientific journals. On the date the DOAJ database was consulted for this study (11 January 2018) it registered 10,845 records of OA published journals in 123 countries. Each record in DOAJ provides basic information about the journal and its editorial process, content licensing and copyright policy. The current criteria for indexing journals in DOAJ were established in 2013 following the Principles of Transparency and Best Practice in Scholarly Publishing, which is a list of recommendations provided by DOAJ in collaboration with the Committee on Publication Ethics (COPE), the Open Access Scholarly Publishers Association (OASPA), and the World Association of Medical Editors (WAME) (Olijhoek, Bjørnshauge, & Mitchell, 2015). This list³ includes some criteria related to open science principles, such as the need for adoption of Creative Commons Licenses, depositing and copyright policies, the promotion of machine readable full-text formats for publication (such as HTML and XML), voluntary adoption of open peer-review among others.
- 9 The work of Björk *et al.* (2018) is aimed at the construction of an “applicable scorecard that can provide a tool for standardized systematic evaluation, and benchmarking of the openness of academic publishers”. The study focused on criteria such as fraction of OA journals among total publication output, costs, use of CC-licensing, self-archiving policies, text and data mining (TDM), openness of citation data, and accessibility of information relating to OA practices. Within the results, the authors present the outcomes from the evaluation of nine “big publishers” under the proposed scorecard.
- 10 It is also worth to mention the initiative from the Scholarly Publishing and Academic Resources Coalition (SPARC) named Open Access Spectrum Evaluation Tool⁴ (OAS). which is aimed at ranking journals according to degrees of openness, considering criteria such as reader rights, reuse rights, copyrights, author posting rights, automatic posting, and machine readability. To the moment, OAS lists 1,022 journals with their respective score.

OA and OS in LA&C

- 11 In this section, we briefly describe some proposed and ongoing open science and open access initiatives and policies developed in six LA&C countries, which have played a significant role in this area.
- 12 Brazil pioneered the OA journals landscape with the launching of the Scientific Electronic Library Online⁵ (SciELO) in 1997. SciELO started as a platform aggregating 275 OA journals and today counts with 1.285 OA journals. Its methodology and infrastructure support fifteen LA&C countries along with Portugal, Spain, and South Africa. Since 2000, the Brazilian Institute of Information in Science and Technology (Ibict) led a strong open access movement, providing capacity building and infrastructure for this purpose. At the regulatory level, some Brazilian legislators with the support of the academic community and research institutes, proposed two bills to the House of Representatives—to the Congress in 2007 and to the Senate in 2011—demanding the deposit of all research

outputs resulting from public funding in institutional repositories. The first bill was archived, and the latter one was rejected in 2015 due to unconstitutionality, for interfering in university autonomy granted by Brazilian legislation. In 2014, Ibict organised an international seminar that brought together a representative group of foreign and local OS and OA experts and advocates, addressing topics such as open data, open hardware, academic open source software, citizen science and open notebook science.

- 13 In Argentina, in 2013 the Congress passed a law⁶, requiring that the outcomes of public funded research must be freely available in open access institutional repositories. Also in Argentina, Fressoli & Arza (2017) and Arza & Fressoli (2017) worked on the characterization and documentation of OS projects and initiatives in terms of a bi-dimensional framework to identify and measure degrees of access and collaboration.
- 14 In 2013, Peru passed the Act No. 30035⁷ that regulates the National Digital Repository for Open Access Science, Technology and Innovation. This Act establishes that the National Council of Science, Technology and Technological Innovation (Concytec) is responsible for implementing, integrating, standardizing, storing, preserving and managing the national repository that gathers the scientific production publicly funded, or private entities that wish to share their information in open access.
- 15 Colombia established the National System of Open Access to Knowledge (SNAAC) in 2015, which is an initiative promoted by the Ministry of Education, the Administrative Department of Science, Technology and Innovation (Colciencias), universities, the National Academic Network of Advanced Technology (RENATA), and other stakeholders. Its objective is “to promote and strengthen the conditions and capacities for the production, articulation, organization, visibility, promotion of the use and visibility of Colombian scientific production in open access.” Institutions wishing to join this initiative provide information on their repositories on the SNAAC website.
- 16 In 2014, the Mexican Congress approved amendments in the Science and Technology legislation, the General Education legislation, and the Organic Law of the National Council for Science and Technology to introduce open access requirements and the development of the national repository⁸. Mexico launched, in 2017, an open science policy⁹ that includes a classification system for open access journals along with a set of OS guidelines aiming to subsidize policies, resources, and initiatives of the National Council of Science and Technology (Conacyt) in this field. It represents a precedent towards OS policy design in the region. Mexico also hosts two important databases for regional journals indexing, namely RedAlyc¹⁰ and Latindex¹¹. Besides indexation, these databases are also responsible for promoting “best practices” for the adoption of quality standards by scientific journals in the region (Alperin & Fischman, 2015).
- 17 In Chile, the initiative Datos Científicos¹² (Scientific Data) has been conducted by the National Commission of Scientific and Technological Research (Conicyt), requiring that all data derived from research funded by Conicyt must be deposited in open repositories in adequate formats. The website of the initiative also presents complementary guidelines as well as FAQ and best practice sections related to open data publication. Chile is also the hosting country of LA Referencia¹³, a Latin American federated network of OA repositories, currently aggregating nearly a million and a half of full-text open access publications from nine countries as national nodes.

- 18 In the beginning of 2018, four LA&C institutions (Clacso, Ibict, Latindex, and Redalyc) signed a joint declaration¹⁴ reinforcing the importance of the adoption of the CC BY-NC-SA license by LA&C journals and repositories in order to promote the open access to scientific production in the region, as well to guarantee its protection from commercial exploitation and appropriation. This declaration constitutes a political statement and a general guideline regarding licensing practices in the region. Nevertheless, it conflicts with the prevailing view in the international open science movement that recommends the adoption of CC BY. CC BY-NC-SA is one of the most restrict model of CC licensing, requiring attributing the work in the manner specified by the author or licensor (BY), with non-commercial purposes (NC), and under the same license specified by the author or licensor (SA) while CC BY, the most open, only requires attributing the work in the manner specified by the author or licensor.

Design and Methodology

- 19 The identification of 19 LA&C countries was based on information from UNESCO website¹⁵. We extracted data from the complete DOAJ database about open access journals located in LA&C countries, resulting in a list of 2,010 journals distributed in 19 countries. Subsequently, we removed journals not validated by DOAJ after 2014¹⁶, which resulted in a list of 1,990 journals, corresponding to our research universe (N). The next sampling stage involved the selection of a simple random sample (confidence interval = 95%, margin of error = 5%), resulting in a list of 322 journals (n = 322). We then distributed this sample proportionally to each of the 19 countries, according to the proportions given by the universe of journals, finally reaching a sample of 322 periodicals distributed in 14 LA&C countries.
- 20 To send the questionnaires, we have collected the email addresses of those responsible for each journal, directly on each journal's website. The questionnaire was developed and distributed in Google Forms platform and has been made available for completion between March 13 and 20, 2018. This short timespan provided for completion resulted from unforeseen changes on the survey methodology, which has shortened our study schedule. At the end of the deadline, we received a total of 55 responses, corresponding to 17% of our sample. Although this result can not be considered sufficiently representative, due to a high margin of error resulting from the estimated level of confidence, it allows observations that may help to understand the LA&C scholarly journals' attitudes towards OA and OS new demands. It is also worth to take into consideration the occurrence of participation bias due to the fact that the journals that answered the questionnaire may be more knowledgeable or interested about the topic in question.

Results and Discussion

- 21 Research results are organised and presented in two main groups. The first group (Table 1) comprises general data on and characterization of selected journals. Data on the levels of knowledge about OS practices and the willingness to adopt them are represented

in Figure 1 and are discussed afterwards. Other data are not represented graphically, such as:

- a. the organizational nature of selected journals' publishers, being 73% institutional, 23% scientific societies or research institutes, only 1 commercial and 1 non-governmental organisation (NGO);
- b. the funding sources, being 85% institutional funding, 9% article processing charges, and 4% grants.

Table 1. General characteristics of selected journals.

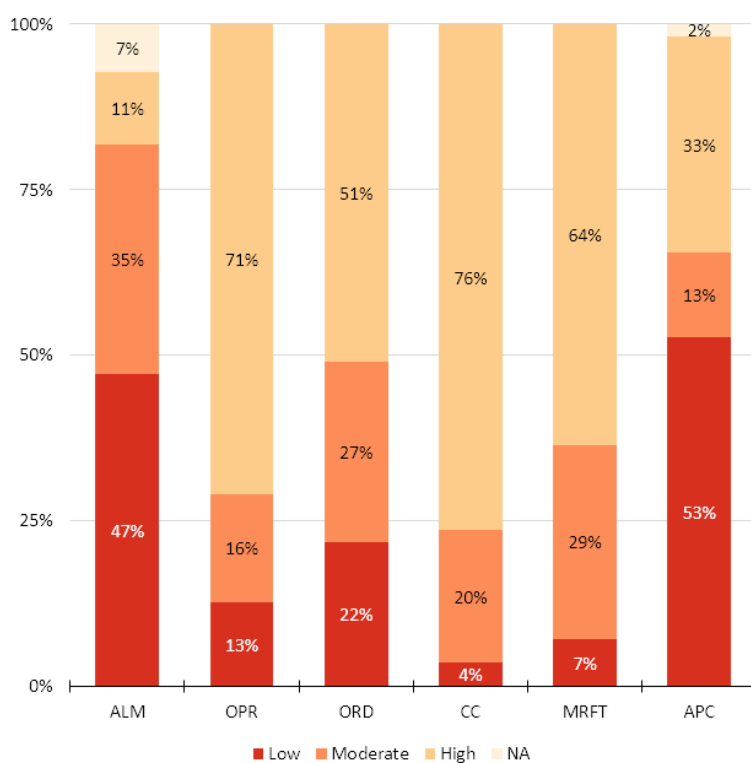
Dimensions	<i>f</i> (n = 55)	%
<i>Hosting country</i>		
Argentina	7	12,73
Brazil	19	34,55
Chile	5	9,09
Colombia	10	18,18
Costa Rica	1	1,82
Cuba	4	7,27
Mexico	2	3,64
Nicaragua	1	1,82
Peru	2	3,64
Venezuela	4	7,27
<i>Fields of Knowledge</i>		
Agriculture and Veterinary	4	7,27
Arts, Humanities and Social Sci.	32	58,18
Engineering and Technology	3	5,45
Medicine, Life and Natural Sci.	16	29,09
<i>License adopted</i>		
CC BY	16	29,09
CC BY-NC	12	21,82
CC BY-NC-ND	13	23,64

CC BY-NC-SA	7	12,73
CC BY-ND	4	7,27
NA	2	3,64
None	1	1,82
Platform		
Commercial	1	1,82
In-house	7	12,73
OJS	41	74,55
SciELO	5	9,09
NA	1	1,82

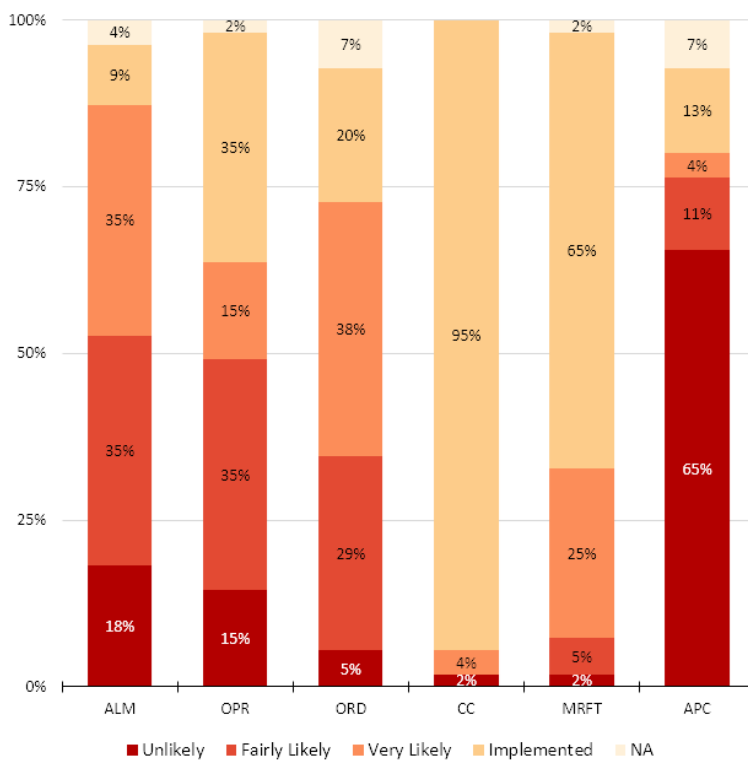
Notes: NA: No answer.

Source: Survey data.

Figure 1. Levels of knowledge about and willingness to adopt Open Science practices by LA&C journals (n = 55).



(a)



(b)

Notes: (a) Levels of awareness; (b) Possibility of adoption; NA: No answer; ALM: Altmetrics; OPR: Open Peer Review; ORD: Open Research Data; CC: Creative Commons; MRFT: Machine Readable Full-Text; APC: Article Processing Charges.

Source: Survey data

- 22 According to the DOAJ database, most of the Latin American journals have adopted blind peer-review process. On the other hand, 71% of our respondents stated to be highly informed about open peer review (OPR). It is important to highlight that 35% (19) of the surveyed journals affirmed that they have already adopted some kind of OPR and other 35% affirmed that it is fairly likely that they will adopt this type of peer review system in the future. Most of the journals (78%) that have adopted OPR belong to Arts & Humanities and Social Sciences fields, which shows that among Natural Sciences, Engineering and Technology, Medicine and Life Sciences & Agriculture and Veterinary disciplines the traditional blind peer-review system is still the preferred system. On the other hand, 15% of the surveyed journals indicated that adopting OPR would be unlikely. One of the reasons presented for the avoidance of this practice refers to a possible decrease in the amount of reviewers, since most of them would not be willing to disclose their reviews. Another justification presented reveals that editors are more willing to adopt OPR after its “consolidation”, since its early adoption would impose “adverse repercussions”. A third given reason refers to “the weakness of academic respect” on a literal translation, which could be understood as the possible violation of the “academic etiquette” in commentary or review sections. These survey results show that OPR is not yet considered a reliable system by journals in LA&C. OPR must be analysed in further and more comprehensive studies, since it involves not only editors but also the authors and reviewers.
- 23 With respect to the adoption of Creative Commons (CC) for content licensing, 82% of the surveyed journals stated high level of awareness of this practice. In fact, 95% of them

have adopted it. In Latin America, the adoption of CC licenses has been advocated by some of the main OA promoters. SciELO, for instance, adopted the most open license (CC BY) in 2015, by emphasizing its advantages in allowing unrestricted information reuse as well as in maximising the dissemination of research results (Santos, Sales & Packer, 2015). However, only 30% of journals surveyed for this study have already adopted CC BY. On the other hand, 25% of them have adopted CC BY-NC-ND, 16% CC BY-NC, and 14% CC BY-NC-SA. In other words, the majority of journals surveyed are seeking to prevent the reuse of scholarly information for commercial purposes, and this does not vary across the disciplines. There is an ongoing debate on which licensing model should be the most appropriate for the LA&C OA context. Different LA&C organizations in the field of science and technology—including Redalyc, Latindex, CLACSO (Latin American Council of Social Sciences), and Ibict—are advocating the adoption of CC BY-NC-SA license not only for journals but also for “courses, workshops, conferences, videoconferences and in any type of communication or academic material” in order to “protect the OA ecosystem” (“Declaración de México a Favor del Ecosistema Latinoamericano de Acceso Abierto no Comercial”, 2018). On the other hand, this statement is contradictory to the major orientation of the open science movement, which encourages the adoption of CC BY in order to maximize information reuse regardless the commercial purpose. It is important to highlight that, to the moment, most of the conceptions about those licenses are based on the assumptions of their advocates, reflecting the strong opposition to the copyrights model, with little or no evidence of their implications or impact. This calls for the realization of in-depth studies about authors, publishers, and readers’ opinions on this issue.

- 24 Only 33% of surveyed journals showed to be highly informed about article processing charges (APC), which could be justified by the fact that the predominant funding model for open access journals in LA&C is based on public and/or institutional resources. 65% of the respondents pointed out that it is unlikely that this practice will be adopted. However, 13% of the journals surveyed have already implemented APCs. The fields of knowledge of these journals are predominantly Medicine, Life and Natural Sciences as well as Agriculture and Veterinary. In contrast, 70% of respondents that stated that APC is unlikely to be adopted are from journals in Arts, Humanities and Social Sciences. Some of the comments received on why they will not likely charge authors are justified by ethical reasons. For instance, a respondent stated that given the precariousness of academic activity in Latin America, collecting fees from authors would create a divide between those who have conditions to bear these costs and those who do not. Another respondent mentioned that, arguing in consistency with the OA movement and in favour of the wide dissemination of LA&C scientific outputs, it is very unlikely for journals to charge authors any type of fee.
- 25 Regarding the practice of altmetrics (ALM), most of the respondents indicated low and moderate levels of awareness of this practice (82%). However, the survey also reveals that a large number of journals are very interested in adopting altmetrics (35%). The percentage of journals that already provide altmetrics is very low (9%) and, combined with the low level of awareness of the practice, it is contradictory to the fact that most of the surveyed journals use the OJS platform (75%), considering such platform allows at least the dissemination of article-level metrics with a combination of plugins. We did not observe significant differences in the levels of awareness between the different fields of knowledge. Regarding implementation difficulties, many surveyed journals mentioned

cost as a barrier. This factor, combined with the low levels of awareness and the low levels of adoption, may be related to the fact that editors still associate the practice of altmetrics exclusively with the service provided by the Altmetric.com¹⁷ platform—specialised in measuring the diffusion of articles in social media—while altmetrics is also related to the promotion of article-level metrics, such as number of views and downloads of articles etc., which would be more easily adoptable and manageable by the editors themselves. Other difficulties mentioned relate to the lack of awareness and to technical barriers, which may also refer to cost.

- 26 As for the practice of providing articles' full-texts in machine-readable formats (MRFT), the surveyed journals indicated a high level of awareness of it (64%), which also corresponds to its level of adoption (65%). In addition, among the journals that have not yet adopted this practice, our survey also reveals the great interest in future adoption. The fields of Natural Sciences, Engineering, Agriculture and Veterinary, and Medicine (STEM) combined demonstrated high levels of awareness (78% on average). On the other hand, more than half Humanities and Social Sciences journals (56%) also indicated a high level of awareness of the practice. The surveyed journals also pointed out the MRFT complexity and the lack of time and technical support as difficulties for its adoption.
- 27 Regarding open research data (ORD), half of the respondents indicated high level of awareness of it, while the other half is virtually divided between the moderate and low levels of awareness. The potential for the adoption of this practice is significantly high: 20% of selected journals have already implemented it, 38% indicated a high possibility of its adoption, and 29% indicated a moderate interest in adopting it. Only 5% indicated that they would not adopt such practice. Regarding the association of this practice with fields of knowledge, Medicine, Life and Natural Sciences have the lowest number of surveyed journals unaware of opening research data (6%), while journals in Arts, Humanities and Social Sciences are divided in levels of awareness (high, moderate, low). Regarding the difficulties or issues impeding the adoption of this practice, the justification of one of the journal's editors encompasses the (ethical) risk of disclosure of low quality material (texts and data) due to the lack of a previous filter performed by reviewers through double-blind review. Other editors pointed out that the practice of opening research data is not directly related to the fields of knowledge of their journals, but it is mainly due to the rare production of quantitative research in the field, which, in turn, results in a low volume of data to be openly disclosed.

Conclusion

- 28 With the conclusion of this study, we highlight that the question we have initially posed could be, to some extent, answered. Based on the research results, it is possible to emphasize that journals in LA&C are somewhat aware of, or informed about, most of open science practices being discussed, and some of those journals have already even successfully implemented some practice.
- 29 Regarding the decision-making process about the adoption of the practices in question, it is possible to reassure the predominantly institutional nature of the journals in LA&C, a condition that encourage journals to avoid the possibility of "outsourcing" their core processes. However, this characteristic would also pose as a barrier to the development or adoption of new practices, since institutions could not always be prepared to provide the

necessary support for publishing activities, resulting in barriers of cost, time, technical support among others.

- 30 On the other hand, the implementation of APC as a guarantee of self-funding is not considered by journal publishers in LA&C either, since this practice is seen in the region as a barrier to authors and, consequently, impacting the free and open dissemination of knowledge. Hence the funding model based on the distribution of grants for journals would emerge as an alternative. The results, otherwise, indicate that the number of journals which benefits of such type of fund is still very small. By increasing funds for this type of expenditure and by serving a larger and more diverse universe of journals seem to be most suitable route to avoid the proliferation of APC, to attenuate institutional dependency, and to encourage journals' development.
- 31 It is also possible to observe that the practices are perceived or impacted differently according to different disciplines. Concerning open research data, e.g, the different needs of each discipline should be taken into account by institutions or funding agencies during the definition of open data policies. Certain disciplines do not require the development of extensive mandatory policies by their journals, however, brief guidelines and referrals to data repositories would address specific cases related to quantitative research.
- 32 The study left some questions open for future exploration, such as:
- a. what are the corresponding decision-making processes of scientific publishers?
 - b. are there any public policies in LA&C currently supporting the adoption of these practices?
- 33 Also, one of the key questions still open concerns the possible positive and negative impacts arising from the adoption of OS practices. This will possibly lead to a more qualitative study.
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NOTES

1. Available at <http://www.fosteropenscience.eu/taxonomy/term/7>. FOSTER is a project funded by the European Union aimed at fostering the practical implementation of Open Science in the initiative Horizon 2020 and beyond.

2. <http://creativecommons.org/>.

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 10. <http://www.redalyc.org>.
 11. <http://www.latindex.org>.
 12. <http://datoscientificos.cl/>.
 13. <http://www.lareferencia.info>.
 14. <http://www.accesoabiertoalyc.org/declaracion-mexico/>.
 15. Available at: <http://www.unesco.org/new/en/unesco/worldwide/latin-america-and-the-caribbean/>.
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 17. <http://www.altmetric.com/>.
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ABSTRACTS

The objective of this study is to investigate how Open Science (OS) values and practices have influenced open access (OA) journals publishers in Latin American and the Caribbean (LA&C) countries. Our key research question is: to what extent are these practices being adopted by LA&C journals? In order to address this question, we conducted a survey with a sample of LA&C journals listed on the Directory of Open Access Journals (DOAJ) database. The results reveal that many journals are somewhat aware of or informed about most of open science practices being discussed, but just some of them have already successfully adopted those practices.

INDEX

Keywords: open access, open science, open access journals, Latin America and the Caribbean, Directory of Open Access Journals (DOAJ)

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