

# EVALUATION OF BRAZILIAN EMERGING EJOURNALS IN SCIENCE AND TECHNOLOGY: A PROPOSED METHODOLOGY BASED ON ANALYSIS OF LINKS TO EJOURNAL'S SITE

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This paper reports the results of a research project, sponsored by CNPq – the Brazilian Council for the Development of Science and Technology -, which develop an evaluation methodology for the emerging Brazilian e-journals in Science and. In Information Science, citation is a traditional measure of prestige for a scientific journal. Brazilian e-journals are a recent reality in Brazilian Web scenario. One of the main barriers to increase their use by Brazilian academic community is the lack of systematic evaluation, like that provided by ISI's impact factor. The proposed methodology were based on the quantitative and qualitative analysis of the links to the site of the e-journal, obtained by submitting its URL to Google search engine. The methodology considers not only the number of links directed to a site, but also the existence of *qualitative* links, those of “authorities” sites in a specific knowledge area, and those of non-Brazilian institutions. “Authorities”, in Brazilian scientific scenario, are considered sites of institutions like specialized or academic libraries, sites of scientific or professional associations and sites of important post graduation programs in a specific area; non-Brazilian sites were also considered qualitative links, because they indicate the reach of an e-journal. These different kinds of links were weighted and used to calculate a *grade* to an e-journal site, as an indicator of its relevance in a knowledge area. The methodology was first tested and fine tuned in Information Science area and then applied to Brazilian e-journals of several knowledge areas.. This paper reports the results and discusses future developments such as how the methodology could be automated and made available through a web site, having as input URLs of the e-journal site and URLs of community agreed “authorities” sites in a given area. This proposal, in the scope of Brazilian public policies concerning scientific and technological information, could constitute in an cooperative evaluation web resource to the Brazilian scientific community, in addition to other resources like the SciELO gateway (<http://www.scielo.br>) and the CAPES scientific journals gateway (<http://www.periodicos.capes.gov.br>).

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## INTRODUCTION

Since the raise of scientific journal in XVII century, with the *Journal des Scavans*, and the *Philosophical Transactions of the Royal Society*, in 1665<sup>1, 2</sup>, the scientific journals have a central role scientific communication as a mean to disseminate the results of research, to assure priority and quality to research and, as library holdings, to provide and preserve an archive of scientific knowledge.

In recent years, the World Wide Web has grown expressively. Today the Web is both a new communication media and a vast repository of information, with an increase

importance to the world's economy of knowledge. Scientists and scholars seem the Web also as publication media to their research results. Web publishing of research results is more visible<sup>3</sup>, faster and cheaper than publish in traditional printed journals<sup>4</sup>.

The Web is constituted of electronic documents, linked pages, that is, content and relations. When a Web page is displayed in a browser, a link in this page permits navigation to other pages, thus constituting the so called the World Wide Web of billions of interlinked pages.

A link is not only a navigational aid, allowing a reader, by clicking the link, to go to the top or bottom of a page, to go to the homepage of a site. The assignment, by the creator of a page A, of a link to page B, is an indicator that he/she considers that page B is somehow semantically related to page A.

As stated by Kleinberg and Lawrence<sup>5</sup>, due to the non-planned grow of the Web, it has been considered as lack of structure. However, recent research considers the Web as a self-organized network. The bases of this self-organization is the Web's link structure. The study of the link structure of the Web is known as link analysis.

Link analysis research found interesting insights in areas as developing crawlers, spiders and robots, in ranking the results obtained by search engines, in finding similarities and classifying Web pages<sup>6</sup>. Kleinberg<sup>7</sup> found two kinds of sites, based on the study of links to and from a set of sites: *authorities*, sites which are linked from many other pages; and *hubs*, pages who links to many pages.

In the area of Information Science, in the context of scientific communication and bibliometric studies, citation of one scientific paper by other is a well known mechanism to evaluate the relevance of an author or of scientific journal. This mechanism indicates a recommendation of one author by other and, indirectly, a recommendation of the relevance of the scientific journal which published the article. This assumption is the base of the calculating of the impact factor<sup>8</sup>, a largely recognized indicator of the relevance of scientific publications. The ISI - Institute for Scientific Information -, founded by Eugene Garfield, is an institution who collects information about scientific publications worldwide and performs statistical analysis on this data, calculating the impact factor for thousand scientific journals. The impact factor is a valuable indicator to evaluate scientific publications, to plan scientific policies and specific library policies.

Brazilian ejournals are a recent reality in Brazilian Web scenario. At present we are developing a research project, sponsored by CNPq – the Brazilian Council for the Development of Science and Technology -, grand number 550693/2002-5<sup>9</sup>, which aims to develop a comprehensive frame of the situation of the Brazilian ejournals in Science and Technology. This research found an universe of almost 500 ejournal in different knowledge areas. Of this amount, approximately 400 are printed journals, having an electronic version too. About 89 are only ejournals. The findings of this research constitutes the universe where the research related here is based.

The universe of Brazilian academic journal has different levels of quality. Brazilian academic journals are object of various public policies from Brazilian scientific and technological development agencies. Specially in the case of electronic journal, there is a project, sponsored by various government agencies, named SciELO<sup>10</sup> – Scientific Electronic Library Online –, to set up in a Web gateway to electronic version of the most important Brazilian journals. SciELO imposes high quality criteria to journals it holds.

In Brazilian ejournals scenario, SciELO plays an outstanding role. SciELO is product of a partnership among FAPESP (<http://www.fapesp.br>) – the State of São Paulo Science Foundation, BIREME (<http://www.bireme.br>) – the Latin America and

Caribbean Center on Health Sciences Information – an organization belonging to PAHO – Pan-American Health Organization – and to WHO – World Health Organization –, as well as national and international institutions related to scientific communication and editors. Today SciELO is an important component of Brazilian public policies concerning the development of Science, disseminating worldwide technical and scientific literature published in developing countries, increasing its visibility that, otherwise, would be limited within their own borders. SciELO/Brazil project began in 1998, with the migration to electronic versions of a certain number of high quality Brazilian Health Science and Biology printed journals. Today there are some other SciELO gateways, holding e-journals of other Latin American and Caribbean countries.

SciELO holds the most important Brazilian e-journals, most of them were originally, traditional academic printed journals. Our research found that, besides the e-journals included in SciELO, there is an amount of more than 200 e-journals, in different knowledge areas, that we called the emerging e-journals. Differently from SciELO e-journals, these e-journals are recently born, not entirely regular, therefore they are not still consolidated publications. They lack of systematic and consistent evaluation methodologies<sup>11</sup>. One of the barriers emerging Brazilian e-journals face to be systematically used by Brazilian research community is the lack of quality evaluation. Brazilian “emerging” e-journals face many difficulties to attend to ISI’s criteria<sup>12</sup>. This research intends to develop an evaluation methodology for the emerging Brazilian e-journals in science and technology, alternative to ISI’s impact factor, based on quantitative and qualitative analysis of the links to an e-journal’s site.

A link from one page to another, like in bibliometric studies, is analogous to a citation. We have a rather different assumption, from those outlined previously, about the meaning of a link to an e-journals site. Differently from links to an individual journal article, links to the site of an e-journal are generally assigned by electronic reference services, an emerging service in academic and university libraries. Electronic reference services indicates an evaluating process on the links included in the service. Our hypotheses is that links to the site of an e-journal means, from the point of view of the site which links to the e-journal, are also a *recommendation* to the e-journal. Besides, depending of the nature of the institution whose site links to an e-journal, this can be a strong indicator of its relevance, too. The relevance of an e-journal can be evaluated by analyzing which institutions web sites link to the e-journal web site.

This work is structured as follows: after this introduction, section 2 exposes the methodology we propose to evaluate e-journals; section 3 shows the results obtained by applying the methodology proposed to different Brazilian e-journals in different knowledge areas and discusses them; finally, section 4 draws some conclusions and indicates new directions of research.

## **METHODOLOGY**

The methodology considers the links directed to an e-journal site and performs a quantitative and a qualitative analysis of them. The links to the site of the e-journal were obtained by submitting its URL to Google search engine. Only the first 10 pages of results provided by Google were considered. When analyzing a group of e-journals in a specific area, the results of Google searches are collected all in the same day. The grade formula considers three kinds of links: the gross amount of links (not considering repeated links), the *foreign links* (links not from Brazilian sites) and the *authoritative links*; each of these kind of links have a different weight in the grade formula.



					(X 2)	(X 3)	(X 1)	
Ciência da Informação (Information Science)	yes	43			7	6		62
DatagramaZero	no	37			8	5		55
Informação & Sociedade (Information and Society)	no	18			5	5		33

The grade formula applied to Information Science area confirms the evaluation of relevance we have about the three e-journals: *Ciência da Informação* is a traditional, consolidated paper journal in the area, edited by IBICT (<http://www.ibict.br>) – the Brazilian Institute for Information in Science and technology -, published in a printed version since 1970 and electronic published since 1998.

*DatagramaZero* is a new, innovative e-journal, published since 2001; it has also a consistent promotion policy among the researchers of the area of information science, since its Editor is an recognized researcher in the area and maintains a discussion list with a wide audience in the area.

*Informação & Sociedade* is an academic journal, edited by the Post-graduation Program in Information Science of The Federal University of Paraíba, in northeast of Brazil. It is electronic published since 2000. *Informação & Sociedade* has not a national coverage and is somehow a regional academic journal, due to its scope and its link to the Post-Graduation Program which edited it. Since the end of 2003 it is published only in electronic version.

The rank provided by the grade formula coincided strictly with the relevance evaluation that we, researchers in the area, have made about the three e-journals.

**TABLE 2 - AREA: APPLIED SOCIAL SCIENCES – BUSSINESS ADMINISTRATION**

Ejournal	Inc. SciELO	tot. links	Tot. Repeat ed links	tot. links from SciELO ; proper site	links foreign ers ] (X 2)	.links authorities (X 3)	Simple links (X 1)	Grade
Administração on line (Administration online)	no	10		0	1	1	1	6
Acadêmica – Revista Virtual de Administração e Negócios (Acadêmica – Virtual Journal of Bussiness Administration)	no	5		0	2	0	1	5
Revista Eletrônica de Administração (Electronic Journal of Bussiness Administration)	no	36	16	0	2	6	6	21

Among the e-journals in this area, *Revista Eletrônica de Administração*, compared with the other two, has links from site of many graduate and post-graduate schools. In this area the concept of authorities as proposed here, holds significantly. We do not have a feedback of specialist to confirm the evaluation provided by the methodology.

**TABLE 3 - AREA HEALTH SCIENCES – PUBLIC HEALTH – 3 EJOURNALS**

Ejournal	Inc. SciELO	tot. links	tot. Repeat ed links	tot. Links from SciELO	tot. links foreigners (X 2)	tot. links authorities (X 3)	tot. Simple links (X 1)	Grade
Cadernos de Saúde Pública	yes	100		87	10	2		27
Revista de Saúde Publica (Public Health journal)	yes	100		94	6	0		12
Revista de Saúde Coletiva	yes	62		57	3	0		8

All the three ejournals in the area of Public Health are included in SciELO gateway, which means to say that they area also paper journals too. In the evaluation of the ejournals in this area we have the support of a researcher in the area. The rank provided by the grade formula coincided strictly too, with the relevance evaluation made by this researcher.

**TABLE 4 - AREA: HEALTH SCIENCES – NURSING – 2 EJOURNALS**

Ejournal	Inc. SciELO	tot. links	tot. repeate d links	tot. Links from SciELO	tot. links foreigners (X 2)	tot. links authorities (X 3)	tot. Simple links (X 1)	Grade
On-line Brazilian Journal of Nursing	No	29			27	1	1	58
Revista Latino Americana de Enfermagem (LatinAmerican Journal of Nursing)	Yes	75		68	4	0	3	11

The area of Nursing revealed a surprising result. Two ejournals where evaluated, *Revista Latino-americana de Enfermagem*, which is included in SciELO gateway, and *On-line Brazilian Journal of Nursing*. In spite of quality criteria to be included in SciELO gateway, *Revista Latino-americana de Enfermagem* got a grade of one-fifth of the grade obtained by the recent published, pure electronic *On-line Brazilian Journal of Nursing*. We do not have a feed back from an expert in this area, so we suppose that these results may be due to the fact that this ejournal is published in English.

The two Health Sciences groups of ejournals presented few links of sites considered authorities: one ejournal presented two authorities and the other two none. On the other hand, among the links we considered just foreign links, there are many digital reference services from libraries outside Brazil. This may indicate the need to adjust and fine tune the methodology and to enlarge the concept of authority, encompassing the foreign digital reference services

**TABLE 5 - AREA: AGRARIAN SCIENCES - VETERINARY – 3 EJOURNALS**

Ejournal	Inc. SciELO	tot. links	tot. Repeat	tot. Links	tot. links	tot. links	tot. Simple	Grade
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				ed links	from SciELO	foreigners (X 2)	authorities (X 3)	links (X 1)	
Arquivos de Veterinária e Zootecnia	Brasileiros de Medicina Veterinária e	Yes	25		10	9	1		<b>21</b>
Pesquisa Brasileira (Brazilian Research)	Veterinária Veterinary	Yes	53		42	6	1		<b>15</b>
Brazilian Journal of Veterinary Research and Animal Science	Journal of Veterinary Research and Animal Science	Yes	22		14	4	1		<b>11</b>

The ejournals of this area are all included in SciELO gateway. This group of ejournals presented few links. To evaluate the ejournals in this area we have the support of a researcher in the area. The evaluation provided by the specialist researcher did not coincided with the rank provided by the grade formula. The researcher indicates *Brazilian Journal of Veterinary Research and Animal Science* as the most important ejournal among the tree analyzed .

**TABLE 6 - AREA: HUMANITIES – EDUCATION – 2 ejournals**

Ejornal	Inc. SciELO	tot. links	tot. Repeat ed links	tot. Links from SciELO	tot. links foreigners (X 2)	tot. links authorities (X 3)	tot. Simple links (X 1)	Grade
Educação e Pesquisa (Education and Research)	yes	67		60	7	0	0	14
Educação & Sociedade (Education and Society)	yes	11		2	6	0	2	14

Both ejournals are included in SciELO gateway. The relevance evaluation provided by a researcher in this area indicated *Educação & Sociedade* as the most important ejournal among the two analyzed.

## CONCLUSIONS

Its was a difficult step to test the grade formula in areas different from the first area in which it is developed and tested, Information Science. The emerging Brazilian academic ejournals are a reality not completely familiar to the majority of Brazilian academic community As stressed by Hyldegaard<sup>13</sup>, citing Brown “*the characteristics of scientific area affected scientists preference for information sources*”. It was difficult to find partners in our nearby research community which know the emerging ejournals we intend to evaluate and could give us a necessary feed-back.

It was also difficult to find in the Brazilian ejournals universe knowledge areas with more than one ejournal to be compared. In the area of Physics there is only one Brazilian ejournal, Brazilian Journal of Physics; a researcher in this area said that this research community prefer to publish in the international journals, preferentially in paper journals. The same situation was found in the area of computer science. Those kind of problems made it difficult to apply the methodology in some knowledge areas. The ideal situation to evaluate the methodology would be to have more than one

ejournal in a knowledge area and to have the assistance of a research in the same area, familiar with the ejournals being evaluate, to give adequate feedback.

Although the results provided by the grade formula were coincident with the relevance evaluation we have made about the three ejournals in the area of Information Science, it reveals itself as not a typical area. Maybe because the professional practice of librarians and schools of librarianship in Brazil, there were good electronic reference services in the area of Information Science and the three ejournals, together with another three that exists in the area, were referenced by the main librarian schools and academic libraries which holds Library and Information Science graduation and post-graduate programs home-pages. Our concept of authorities also holds satisfactory to the area.

We considered the hypothesis of sites of postgraduate programs in different areas be considered as authorities. This was true just in a few areas, as Business Administration. However, many sites of graduate course were found having links to ejournals in different areas, so we considered them as authorities too.

We found too, that, with the exception of Information Science area and a single exception in Health Science area, UNIFESP – São Paulo Federal University -, an important post-graduation and research center in Health Science, it seems to have very few Brazilian electronic reference services in university, academic or research libraries. If this services do exists, they do not include the Brazilian ejournals. This may be due to the importance that international journals have to the Brazilian research community.

After this initial results, more research is needed to define what are the conditions in which the grade formula can be satisfactory applied. The concept of authority used may be enlarged, perhaps to encompass foreign authorities We must also look for a more consistent support of researchers in the specific areas of the ejournals been evaluated. And we must establish the basis to automate the methodology, so it can be publicly available in an web site. An extensive and secure use of the proposed methodology depends largely on the emergence of digital reference services among the Brazilian academic libraries

Quality evaluation is essential to consolidate the emerging Brazilian ejournals. A continuous evaluation system is needed to improve the quality of the emerging Brazilian academic ejournals. These ejournals have difficulties in meeting ISI's impact factor quality criteria. So, alternative methodologies and public policies may be considered.

The use of the grade formula, as exposed before, can be more than a mere methodology, if it is thought as a public policy, together with other Brazilian public policies concerning ejournals, like the SciELO and the CAPES gateways. The research and library community of an knowledge area can agree with a set of authoritative institutions (authoritative links). A web site may be developed and feed with the authoritative links agreed by the community. Therefore any editor may submit to this website the link of his ejournal and the grade formula will be applied on it and its grade obtained, displayed and publicly available on the web, to all the research community.

In spite of all these questions, alter fine tuning and in the scope of community agreed "authorities" sites in a given area, the methodology proposed here can be a valuable aid to evaluate ejournals.

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