

The emergence of journals of Brazil and scenarios for their future¹

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Abstract

Quality journals in Brazil have achieved remarkable progress in recent years, with an increasing presence in international bibliographic indexes and on the Web. This is primarily due to Brazilian authors from different fields of knowledge communicating the results of their research in English and/or Portuguese. At least 80% of their original and review articles that are internationally indexed have a Brazilian affiliation, representing approximately 30% of the total indexed scientific production from Brazil. However, this national centrality has a low impact when measured by the number of citations received in the indexes in comparison to that of journals from developed countries. Despite their performance being comparable to that of journals from emerging countries, and although open access publishing results in an extraordinary number of article downloads, most journals of Brazil face the challenge of becoming qualified to compete on a national and international level for better quality manuscripts, as well as of improving their performance in the international indexes. This sought-after qualification demands that these journals overcome the inherent limitations of institutional, management, and financing conditions in which they operate, while advancing professionalization, internationalization, and innovation in the editing, publishing, and dissemination processes, in order to be aligned with international state-of-the-art standards. This article presents an overview of the main bibliometric and editorial management characteristics of the 400 journals of Brazil indexed in Scientific Electronic Library Online (SciELO), Scopus, and Web of Science (WoS). It also projects scenarios for changing the current framework by promoting journals considered as international benchmarks and the way journals are evaluated and funded.

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Keywords

Scientific journals – Scientific communication – Scholarly Communication – Bibliometric indicators – Research Evaluation – Bibliographic.

A eclosão dos periódicos do Brasil e cenários para o seu porvir

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Resumo

Os periódicos de qualidade do Brasil alcançaram, nos últimos anos, um notável avanço, com a crescente presença nos índices bibliográficos internacionais e na web, impulsionados principalmente pela comunicação de resultados de pesquisa de autores brasileiros das diferentes áreas do conhecimento e com uso diferenciado dos idiomas inglês e português. Pelo menos 80% dos seus artigos originais e de revisão indexados internacionalmente têm afiliação brasileira e representam cerca de 30% do total da produção científica indexada do Brasil. Porém, essa centralidade nacional é acompanhada de baixo impacto, medido pelo número de citações recebidas nos índices, em comparação ao que obtêm os periódicos dos países desenvolvidos. Embora o desempenho seja compatível com o dos periódicos de países emergentes e a publicação em acesso aberto resulte em cifras extraordinárias de downloads de artigos, boa parte dos periódicos do Brasil enfrenta o desafio de qualificar-se para, de modo concomitante, competir nacional e internacionalmente por manuscritos de melhor qualidade e melhorar o desempenho nos índices internacionais. Essa almejada qualificação requer a superação das limitações inerentes às condições institucionais, de gestão e financiamento nas quais operam e o avanço da profissionalização, internacionalização e inovações nos processos de editoração, publicação e disseminação, alinhados ao estado da arte internacional. Este artigo apresenta um panorama das principais características bibliométricas e de gestão editorial do conjunto dos 400 periódicos do Brasil indexados no SciELO, Scopus e WoS e projeta cenários de mudança na composição atual com a promoção de periódicos de referência internacional e na forma como são avaliados e financiados.

Palavras-chave

Periódicos científicos – Comunicação científica – Indicadores bibliométricos – Avaliação de pesquisa – Índices bibliográficos.

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Introduction

Most quality journals published in Brazil are an integral part of the country's educational and research systems. They have well-defined missions and objectives and constitute a substantial group of internationally indexed journals. However, they predominantly publish Brazilian authors, and thus contribute to the communication of an important portion of Brazil's scientific production using both English and Portuguese. They are aligned with public and institutional research programs, and are present in all major fields of knowledge. They make use of manuscript peer review and are managed with a high level of independence by their editors-in-chief, all or nearly all of whom are affiliated with Brazilian institutions, and whose editorial dedication is part of their regular academic duties. Their performance, measured by the number of citations received by their articles in international indexes, is low in comparison to that of journals from developed countries, but is high among developing and emerging countries. They have a ubiquitous presence on the Web; most are open access and distinguished by the extraordinary use of their articles, which is measured by the number of downloads.

They operate under the umbrella of universities or professional and scientific communities and, to a lesser extent, institutions that are not linked to universities but are related to research. They are not part of an editorial business, unlike most quality journals from developed countries, and most of them still lack a model for sustainable funding.

The remarkable dimension that journals of Brazil have achieved in recent years is sharply contrasted by the doubts regarding their qualification. Most are located below the median in the distribution of bibliometric indicators, regarding the number of citations that their articles receive in international indexes, even though the limitations of these indexes and indicators and the reasons behind this low performance are well known.

This article presents an overview of the main bibliometric characteristics, as well as the characteristics of editorial management and progress of journals of Brazil, in view of the innovations that are shaping the future of scientific communication. It also discusses the journals' future development in light of the Scientific Electronic Library Online (SciELO) / São Paulo Research Foundation (FAPESP) Program's prioritization of professionalization, internationalization, and financial sustainability, in addition to possible scenarios for innovation in policies and programs for evaluation and support for scientific communication.

This study encompasses the journals indexed in SciELO, Scopus, and Web of Science (WoS), using both data from the beginning of 2014 and the conclusions of previous studies on the presence and impact of journals in communicating Brazilian research (MENEGHINI, 2012; PACKER, 2011; PACKER; MENEGHINI, 2007).

The universe of indexed journals

The fact that 400 journals are indexed in at least one of the SciELO, Scopus, and Web of Science (WoS) indexes highlights the notable presence that journals of Brazil have achieved over the last few years within the flow of international scientific communication. As the product of a combination of factors, the new profile and dimension acquired by the journals of Brazil represent both an achievement and a challenge for Brazilian research. The main contributing factors include: the growth of a community of researchers and an increase in scientific production; the advent of SciELO and other programs that contribute to the continuous improvement of journals; the QUALIS system of the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), which – in recognizing and classifying thousands of journals – also has the main task of qualifying the research communicated by graduate programs; and last but not least, the changes that have occurred in

the coverage policies of international indexes – which favor developing and emerging countries, particularly Brazil. In contrast, journals that have recently been routed toward the international flow of scientific information have the added challenge of competing within the domains of international indexes, whose mechanisms and rules favor journals from developed countries that are already well established.

However, the number of Brazilian academic journals that aspire and attempt to be indexed is at least twice the current total of 400 journals that are now indexed. Approximately 900 journals were evaluated for admission into the SciELO collection over the last 15 years, and more than 1200 are qualified by the QUALIS-CAPES system within their higher rankings of A1, A2, B1, and B2. Therefore, if there is no stabilization or decrease in the production of articles, or an increase in publication capacity of the journals that are already indexed, it is likely that the number of internationally indexed journals will continue to increase.

About bibliographic indexes

In this study, we used a group of 402 journals of Brazil indexed in SciELO, Scopus, and WoS at the end of 2013 as reference. Whenever possible, we also used Google Metrics. These indexes are characterized by a multi-disciplinary coverage and operate databases of: original articles, review articles, conference papers, book chapters, editorials, and other types of documents published by journals; conference proceedings; and indexed books. However, to maximize comparability between journals of different indexes, thematic areas, and countries of publication, only original and review articles are taken into consideration in this study.

The databases of these indexes register the bibliographic references of the indexed documents as well as their citations. Therefore, the indexes operate websites with products and functions to search for documents, and

compute the indicators or metrics based on the distribution of the documents and citations that they grant and receive according to different research characteristics. These metrics are applied to the accumulated set of citations received and tabulated by authors, authors' institutions and countries of affiliation, and by thematic fields, during a certain period of time and the results are organized in rankings. The articles' citations are also attributed to the journals that publish them and the accumulation of citations generates the indicators and rankings of journals, such as: the Journal Citation Reports (JCR), which is based on citations collected in WoS and takes the Impact Factor as its leading indicator; the SCImago Journal Ranking (SJR), which takes its name from its main indicator and is based on citations collected in Scopus; and Google Metrics, based on Google Scholar, whose main indicator is the H-index, which covers the last five years.

SciELO complements WoS and Scopus with regard to the countries that participate in the program's network. In addition to the bibliometric indicators of citations, SciELO also calculates the number of document downloads. As of 2014, SciELO's journal collection began to operate within the database platform of the WoS, under the name SciELO Citation Index (SciELO CI), with the possibility of expanding the coverage of journals in searches and citation counts.

Google Scholar, operating on the Web with an exhaustive coverage but without policies or specific selection criteria, is a bibliographic indexing system that currently presents the most thorough coverage of journals in general and journals of Brazil in particular. But the use of Google Metrics as a systematic source of journal indicators and metrics is still limited, for it lacks historical series, detailed availability of data, and even the identification of the universe of indexed journals.

Beyond scientometrics and information science, the use of metrics, particularly the ones derived from WoS and Scopus, has intensified over the last few years as a reference source for systems of evaluation and ranking of scientific

productions, comparing thematic fields, countries, institutions, research groups, and researchers, with the understanding that the citations received by articles (and the corresponding metrics) serve as a proxy for measuring the influence or impact of the research they disseminate. The objections have proportionately intensified, focusing on critical and controversial issues such as measuring the quality of research and the representativeness of bibliometric measures. This controversy is not a new one, and there is an extensive amount of international scientific literature on the issue. A good example of how these objections converge and persist is the debate over the Brazilian context – published in the September 2013 edition of *Cadernos de Saúde Pública* – regarding Keneth Rochel de Camargo Jr.'s article, which preaches ending rankings in favor of a qualitative assessment (CAMARGO JR, 2013). Similarly, a study published in 2012, regarding the results of a survey conducted with over 1,700 researchers from 84 countries who have at least one article in the JCR, reveals that about 90% of them believe that the impact factor is important or very important for evaluating scientific performance in their countries, and that their attitude toward the impact factor is ambivalent (BUELA-CASAL; ZYCH, 2012).

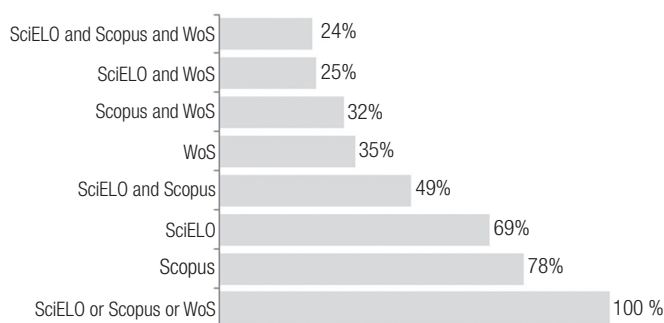
The vicissitudes of indexing

The fact is that indexing itself is an essential attribute for qualifying journals and that the better the position they hold in the indexes' ranking, the

greater the prestige they will acquire within the academic community and the evaluation systems. The prestige of journals, notwithstanding the variations in rankings, is often reflected in their capacity for attracting quality manuscripts and a greater capacity for attracting citations when compared with journals of lower prestige with equivalent articles (LARIVIÈRE; GINGRAS, 2009; LARIVIÈRE; LOZANO; GINGRAS, 2014). This is a situation that particularly affects the journals of Brazil (MENECHINI, 2010). However, as we shall see, attaining the much-desired approval of manuscripts in prestigious journals with high rejection rates is not a guarantee to authors that the article will have a good performance in receiving citations. Nevertheless, publishing in high-impact journals is an inherent motivation for performing research in many disciplines (SOREIDE; WINTER, 2010).

Even though indexing in itself symbolizes an acknowledgment of journals based on evaluation and selection criteria, the coverage of journals of Brazil by SciELO, Scopus, and WoS indexes, beginning with the number of journals that each one indexes, is far from representing a consensus. In fact, based on the catalogues from 2013 and 2014, SciELO indexed 278 journals, Scopus indexed 313, and WoS indexed 141. However, as seen in Figure 1, only 97 of these journals (24%) are simultaneously indexed in all three indexes. Even if we consider the more restricted collection of WoS, the coincidence reaches only a total of 70%.

Figure 1. Distribution of journals indexed in SciELO, Scopus, and WoS



Source: Scielo, Scopus and WoS

The journals' coverage by thematic field in the three indexes, as shown in Table 1, is proportionally similar for health sciences, engineering, linguistics, literature, and the arts, but differs significantly in other areas. Therefore, in addition to health sciences, SciELO's relative

coverage favors journals from the humanities and applied social sciences, comprising 35% of its collection; WoS favors agricultural and biological sciences, which comprise 45% of its collection; and Scopus favors the humanities and agricultural sciences, which comprise 40% of its collection.

Table 1. Distribution of journals of Brazil indexed in SciELO, Scopus, and WoS, per thematic field in 2013.

Index	Thematic fields - journals								Total
	Health	Human	Agriculture	Biological	Applied Social	Exact and Earth	Engineering	Linguistic, Literature and Arts	
All	30%	25%	15%	12%	10%	7%	6%	5%	402
SciELO	33%	29%	14%	10%	12%	3%	7%	4%	278
Scopus	32%	22%	18%	15%	6%	8%	7%	4%	313
WoS	34%	14%	24%	21%	3%	9%	8%	3%	140

The number of articles indexed per thematic field is influenced by the journal indexing policies of the specific indexes. In the three aforementioned indexes, the articles on health and agricultural sciences predominate and totally account for over 60% of the collections. Biological sciences follow,

with a greater presence in WoS and Scopus. Humanities and applied social sciences account for 23% of articles in SciELO, compared with 14% in Scopus and only 6% in WoS. The fields of engineering and exact and earth sciences have a relatively similar distribution among all three indexes.

Table 2. Distribution of articles from journals of Brazil indexed in SciELO, Scopus, and WoS per thematic field in 2013.

Index	Thematic fields - Articles								Total
	Health	Human	Agriculture	Biological	Applied Social	Exact and Earth	Engineering	Linguistic, Literature and Arts	
SciELO	45%	21%	12%	17%	8%	5%	6%	0%	19.064
Scopus	38%	24%	18%	11%	6%	6%	3%	1%	20.758
WoS	38%	31%	22%	5%	8%	7%	1%	1%	12.547

In total, the three indexes annually index around 24,000 original and review articles from Brazil journals.

The difference in coverage between the indexes contributes to broadening the universe of indexed journals of Brazil mainly due to the different approach that each index takes with regard to the thematic fields. At the same time, it relativizes the analysis of citations and indicators at the journal level. In addition, a critical aspect of ranking journals comes from the oft-repeated fact that the number of citations an article receives within the context of a journal, as well as the number

of citations that a journal receives within the context of an index, varies significantly. This results in an asymmetric distribution, with a set of 20% to 30% of articles or journals receiving 70% or more of the citations. This citation behavior, similar to Bradford's law for the formation of core collections of journals per thematic field, was identified in the early days of the Science Citation Index (SCI) by its creator, Eugene Garfield (GARFIELD, 1972). In other words, the indicators of journals based on received citations, whether from the impact factor, the SJR, or Google Metrics, have a differentiated value as a result of the high

performance of a relatively small percentage of articles that they publish. As an example of this behavior, we evaluated the indexing of the megajournal PLOS One on WoS, which published 37,328 articles in the years 2011 and 2012 and received, up until February 2014, a total of 176,846 citations, that is, an average of 4.75 citations per article. However, only 13,300 (36%) of the articles received five or more citations and 14% did not receive any citations at all. The exposure time of the articles during the citation counting periods influences the development of the distribution. However, the asymmetric distribution of the received citations persists over time and implies that, in research evaluation systems that use citation indicators at the level of the journals in which they are published, as it occurs in many fields for QUALIS CAPES, the majority of the articles are at an advantage. In other words, they “hitch a ride” on the articles with the most citations. Furthermore, with regard to PLoS One, during the same period of time, the 771 articles with at least one author with a Brazilian affiliation attained an average of 4.5 citations per article, only 6% below the global average. But this becomes 10% above the average when we only consider the articles with international collaboration (56%), with 5.26 citations per article. Similarly, if we consider a Brazilian journal with a high rate of manuscript rejection, such as *Revista de Saúde Pública* – with 303 published articles in 2011 and 2012, which received 376 citations on WoS up until February 2014, that is, an average of 1.24 citations per article – the asymmetric behavior of citations is again confirmed, because 96 articles (32%) are found to be above average, yet 137 (45%), less than half of the articles, received one or more citations. If we consider SciELO CI, with a wider coverage, the total number of citations received by the same articles found in *Revista de Saúde Pública* increases to 519, that is, an average of 1.71 citations per article, 40% above the number achieved in the WoS core collection.

Limited citation performance

Citation performance is a central and recurring issue that permeates the development of journals of Brazil, as the majority of them are below the median impact factor for thematic fields in the international indexes. Furthermore, the distribution of the impact factor of all indexed journals tends to stabilize, which can be interpreted in the following way: since the adjustments in the last few years, the journals’ capacity to receive citations within this context is at its limit, for both Brazilian and foreign citations.

Three paths can contribute to improving the journals’ performance in this regard. The first is to analyze citations within contexts that maximize the number of journals citing, that is, cover the maximum number of citations. Google Scholar best represents this amplified context, especially for humanities and applied social science journals, whose relative performance is significantly increased. However, the use of Google Scholar is limited because it does not operate within the classic models of bibliometric indexes and its data has limited availability. Increasing the indexing of journals of Brazil within the international indexes to increase national citations is a temporary solution that would rapidly lead to a new balance, and would also bring the risk of further decreasing its placement in the distribution of impact factors. Operating the SciELO collection on the WoS platform would be a more appropriate solution, for it would expose the same SciELO journals to a more exhaustive and controlled universe of journals that make citations. In fact, as shown in Table 3, this contribution proves to be significant. Taking into account the citations received until February 2014 by the articles indexed in SciELO in 2012, there is an increase of 2.30 times (or 130%) in the citations received from all WoS databases, ranging from 0.17 citations per article to 0.40 citations. This increase varies by thematic field and their respective journals, with an emphasis on exact, earth, and biological sciences, which received four times more citations, which indicates their predominantly international orientation.

Agricultural science, humanities, literature, language, and the arts, and applied social science had a relatively smaller increase, which further highlights their national orientation. SciELO CI's contribution in terms of citations initially applies

to the context of the SciELO journals and serves to promote important adjustments to the national evaluation systems, but lacks international comparability. However, the expectation is that it increases the visibility of most journals.

Table 3. Distribution of citations received in articles from 2012 in SciELO CI journals from the SciELO database and all WoS databases.

Thematic Fields	Journals	Articles	SciELO database		All WOS databases		increase
			citations	citations per article	citations	citations per article	
All	267	19445	3384	0,17	7764	0,40	2,29
Exact and Earth	9	1032	152	0,15	649	0,63	4,27
Biological	28	2517	387	0,15	1512	0,60	3,91
Engineering	18	1310	155	0,12	419	0,32	2,70
Health	89	8463	2054	0,24	4802	0,57	2,34
Agriculture	35	4015	730	0,18	1387	0,35	1,90
Human	80	3516	239	0,07	346	0,10	1,45
LL&A	11	336	11	0,03	14	0,04	1,27
Applied Social	32	1092	68	0,06	85	0,08	1,25

The second path is to maximize the internationalization of journals of Brazil with the objective of increasing the community of researchers making citations. SciELO and other programs attempt to do this, but it largely depends upon changes to the journals' policies, management, and editorial priorities. The third path is to establish a funding program directed at a selected group of journals that already show good international performance, with the aim of placing them within the top quartile or decile of the impact factor ratings in a few years.

To provide a clearer description of the challenges of these two paths, we shall revisit some of the determining factors of the performance of journals of Brazil on WoS, with a special emphasis on the communication of research in Brazil.

Citation performance on WoS

We shall consider the publication year of 2012 as a reference because it is a good representation of current coverage, and the beginning of March 2014 as the date for collecting citations, which ensures at least a year of exposure for the citations. As seen in Table 4, in 2012, journals of Brazil published 14,841

documents, of which 13,518 are original or review articles, representing 1% of all the articles on WoS, reaching up 25th among the countries ranking. A Brazilian affiliation is present in 83% of the articles; 22% of the articles have at least one foreign author; and 6% of the articles are by Brazilians collaborating internationally. English is used in 60% of the articles, which reflects a remarkable progress considering that the total was 48% in 2007. The number of citations received per article throughout 2012, 2013, and the first two months of 2014 reached 0.47 for all articles and 0.61 for the articles in English, a number three times higher than that of articles in Portuguese, which received 0.27 citations per article. Foreign authors achieve the best performance with 0.77 citations per article, a higher result than that of the articles by Brazilians collaborating with international authors, who achieve 0.58 citations per article; this number increases to 0.7 when the article is in English.

The distribution of the number of articles and citations received significantly varies according to thematic fields; within those fields, they vary according to the language of their publication and the presence of foreign authors, as seen in Table 5. Health and biological sciences, engineering, and exact and

Table 4. Distribution of articles from 2012 in journals of Brazil indexed in WoS.

Total documents indexed on WoS in 2012	2.132.312
Original and review articles	1.355.289
Brazilian Journals on WoS – Total documents	14.841
Original and review articles	13.518
Citations per article	0,47
Review Articles	482
Citation per article	1,16
Articles in English	8.070
Citations per article	0,61
Articles in Portuguese and others	5.448
Citations per article	0,27
Articles with foreigners	2.942
Citations per article	0,68
Articles in English	2.416
Citations per article	0,77
Articles of Brazil in collaboration	759
Citation per article	0,58
Articles in English	522
Citations per article	0,70

earth sciences publish over 70% of the articles in English. Exact and earth sciences, with a total of 0.74 citations per article and 0.83 citations per article published in English, have the best performance, followed by biological sciences with 0.60 and health sciences with 0.55. Furthermore, among the natural science journals, agricultural science journals are in second place (31%) in number of articles, but have lower values regarding articles in English (43%), foreign authors (11%), and number of citations per article (0.32). WoS is known for its limited coverage of humanities and applied social science journals, which have the lowest number of indexed articles (7%) and the lowest rates of citations per article. The articles in English and those with foreign affiliation present a better performance in all fields, especially those from exact and earth sciences, with over 0.80 citations per article. The short exposure time of articles contributes toward a lower relative performance in subjects with a greater temporal range of citations.

Table 5. Distribution of articles from journals of Brazil indexed in WoS in 2012 and citations received per article, per thematic field, according to their language and foreign authorship.

Language and Authorship	All		Health		Agriculture		Biological		Engineering		Exact and Earth		Humanities and Social Sciences		
	recs	%	cit/recs	%	cit/recs	%	cit/recs	%	cit/recs	%	cit/recs	%	cit/recs	%	cit/recs
total	13518		0,48	43%	0,55	31%	0,32	20%	0,60	6%	0,43	8%	0,74	7%	0,12
English	8070	60%	0,62	73%	0,62	43%	0,39	89%	0,65	77%	0,52	71%	0,83	15%	0,28
Portuguese	5448	40%	0,38	27%	0,38	57%	0,26	11%	0,24	23%	0,14	29%	0,40	85%	0,09
Foreign	2942	22%	0,76	21%	0,76	11%	0,45	37%	0,72	31%	0,61	32%	0,81	23%	0,07
English	2341	80%	0,79	86%	0,80	79%	0,53	98%	0,72	91%	0,61	90%	0,87	23%	0,17
Portuguese	480	16%	0,22	14%	0,41	21%	0,14	2%	0,59	9%	0,17	10%	0,27	77%	0,04

Presence and performance in Brazil's scientific production

Still using the year 2012 on WoS as a reference, journals of Brazil contributed to 25% of all the 47,418 documents with a Brazilian affiliation indexed in their database. If we consider only the 37,697 original and review articles, which are the main types of documents published by journals of Brazil,

this participation increases to 30%, which is high compared with those from other emerging and developing countries whose native language is not English. Table 6 presents a sample of this participation for the BRICS countries (Brazil, Russia, India, China, and South Africa), France, and Japan, with special emphasis on journals from Russia, Brazil, and Japan, which publish 53%, 30%, and 22%, respectively, of the articles from

their country on WoS, and Brazil, China, and Russia, whose researchers publish 83%, 81%, and 79%, respectively, of the articles from these country's journals that are indexed in WoS. This sizable proportion of national

authorship in journals of Brazil also occurs in the Scopus index in SciELO's collection, which has a greater coverage of humanities and applied social science journals, whose orientation is predominantly national.

Table 6. Distribution of the number of original and review articles from selected countries and from journals of those countries on WoS, in 2012

Set of articles on WoS	Brazil	Russia	Japan	South Africa	China	India	France
Articles from the country	37.697	27.884	75.876	9.907	185.959	48.131	67.824
% of WoS	2,8%	2,1%	5,6%	0,7%	13,7%	3,6%	5,0%
Articles from the country's journals	13.518	18.810	26.639	2.380	30.705	10.838	19.535
% of WoS	1,0%	1,4%	2,0%	0,2%	2,3%	0,8%	1,4%
Articles from the country in the country's journals	11.276	14.917	16.630	1.562	24.774	6.376	7.945
% of country's articles	30%	53%	22%	16%	13%	13%	12%
% of articles from the country's journals	83%	79%	62%	66%	81%	59%	41%

One immediate conclusion of this high participation in international indexes is that it represents an acknowledgement of: the growing quality of journals of Brazil; their capacity to disseminate research in areas of national interest or orientation and to meet the needs, the convenience, or the option of publishing in Portuguese, according to subject, discipline, or field; and their availability to accommodate rejected manuscripts or those deemed not compatible for submission to foreign high impact journals. One way or another, the numbers prove that journals of Brazil have reached an important position within the context of Brazilian research and represent the preferred publication option for a significant number of Brazilian researchers (MENEGHINI; PACKER, 2013). However, let us remember that the prestige and credibility of journals of Brazil face the persistent, polemic, and crucial issue of their qualification in the international communication of Brazilian research. This occurs due to their low average performance, as measured by the number of citations they receive in international indexes, in comparison with high-impact journals

from developed countries, in which, as expected, most Brazilian research is published. Therefore, for original and review articles of 2012 from Brazil on WoS, as seen in Table 7, the number of citations received per article until February 2014 is 2.03, and it increases to 4.1 for articles that are international collaborations. The articles by Brazilians in journals from other countries achieve 2.67 citations per article, but this value decreases by approximately six times, to an average of 0.43 for articles by Brazilians in journals of Brazil. This average increases to 0.57 citations for articles published in English. However, if we consider only Brazilian authors publishing in English, which is a characteristic of the articles published in journals of Brazil, publications in foreign journals achieve 1.74 citations per article, whereas publications in journals of Brazil achieve 0.51 citations, which is closer to the average performance. This performance of Brazilian articles, which is three times lower except for a few cases, can also be seen in the thematic fields wherein most journals of Brazil publish.

Table 7. Distribution of original and review Brazilian articles from 2012 on WoS, according to language and the authors' affiliation

Total documents indexed on WoS in 2012	2.132.312
Original and review articles	1.355.289
Brazil - all documents from 2012 on WoS	47.418
Brazil - total of original and review articles	37.697
Citations per article	2,03
Review articles	1.418
Citations per article	4,07
Articles with international collaboration	10.410
Citations per article	4,10
Articles in foreign journals	26.819
Citations per article	2,67
Articles in journals of Brazil	11.276
Citations per article - total	0,43
Articles with international collaboration	735
Citations per article	0,58
Original and review articles - in English	5.916
Citations per article	0,57
Original and review articles - in Portuguese	4.867
Citations per article	0,28
Articles in English by Brazilians only, in foreign journals	16.733
Citations per article	1,74
Articles in English by Brazilians only, in journals of Brazil	0,54

The systematically lower performance of journals of Brazil in disseminating Brazilian research indexed in WoS can also be seen on Scopus, but with a few variations. The determining factors that enhance this phenomena are factual and well known: (a) within the scientific areas with the greatest number of citations, publication in high-impact foreign journals predominates, and no journal of Brazil fulfills this condition; (b) in most thematic fields, journals of Brazil were indexed with an initial performance below the established median of distribution of citations per article; therefore, they have a low capacity for attracting quality manuscripts and competing for better performance, which is a situation traditionally identified as a vicious circle or as the Matthew effect; (c) so far Brazilian research has not been successful in developing journals that are an

international benchmark, with performance within the top decile or even the top quartile of the citations per article distribution. A set of three to five journals that are an international benchmark would decisively contribute toward the progress of journals of Brazil, especially as models of internationalized editorial management; (d) the majority of internationally indexed journals of Brazil are still young within the international flow of scientific dissemination, and are produced under predominantly Brazilian editorial councils and peer reviewers. To give an idea, half of the SciELO journals have been indexed for seven to eight years; and they have been in WoS for five to six years. But considering that they receive their first impact factor on JCR after two or three years, the indexing time decreases to practically three years. Although the prospects for increasing the impact factor are limited for the set of journals, some young journals might achieve a high impact within the next years; (e) except for biological, engineering, exact and earth science journals, the presence of foreign authors is below 30%; (f) the articles by Brazilians, which predominate, have low international collaboration (6% for the articles from 2012); (g) the publication of articles is delayed, or advanced publication is not put into effect, which implies a lower exposure time within the indexes, and consequently fewer citations in recent periods; and (h) a large percentage of the publications are in Portuguese and, as seen in Table 5, they receive less than half the number of citations that articles in English do in most thematic fields, in the international indexes. It is a fact that articles with at least one foreign author perform systematically better in all thematic fields. This may occur due to better research or manuscripts, including the quality of the text in English, combined with stricter assessments, or due to the never-proven fact that foreigners cite each other more than Brazilians do (MENEHINI, 2010; MENEHINI; PACKER; NASSI-CALÓ, 2008). Brazilian researchers should react to one anecdotal fact, which is foreign peer reviewers questioning about the citations

of Brazilians journals or the self-censorship of Brazilian researchers who, for different reasons, hamper the citation of Brazilian journals in the manuscripts they submit to foreign journals. Lastly, it is important to highlight that, whether they are captive to or a result of the phenomena of scientific productivism, many indexed journals convey an excess of articles with no academic impact (ALCADIPANI, 2011; TREIN; RODRIGUES, 2011), which only adds to the causes and classic behavior of low citations from journals of local orientation or interest. An understanding of all these listed facts, whether individually or as a whole, is essential to guide policies, programs, and courses of action for the development of journals of Brazil.

Besides improving the quality of research and the resulting articles, as well as professionalizing the editing and publishing processes, the crucial issue permeating the development of most journals of Brazil continues to stem from framing an evaluation system based on citations in the international indexes with the crucial role in disseminating research of national interest or orientation, which lacks international impact, and is an issue that also applies to journals from other developing and emerging countries (TIJSSEN; MOUTON; VAN LEEUWEN; BOSHOFF, 2006). The stratification of journals in the QUALIS-CAPES system is a simple solution for this issue, as it predetermines a score for the articles according to the journals in which they are published, regardless of the number of citations that they might come to obtain. It is a solution that particularly benefits journals from thematic fields whose citations have little dynamism, and those with no prospect of internationalization or achieving impact growth.

Performance among emerging countries

The low relative citation performance of journals of Brazil in the WoS and Scopus indexes, in disseminating Brazilian research, does not occur when compared with the

performance of journals from developing and emerging countries, particularly the BRICS countries. To the contrary, as shown in Table 8, the journals of Brazil indexed in Scopus have the best performance – measured by the SJR median – among the BRICS countries, whereas Brazil's SJR distribution – evaluated with those of the BRICS countries by the Mann-Whitney test – does not differ from that of China and South Africa and is superior to that of India and Russia. However, with regard to the JCR impact factor distribution, considering only the SCI's collection, which allows for a better comparability among countries, journals of Brazil have the second median, behind China, and Brazil's distribution is no different than that of India and South Africa. It is worth remembering that the large percentage of articles in Portuguese, which in general receive fewer citations in the international indexes, highlights the good performance of journals of Brazil among the BRICS countries. However, journals of Brazil hold the lowest presence within the top quartile of the JCR impact factor distribution due to the lack of journals with high citation performance, as aforementioned. Within Latin America, journals of Brazil have outstanding performance in the international indexes.

Open Access, presence and performance on the Web

Journals of Brazil also stand out for their wide visibility on the Web, and for the use of their articles, as measured by the number of downloads of HTML and PDF files. All quality journals of Brazil have updated online operation, whether through SciELO, their websites, their publishers' portals or other aggregators, or a combination thereof. SciELO's pioneering adoption of open access online publishing in 1998, associated with an evaluation based on well-defined criteria and performance measurements, decisively contributed to the development of Brazil's capacity for the indexing, publication, and

Table 8. Data of the box plot structure of the SJR/Scopus and FI/SCI/JCR distributions from 2012.

Metrics	SJR Distribution of BRICS Journals – Scopus 2012				
	Brazil	China	India	Russia	South Africa
Maxim	0,924	3,739	0,974	0,924	0,660
Q3	0,325	0,303	0,261	0,283	0,286
Average	0,255	0,264	0,212	0,229	0,228
Median	0,215	0,207	0,182	0,182	0,190
Q1	0,142	0,128	0,125	0,117	0,126
IQR	0,183	0,175	0,136	0,166	0,160
Minim	0,100	0,100	0,100	0,100	0,100
Journals	271	521	333	192	89
Brazil and BRICS Mann-Whitney test - z(5%)=1.96		Zcalc = 1.21	Zcalc = 3.61	Zcalc = 2.70	Zcalc = 1.59
		p > 0.05	p < 0.05	p < 0.05	p > 0.05
		do not differ	differ	differ	differ

Metrics	Distribution of FI of BRICS Journals – SCI/JCR 2012				
	Brazil	China	India	Russia	South Africa
Maxim	1,856	10,526	2,272	7,714	1,702
Q3	0,762	1,288	0,761	0,619	0,848
Average	0,573	1,126	0,549	0,521	0,590
Median	0,543	0,712	0,404	0,408	0,462
Q1	0,319	0,464	0,173	0,243	0,273
IQR	0,443	0,824	0,588	0,376	0,575
Minim	0,000	0,000	0,000	0,004	0,111
Journals	99	151	99	150	35
Brazil and BRICS Mann-Whitney test - z(5%)=1.96		Zcalc = 4.04	Zcalc = 1.58	Zcalc = 2.76	Zcalc = 0.03
		p < 0.05	p > 0.05	p < 0.05	p > 0.05
		differ	do not differ	differ	do not differ

interoperability of journals and articles on the Web. It is expected that most journals will publish exclusively online as of 2015.

Open access publication is a great differential that favors journals of Brazil. A study requested by the European Commission, published in 2013, regarding the availability of open access scientific articles indexed in Scopus, which included authors from the European Commission, the United States, and other countries, placed Brazil in first place with 63% of their articles available online, and highlighted SciELO as being the determining factor for this (SCIENCE MATRIX, 2013). As of 2014, WoS began registering its articles in open access, which is a clear indicator that open access is progressing in all spheres of scientific communication and a clear acknowledgement of SciELO's leadership.

In 2013, WoS registered slightly over 1.5 million original and review articles, of which 12% were open access. Brazil, which was in 13th place with 2.7% of the total number of articles on WoS, jumped to 3rd place with 7% of all open access articles, behind the United States and China. This is largely due to the journals of Brazil, which account for 72% of the articles with Brazilian affiliations, being open access on WoS. SciELO Brazil, in particular, stands out as a service provider of open access journals indexed in WoS, Scopus and the Directory of Open Access Journals, in which Brazil holds the second place for the number of open access journals, behind the United States.

The availability of open access content enabled SciELO's strategy of maximizing the online presence and interoperability of journals

and the research they convey. The main external indicator of this strategy's success is the international ranking of open access scientific content from the Ranking Web of World Repositories (CSIC/CYBERMETRICS LAB, 2014), in which SciELO Brazil has held first place since 2011. This position is the result of a high performance in terms of visibility criteria, measured by the relative number of external links received, the number of documents indexed by Google Scholar, and the number of pages and archive files on Google.

However, the most direct indicator of the use of journals of Brazil is the number of downloads of full text articles from SciELO's collection in the HTML and PDF formats, enabled either through SciELO's interface or directly from PDF files. Using the Counter system code of practice, which subtracts the access from a wide range of robots and demands a minimal length of time between multiple attempts to access the same text, journals of Brazil serve a daily average of 600,000 downloads. Such a number is extraordinary if we further consider that many journals render their full texts available on their own websites and many articles are also replicated in different institutional and thematic repositories. This notable article download performance varies according to the knowledge area and the language of publication. Taking into account SciELO Brazil's complete collection, during the second half of 2013, the current journals had a monthly average of 51,000 downloads per journal and an average of 62 downloads per article. The humanities, applied social science, and health journals showed a performance above the average of downloads per article, of 35%, 15%, and 11% respectively, while those for engineering, and exact and earth science had 20% and 26% of downloads below the average, respectively. The lowest performances lie in literature, language and the arts; agricultural; and biological sciences, with 41%, 44%, and 54% below the average, respectively. The humanities and applied social science journals

are fully compensated in terms of download performance, considering their relative low performance in comparison with other fields in the metrics based on number of citations. The problem with download indicators is the lack of comparability, as they are almost always restricted to repositories or portals, such as SciELO. As of yet, there are no systems that enable integrated counting.

Beginning in 2013, and coinciding with the launch of the DORA Declaration and the renewed criticism of using journals' impact factor as a proxy for evaluating the quality of both the research being published and the researchers themselves, research groups and institutions, the so-called altmetrics have gained prominence. They account for the influence of articles and other documents based on the transactions they are subjected to on the Web (BUSCHMAN; MICHALEK, 2013). However, even in the condition of complementary metrics, it is still too early to make use of them to measure the influence and presence of journals of Brazil and the articles they publish, given the low activity of researchers and journals on social networks. However, as of 2013, SciELO began using the services of the company almetric.com to record the articles' transactions on different social networks.

The academic locus of journals of Brazil

Institutional framework and management

Using the 400 journals indexed in SciELO, Scopus, or WoS in the beginning of 2014 as reference, and as shown in Table 9, the universities and their teaching and research institutions are responsible for 50% of the journals. An additional 15% of the journals come from institutes and research institutions that are not linked to universities, and 33% belong to scientific societies and professional associations.

Table 9. Distribution of the journals indexed in SciELO, Scopus, or WoS according to thematic field and the type of institution responsible for publishing them.

Type of institution responsible for journals	Thematic fields								Total %	Total
	Health	Human	Agriculture	Biological	Applied Social	Exact and Earth	Engineering	Linguistic, Literature and Arts		
Universities and their units	38%	64%	63%	37%	64%	33%	38%	90%	51%	206
Scientific and professional communities	48%	19%	19%	39%	13%	50%	50%	5%	33%	131
Institution not linked to universities	11%	16%	17%	22%	18%	10%	12%	5%	14%	55
Commercial Publishers	3%	2%	2%	2%	5%	7%	0%	0%	2%	10

This panorama of the journals' institutional affiliation extends through the different knowledge areas, but there is one clear variation among them with regard to the prevailing types of entities responsible for them. The universities, through their many units, are responsible for most journals for agricultural sciences (63%), humanities and applied social sciences (64%), and linguistics, language and the arts (90%), while societies, colleges, academies, and scientific and professional associations are responsible for the majority of journals for biological (39%), health (48%), exact and earth sciences, and engineering (50%). The institutions that are not linked to universities are responsible for a significant portion of journals for biological sciences (22%), applied social sciences (18%), and agricultural sciences (17%). Commercial publishers are responsible for only 10 journals.

Considering the universe of the 278 journals indexed in SciELO, there are 176 entities responsible for the SciELO journals, of which 27 (15%) are responsible for more than one journal, and only 8 (4.5%) are responsible for more than five journals. This gives us an average of 1.5 journals per entity. In other words, the management and operation of journals is widely spread out through Brazil's systems of education, research, and technological development. The publication of scientific journals in Brazil is not and does not come across as a commercial publishing business. However, journals are increasingly making use of national and international private companies

that are contributing toward the formation of an updated and competitive national market for scientific publishing and editing.

In general, the entities that host and loan their institutional structures to the journals, despite providing them greater or lesser financial support, lack not only well-established, systematic, and proactive policies but also professional editorial services. This occurs even within the few entities that host more than one journal. Thus, any control over performance and the results attained by editors and their journals is mainly an external control, especially by the QUALIS CAPES journal ranking. And, as with journals from other countries, control is also exerted by indexing systems and their performance metrics based on citations received, especially on SciELO, Scopus, and WoS.

The editors and their duties

In many cases, the editors-in-chief, in addition to implementing policies and executing editorial duties such as the selection of manuscripts and dissemination, take on most of the administrative and operational tasks of publishing, acting as publishers of only one journal.

Regardless of their crucial position and responsibilities, very few editors dedicate themselves full time to managing journals because, as aforementioned, the editorial duties are added to their academic, research, teaching, and extension tasks. Among the 278 SciELO journals active in 2014, 39 (14%) operate with two

or more editors, a practice that occurs especially in health (17) and humanities (15) journals, which occupy the first and the third places in numbers of published articles, respectively. The editors-in-chief are almost always active researchers: only two of the 337 editors-in-chief of SciELO journals do not have their CV on the Lattes Platform; 40% are CNPq level 1 researchers and another 15% are level 2. Using the CVs on the Lattes Platform in December 2013 as a source, their h-index distributions on Scopus, which has a broader indexing coverage, have a median of 9 for life sciences and 8 for physical sciences, with the top quartiles varying from 13 to 40 and 15 to 31, respectively. It was not possible to collect enough data to compile h-index distributions for humanities and applied social science editors based on their CVs or profiles on Google Scholar. The duties of an editor-in-chief and associate editors, despite adding prestige to the researchers, are not formally acknowledged within the evaluation systems, and only a few of them are actually properly paid for taking on such duties.

There are no undergraduate or graduate courses on scientific publishing in Brazil and most editors empirically obtain their qualification and specialization through self-learning, based on their everyday experience and through opportunities to participate in events regarding the field's latest developments, specific trainings and exchanges of information and experiences at academic editing and publishing events. These events are mainly promoted by the Brazilian Association of Scientific Editors (ABEC – Associação Brasileira de Editores Científicos), by scientific societies and associations which organize parallel publishing meetings at their congresses, and by the SciELO program. Participation in international editing and scientific communication events is very rare.

The tasks of editing, publishing, and dissemination, which are performed individually by journals of Brazil, have a minimized scope that is focused on the noble task of managing the flow of manuscripts. Very few journals have proactive policies on

scientific marketing, including the intensive use of social networks, systematic manuscript commissioning, providing additional services to their communities of researchers, and implementing innovations. This centrality has two facets, one being budget limitations, and the other being the limited time that the researchers/editors-in-chief have to dedicate themselves to the journals. However, this situation is largely overcome through SciELO's contribution, which promotes and provides to all journals it indexes the implementation of innovations that align them with international state-of-the-art academic editing and publishing, with a strong focus on improving the quality of the editorial process and on maximizing the visibility of the research they communicate. In this sense, in addition to the bibliographic index, online publication, and preservation of digital content, SciELO operates as a common space for the convergence and development of journals. Nevertheless, the editors' role and leadership is crucial for the good performance of journals.

Disputed funding

Over the course of their existence, journals have developed their own individual strategies to conduct their operations and achieve financial sustainability or survival, directly or indirectly influenced by the national policies and programs for research and scientific communication, such as QUALIS CAPES, the journal funding programs of federal and state agencies, and the SciELO program from FAPESP. These strategies turned out to be very similar. Journals rely on different levels of physical infrastructure and personnel, which almost always come from their umbrella institutions. Many journals published by scientific societies utilize this infrastructure to support their operation through partnerships or by taking advantage of their editors' institutional affiliation.

The journals' annual budget is covered by the institutions responsible for them, and in

most cases it is complemented by one or more sources of additional resources, predominantly public, which are distributed by federal and state programs to support editing and publishing, as well as from other sources that the editors frequently mobilize through their high level of dedication and personal efforts. In general, the editors prepare projects for the journals' maintenance in order to compete for the assistance that is available. However, very few calls for projects are guided toward innovation and increasing visibility or impact. The expenditures of these scarce and precise resources are almost always controlled by legislation and rules that do not favor the achievement of the results desired. Some of the publishing tasks, particularly those related with the editing, translation, and revision of texts, are in many cases provided by informal and personal networks of professionals. A very restricted portion, particularly in the area of medicine and engineering, receives support from advertisement. A small but growing number of journals have been developing autonomous financing strategies by charging the authors of approved manuscripts a publishing fee that varies from 400 to 900 dollars, which is lower than the amount currently considered as the international benchmark (1250 dollars). Another group, also limited, has recently opted to publish through large commercial publishers, which have begun conducting business within the Brazilian market, offering different business models. Some scientific societies and institutions, in opposition to the trend of the most advanced scientific communities, ceased to publish their journals as open access, and instead opted to sell subscriptions.

Pursuing innovation:

Professionalization, internationalization, and sustainable financing

The conditions behind the management and operation of a large part of journals of Brazil present limitations to sustaining their

future development. They must be remodeled in order to strengthen their role within the education and research infrastructure and create conditions for implementing state-of-the-art services for scientific dissemination. In other words, their academic nature does not contradict the professionalization of their services. A new *modus operandi*, implementing innovations that would bring us closer to the journals that are international benchmarks, will greatly contribute to an increase in the prestige and credibility of journals of Brazil among national and international researchers.

Current innovations

The consolidation of the Web as the new and primary means of communication and interoperability of scientific content has been leading to continuous adjustments, adaptations, and innovations in journals' production and operation, particularly in the sharing and evaluation of research. In fact, the use of the Internet and the Web has become ubiquitous in scientific entrepreneurship as a whole, granting it the condition of *eScience*.

The flows of manuscript submission and evaluation, as well as the publishing, formatting, and editing of the approved articles' texts, are amenable to online management and operation, with the support of exhaustive logging of process and statistics. The main innovation in relation to classic serial publication that resulted from online publications, in addition to the possibility of strictly controlling the procedures, is the option to obviate the use of issues as a necessary publication unit, liberating the individual publication of articles immediately after the completion of their editing, which speeds up dissemination, with considerable benefits for all. Journals then move themselves to the management of flows of articles that are made available on their own portals or platforms, or shared with other journals. The articles are occasionally collected in issues and volumes to manage bibliographic

references and the preservation of the texts. The rise of *megajournals* is the most advanced manifestation of this change.

Two other important innovations might gain strength in the near future. The first is the rationalization of peer review through the sharing of evaluations among journals. Regardless of the tremendous effort invested in evaluating the increasing number of manuscripts by the community of researchers and the ongoing difficulty faced by journals to find *ad hoc* reviewers, this proposal is still faced with resistance and difficulties in terms of its implementation mechanisms. Joining journals in shared platforms of manuscript management and publication, which emulates *megajournals*, might be a solution for the journals of Brazil. The second is the mandatory availability of the data utilized in the research on online repositories, organized as citable research objects, with the objective of facilitating the research's reproducibility and the reuse of data in other research. This practice is being implemented by an increasing number of benchmark journals, and journals of Brazil should progressively adapt to this innovation.

Another change inherent to online digital publication is maximizing the interoperability of the articles that are made available on the Web. These articles are organized according to their sections to facilitate internal browsing, and are enriched with numerous links or services associated to the authors and the subjects being addressed. Furthermore, it facilitates sharing through email or social networks, visualization of texts in different presentation formats, and performance tracking through download and citation indicators, which are dynamically updated. In summary, the articles have begun to operate as true Web portals, with numerous possible uses.

The specialized support services for researchers with regard to managing and sharing their personal libraries, as well as the use of social networks to exchange and disseminate content, have become mandatory

tools for the marketing and dissemination of journals and the research they publish.

Information technology also contributes to the use of and the increasing preference for accessing journals and articles from mobile devices, cell phones, and tablets, a modality that will predominate in the near future, as they facilitate the tasks of reading, interoperability, and sharing within social networks, acting as an extension of the human body.

The collective adoption of innovations

Journals of Brazil have been following and adopting these advances with a relative delay. In this process, the 15 Years SciELO Conference program, held in October 2013 in São Paulo, was a milestone, presenting the main developments that are reforming and revolutionizing international academic dissemination, as well as their consequences and contributions to journal publishing in developing countries (SciELO, 2013). In addition to the debate, the SciELO Program is also promoting four major developments to all the journals it indexes, which are organized as lines of action for professionalization, internationalization, and sustainable funding, guided toward the sustainable implementation of the innovations highlighted above. The first development is the online management of manuscripts, through public services that are operated with systems known to the international academic community. These systems also have an integrated option for charging publication fees and generating basic transaction statistics, which may allow for the monitoring of productivity levels in managing the flow of manuscripts. The second is the structuring of full texts in extensible markup language (XML), in accordance with the Journal Article Tag Suite (JATS) standard. With the full text being marked in XML, it is possible to precisely identify the sections, components such as tables and figures, and bibliographic elements of the article. This identification

is necessary for a quality automation of indexing, the implementation of different metrics, interoperability, and the article's presentation in different formats, according to the characteristics of different reading devices. The third development is to promote journals using social networks as a primary means of dissemination. As part of this line of action, SciELO has been working on implementing a blog platform, SciELO in Perspective, by thematic fields as a common solution to ensure that most of the journals they index attain a minimum presence on the social networks. This is done through posting the press releases of all new publications, interviews with authors, general communications, and comments. The fourth development is the operation of the WoS platform's collection through SciELO CI, giving all journals the tools for regular browsing, searching, and counting citations of one of the most important systems of scientific information in the world. This development complements the intensive interoperability that characterizes the operation of SciELO journals on the Web, with an active presence of metadata on Google Scholar and in bibliographic indexes with links back to the full texts. A fifth development deals with the implementation of solutions and international standards for the publication of research data that supports the articles. Lastly, the creation of *megajournals* should be considered as a solution to render the entire dissemination process more efficient for thematic fields with high rates of article production.

These developments have occurred in parallel and, as their implementation advances, it brings SciELO's journals closer to the international state-of-the-art standards regarding scientific communication. Within this context of professionalization, the production of journals will be carried out with the support of advanced methodologies, technologies, and services, which might be contracted from national and international editing and scientific publishing companies, duly recognized by SciELO.

Professionalization as a *modus operandi* to implement the aforementioned innovations has been developed simultaneously with the line of action for internationalization, prioritized by SciELO to increase the submission of articles by foreign researchers. The solutions that are being made available for processing the production flow and the dissemination of articles follow international standards, solutions and services, which are familiar to most researchers worldwide. Thus, a researcher from anywhere around the world will be able to interact with journals of Brazil through known systems and services for manuscript management, including the option to charge internationally for publishing fees, as well as that of citation search and analysis. Internationalization also comprises an increase in the participation of foreign researchers in managing journals, as active members of editorial boards, associate editors, and peer reviewers in the manuscript evaluation processes. This dimension requires the commitment of the journals' editors-in-chief. One of SciELO's specific recommendations is that journals should structure their groups of associate editors with pairs of scientists, wherein one would be Brazilian and the other a foreigner, for each subject or field. However, the most visible aspect of internationalization is the publication of articles in English, which has been increasing in SciELO journals, including simultaneous publication in two or more languages. In fact, as of 2012, SciELO's collection began publishing over 50% of its articles in English. Within the next three years, this percentage is likely to rise to 70% of all articles being published in English, and at least 20% being published simultaneously in English and Portuguese.

The third line of action is promoting the stable financial sustainability of journals within their current context, wherein combined funding from different sources predominates. Developing the platform of common editing and publishing services that is promoted by SciELO will provide Brazilian scientific communication

with an increasingly competitive national market, a progressive increase in productivity, and the adoption of innovations. This common service platform will contribute toward achieving minimized fixed costs of editing and publishing, which will assist the budgeting of costs of hundreds of journals and of journal's funding programs. One of the services that will be provided by the platform is billing for publication fees for those journals that opt to cover part of their budgets, or the entire budget, through charging the articles' production costs, known within the international community as Article Processing Charge. The charging of publication fees is slowly but progressively being adopted. However, the adoption of article processing charges as a central element of a national strategy to sustain quality journals will depend upon changes in the current policies and programs for financing journals, within both the funding agencies and the research institutions. The current development of a common service platform with minimized prices and a billing system will certainly contribute to the adoption of these policies, providing a better cost-benefit relationship than the current system. In England, an integrated management system for funds provided by agencies, institutions, and the transactions of publication payment fees for articles made available by authors is being tested. This system might be suitable as a model for Brazil (JISC, 2014). As journals of Brazil increase their publication of foreign authors, the costs should also be shared internationally, the publication fee is the most appropriate mechanism to do so.

The developments that SciELO has been promoting were defined based on a consultation about the recommended suggestions for improving journals of Brazil' quality and visibility. This consultation was requested by FAPESP Scientific Director and was conducted by ABEC and SciELO at the end of 2011, together with a group of selected editors from different thematic fields. In the 15 Years SciELO

Conference, the SciELO Network adopted these developments for all its collections. A fourth line of action, of a political nature, was proposed at the conference. It is focused on the joint participation of editors in favor of improving the Brazilian system of scientific production, evaluation, and dissemination (REGO, 2014).

The implementation of the developments headed by SciELO, in partnership with the editors and national and international scientific editing companies, will strengthen the current decentralized and independent journal management structure, keeping the editorial centrality within the academic environment, but with a common space for the convergence of content and interoperable services within the platform of *eScience*, both in Brazil and internationally.

Conclusion: a promising future demands innovative scenarios

This panoramic view of the current state of development of journals of Brazil highlights the ample international indexation they have achieved, acknowledges their main *locus* as part of the national research and education infrastructure, and identifies the increasing rhythm of improvement and innovations in the editing, publishing, and dissemination processes, which are aligned with the international state-of-the-art with regard to producing quality publications. In terms of the typical institutional and management conditions journals have historically operated in, their advances are triggered by professionalization, internationalization, and sustainable funding.

A large part of journals are actively present in the international flow of scientific dissemination, with the predominance of open access to full texts of the results of research and studies they communicate. In the case of the SciELO journals, we can highlight the ubiquitous availability and interoperability

of articles on the Web, which are reflected in the extraordinary number of downloads, and which highlight their importance not only for the academic communities but also for the general public. However, the performance according to the classic metrics based on the number of citations received in international indexes, where most journals of Brazil have been incorporated in recent years, has remained considerably lower than the performance most benchmark journals from developed countries have had for many years already. In addition to the fact that they are new to the international flow, the low citation performance of journals of Brazil has well-known causes, such as the low presence of foreign authors, minimal international collaboration in the Brazilian research they communicate, a scope of national orientation or interest, and the very frequent use of Portuguese. However, when compared with the average performance of journal collections from developing and emerging countries within the same indexes, Brazil's collections are among the first. The results of the classic metrics improve for journals of Brazil in collections with more ample coverage, such as those obtained by SciELO CI. Another field where performance is still low is altmetrics, which indicate a still-incipient presence of journals and their articles on social networks.

Under these conditions, the future evolution of journals of Brazil is, on the one hand, promising, with the perspective of continuous improvement in the quality of editing and publishing, and the progressive increase of their presence, influence, and prestige within the national and international scientific communication, following the trends of recent years. Among these promising perspectives is the possibility of implementing a specific program to promote the progress of a selected group of journals, so that they become an international benchmark in their respective thematic fields and fulfill this gap in Brazilian research. This idea was originally raised through the consultation conducted by FAPESP in 2011

to a group of selected editors. On the other hand, the current conditions present resistances and difficulties to the evolution of journals of Brazil, within the different spheres and among the different actors that are part of scientific research and dissemination.

The evolution of these forces may either accelerate or penalize the progress of journals of Brazil, depending on the scenarios that prevail in the next few years, as a result of the convergence of innovation policies and programs in Brazil's scientific communication. In the next section, three political and operational scenarios are considered, whose development is feasible and which would contribute to remarkable advances in the influence and credibility of journals of Brazil.

Proactive scenarios

The first scenario is a reaffirmation of the journals' current evolution. This scenario has the greatest likelihood of prevailing, as it results from the inertia of policies and programs from the institutions responsible for the journals and the agencies supporting scientific research and dissemination. It reflects the difficulties that journals face in promoting innovation in terms of funding journals. A crucial issue within this scenario is acknowledging the merit of most journals of Brazil, based on the advances they have already achieved, and persisting in increasing their international quality and visibility, with a strong focus on the priority lines of action, which are professionalization, internationalization, and stable funding, all headed by the SciELO/FAPESP Program. The other crucial issue is acknowledging that the future development of journals greatly depends upon editors' leadership and proactivity. Even though radical advances led by individual journals could take place, they are not probable, given the limited investments inherent to the institutional and financial context in which they are managed and operated, thereby limiting them to only maintaining the journals' operation.

However, this scenario provides the conditions for two important innovations within the structure of the universe of journals of Brazil. The first would be to establish journals with efficient platforms for continuous article publication in the thematic fields with the greatest flows of articles, much like the *megajournals*. This would be done to rationalize manuscript evaluation and the cost of processing articles by bringing many journals together. It would also discourage the creation of new journals focused on already existing subject areas. The second innovation would be to implement the aforementioned specific grant program, in order to promote a selected group of quality journals to the position of international benchmarks.

A second scenario favorable to the progress of Brazilian scientific communication in general, and particularly of journals of Brazil, will derive from the recommended modification of the QUALIS-CAPES system. This system currently uses the journals as a proxy to evaluate the research they publish from graduate programs. In the next few years, this system should be changed in order to evaluate the performance of individual articles. This modification – whose implementation effects and technicalities could easily be tested with the articles produced over the last few years from selected graduate programs – will greatly contribute toward granting a greater flexibility

to the system for communicating research, and will guide the focus toward improving the articles' quality, rather than increasing quantity, with the aim of increasing the impact of Brazilian research.

The third scenario would conform to modifying the current journal funding system. It would replace the assistance that agencies and institutions provide to maintain individual journals by an article processing funding system, which would be paid for by the authors. Authors would either utilize funds from their own research projects, or would strive to obtain collective funds from agencies or from the institutions with which they are affiliated. This modification would contribute toward a less bureaucratic funding system and the journals' progressive financial autonomy, and thus to overcome the stress and uncertainty of ensuring an annual budget. Within this funding structure, researchers, upon selecting the journals in which they wish to publish, and editors, upon promoting their journals to be more competitive in order to receive better quality articles, assume a greater direct responsibility for the journals' progress.

The construction and development of these scenarios, whether individually, in parallel, or simultaneously, will endow journals of Brazil with a greater capacity to contribute to Brazilian scientific communication.

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