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ABSTRACT

It accomplishes a bibliometric analysis of the journal ‘Ciência da Informação’, one of the issues with highest visibility in the Librarianship and Information Science field in Brazil. This study is accomplished aiming to establish the quantification of a series of indicators which allows it to configures an overview of the scientific production registered during the period of 2000-2004. Among the analyzed elements they are stand out: authorship, citation of authors and sources, production and average life of the references.

Keywords: Bibliometric Analysis; Journal ‘Ciência da Informação’ – Brazil; Cocitation; Science Maps; Infometrics Studies.

INTRODUCTION

The study of scientific production in Librarianship and Information Science (LIS) is one of the most proliferous of our discipline. This overview is presented not only in international level, whose scientific production is, with no doubt, high, but it is also presented in more modest environments as it is the iberoamerican.

This characteristic allows at the current to have a quite real knowledge of the characteristics and behavior of our intellectual field even if in the region yet exist opened blanks. At this point, the Iberoamerica is presented as a space with
remarkable inequalities in relation to the development and consolidation of LIS as academic discipline.

In this mosaic of realities in the region, Brazil stands out over the others due to an important process of the discipline institutionalizing. At the current exists a wide offer in the academic formation at the graduation and post-graduation (42 universities) and an important scientific production, such as the study accomplished by Moya and Herrero (2002) reflects over the production of iberoamerican authors in the ISI journals, more specifically in the category Information Science and Library (LIS). At this work, Brazil is the centralizer, in the scope of Latin-America, it is overcome only by Spain. It is also possible to prove this phenomenon from the wide proliferation of specialized sources, and the degree of visibility which has reached some of these sources (HERRERO, LIBERATORE, 2004).

The existing antecedents in the field of metric studies relative to the LIS in Brazil are important, even that the main aspect is that none of them is inclusive enough to establish a clear view of the area. Generally, this kind of research has been partial, in different time and periods, under different methodologies, in multiplicity of sources and in quantitative and qualitative perspectives.

To systemize this information we will divide the work according to the type of source adopted to accomplish the study.

The scientific production of the professors and investigators, especially the ones who perform in post-graduation level, results to be one of the most analyzed variables. The studies focus on the thematics, methodologies and depositing sources of the academic production (MACHEDO, 1987; POBLACIÓN; NORONHA, 2002a, 2002b, 2002c, 2003a; GOMES, 2006), at the main lines of research and its dissemination (MUELLER et al., 1996; POBLACIÓN, 1993; POBLACIÓN; NORONHA, 2002d, 2003b) and in the formation of human resources (MUELLER; SANTANA, 2003).

The post-graduation theses, particularly in master degree level, are objects of analysis since quantitative and qualitative approaches (OLIVEIRA, 1999; ARAUJO W. T., 2000; ARAUJO E. A. et al., 2003a, 2003b) or since more specific focuses such as predominant thematics in its development (TEIXEIRA, 1997; QUEIROZ;
NORONHA, 2004), the problematic and objects of study selected (EVANGELISTA, 2002) or the ways of citation (VANZ, 2004).

The congresses and specialized seminars have also been analyzed, for example the bibliometric study made by Noronha et al (2000) about the seminar of University Libraries, covering the period of 20 years (1978-1988) or the one by Vianna and Caldeira (2004) about the Seminar School Library of ECI/UFMG.

About the periodic issues, it is observed a serie of work guided to represent distinct realities. On one side certain thematics through its treatment in specialized journals (MENEZES; COUZINET; 1999; MENDONÇA, 2000; OHIRA; PRADO, 2002; FRANCELIN, 2004); on the other side, the ones which analyze the content of many sources in a period of time (FORESTI; MARTINS, 1987; PECEGUEIRO, 2002). There are also studies which take as analysis element a journal in particular (studies of unique source) and which are of special interest to the purpose of this research. At this line, it is pointed out that exist studies applied to the journals Transinformação (FREITAS, 1997), Revista de Biblioteconomia de Brasília (SIMEÃO, 2001), Encontros Bibli (SILVA et al., 2005), Informação & Sociedade: estudos (AUTTRAN; ALBUQUERQUE, 2002) and Ciência da Informação (MUELLER; PECEGUEIRO, 2001; SILVA, 2002; PINTO et al., 2006).

Out of all the mentioned antecedents, only the three last refer to the journal Ciência da Informação, object of study at this work. These researches deepen mainly, in the indicators relative to the authorship and content of articles and only the last covers the citation matter. Also the plataform Scielo proportionates a serie of indicators, including the reference analysis, but they are not totally inclusive even culminating in an important source to comparison of results.

Given this overview, this research intends to proportionate a model of analysis much deeper, particularly based in the citation, with the purpose to get to more conclusive results, considering that it deals with one of the journals of highest prestige in LIS in Brazil.

2 MATERIAL AND METHODS
For this research they were considered all the articles published by the journal *Ciência da Informação*, in the period of 2000-2004. To store the production it was drawn a database *ad hoc*, through that it was calculated the variables, not only to the source register but also to their references. They were considered the following indicators:

**Source Articles:**
- Productivity
- Authors affiliation
- Co-authorship

**References:**
- Cited sources
- Citation idioms
- Most cited authors
- Co-citation of journals (ACR)
- Co-citation of authors (ACA)
- Average Life

To the analysis of the journal co-citation they were measured the co-citations by peers, aiming to create a square and symmetric matrice of 12 x 12. Afterwards, they were applied three techniques of reduction of the dimension: clustering, multidimensional scaling (MDS) and analysis of social networks. At the clustering the agglomeration rule used is the one of Ward method and the distances were calculated through the function 1-Pearson. At the co-citation of authors it was accomplished an analysis of social networks under a vector calculation to reproduce centrality aspects. The same was based in a square symmetric matrice of 25 x 25.

**3 RESULTS**

The amount of information loaded in the database is 3298 registers, out of them 177 are source articles and 3121 correspond to references. At the total were loaded 2952 authors (source articles + references) and 1082 types of sources (titles of journals, editorials, congresses etc.) where the references come from.
Starting from the source articles and in relation to the authorship it was analyzed in first term the productivity, observing the existence of a nucleus, identifiable, of very productive authors. On the contrary, the contributions are divided in a uniform way, with the most 3 by author. Neither in the institutions of the author’s origin there is one who stands out more than the others, which is a good indicator that the publication does not find itself anchored to the sponsored institution.

About the institutional affiliation the *Universidade de São Paulo* is the one which holds a higher quantity of authors with 16.1%, followed by another Brazilian university, *Universidade de Brasília*, with 8%. Follow in importance the *Universidade Federal de Minas Gerais* and the *Universidade Federal de Santa Catarina* with 6.6% in both cases. Regarding the geographic origin, Brazil has an absolute monopoly with 77.7% of the authors, followed by Spain with 9% and Argentina with a little more than 7%. Here it is realized that it deals with a publication quite located, however it is beginning to have an increasing influence in the region.

About the co-authorship the general index calculated covers 1.8 authors by article, what represents a high value to the specialty. The simple authorship accumulates 55.4%, and when compared to the results obtained in other LIS studies in Iberoamerica, this percentage is lower. Like that, Gorbea Portal (1996) calculates 84%, Cano (1999) 68%, Mueller and Pecegueiro (2001) 78% and Liberatore et al. (2002) 82%.

In the reference analysis it was calculated at first instance the type of source cited, observing that the higher percentage corresponds to monographic work (books) with 44%, followed by articles of journals with 38%, congress minutes 7%, Internet resources with 6% and the thesis with 2% (graphic 1). Comparing to similar studies it is observed that the percentage of monographs is found in tune with the sources of specialty in the region such as the Mexican journal *Investigación Bibliotecológica* (47.8%), even superior to roughly 36% in Spanish journals and about 33% in the journals ISI of this field (MOYA; HERRERO, 2001).
In the references idiom it is considered the predominancy of three languages still with essential differences. Firstly is the English with 52% followed by the Portuguese with 34% and, finally, the Spanish with 14%. Delinquently appears the French, the Italian and the Danish. In the authors analysis of the references it was isolated a group of theirs holding as parameter a citation margin equals ten. This way, it was formed a nucleus of 33 authors which represents 1,2% of the total (N=2678) (Table 1).

Table 1 – The Most Cited Authors

<table>
<thead>
<tr>
<th>Authors</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morin, Edgar</td>
<td>29</td>
</tr>
<tr>
<td>Lévy, Pierre</td>
<td>26</td>
</tr>
<tr>
<td>Saracevic, Tefko</td>
<td>22</td>
</tr>
<tr>
<td>Lancaster, F. W.</td>
<td>22</td>
</tr>
<tr>
<td>Castells, Manuel</td>
<td>21</td>
</tr>
<tr>
<td>Fox, Edward A.</td>
<td>20</td>
</tr>
<tr>
<td>González de Gomez, Maria Nélida</td>
<td>18</td>
</tr>
<tr>
<td>Davenport, Thomas H.</td>
<td>17</td>
</tr>
<tr>
<td>Bourdieu, Pierre</td>
<td>16</td>
</tr>
<tr>
<td>Ingwersen, Peter</td>
<td>16</td>
</tr>
</tbody>
</table>
Through the list it may be appreciated a diversified set due to its origin. At this point and with certain degree of liberty, five groups may be analyzed. The first is the one related to the authors deriving from Sociology, Science and Language Philosophy (Morin, Bourdieu, Habermas and Kuhn). The second would be composed by authors who work the social impact of information and communication technology (Lévy, Castells, Barreto, Santos, Demo, Mostafa and Masuda). A third group may be delimitated with the authors who come from the LIS specialized in the development of the grounds and theoretical marks of the discipline (Saracevic, González de Gomez, Pinheiro and Wersig).

Fourthly, deriving from the user studies and the information recover, appears a numerous set: Lancaster, Ingwersen, Dahlberg, Belkin, Moya-Anegón, Bates, Choo, Guarino and Nielsen. Finally, a fifth group guided to the information management where it appears Davenport, Prusak, Tarapanoff and Drucker.
Regarding the co-citation of authors they may be observed some of the characteristics mentioned previously with some tones. To obtain a clear view it was chosen to cut even more the ranking obtained, establishing to the representation a matrice of 25 x 25 authors (Picture 1). Through the web it is observed that exists a small group of authors strongly cited (the node size indicates the citation quantity) located in the graphic center (Saracevic, Lancaster, Lévy, Pinheiro and Castells). However, such centralization does not indicate necessarily a relation between them. If we consider the grouping proposed in the previous paragraph regarding the “thematic” property of the most cited authors it may be observed that the web reflects this aspect viewing the relations between them.

Picture 1: Map of Co-Citation of Authors through Social Networks.
Source: Prepared by the Authors.
On the other side, it may be observed, when these authors group through the geographic space where they come from, that exists a wide eminence of American origin (Graphic 2).

The graphic shows a ranking with the most cited journals. It may be observed as usually, the journal source itself to be the most cited. Follow the journal JASIS with 70 citations and, quite behind with less than 40 citations, the journals JDOC, IPM, etc. It is important to point out the presence of two Brazilian journals among the ten first, besides the journal *Ciência da Informação*, phenomenon which has not been found out in former work (HERRERO, 2003).

### Table 2: The Most Cited Journals.

<table>
<thead>
<tr>
<th>Code</th>
<th>Journal Title</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINFO</td>
<td>Ciência da Informação</td>
<td>267</td>
</tr>
<tr>
<td>JASIS</td>
<td>Journal of the American Society for Information Science</td>
<td>71</td>
</tr>
<tr>
<td>JDOC</td>
<td>Journal of Documentation</td>
<td>37</td>
</tr>
<tr>
<td>IPM</td>
<td>Information Processing and Management</td>
<td>36</td>
</tr>
</tbody>
</table>
Along with the twelve journals of the ranking, it was accomplished a co-citation analysis of journals. In Picture 2, it is observed the clustering represented through a horizontal dendogram. Out of the same it is extracted clearly at least three large groups. On one side, the one of the journals JASIS, JDOC, IPM, ARIST and ONLINE, which represent what it is used to name “information recover”, following the denomination used by other authors (WHITE; MCCAIN, 1998, MOYA; JIMÉNEZ; HERRERO, 2006). The second branch of the dendogram in turn divides itself in two subsets. On one side, the three Brazilian Journals and on the other three journals which were encompassed under the denomination “library/management”. This classification is general once the nature of these titles is different. HARVBR is clearly a publication of company management in general, while the other two correspond to a profile simply put librarianship.

These two thematic fields appear reflected in the work by Moya and other authors, represented by a great quantity of titles. It is, however, licit to think that with a bigger amount of database it could be configurated in this cluster two fronts clearly defined. The only group detected by Moya, and that does not appear here is the one of ‘bibliometric’ characterized generally by ‘Scientometry’.

<table>
<thead>
<tr>
<th>Journal</th>
<th>Abbreviation</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARVBR</td>
<td>Harvard Business Review</td>
<td>30</td>
</tr>
<tr>
<td>DLIB</td>
<td>D-Lib Magazine</td>
<td>27</td>
</tr>
<tr>
<td>LTRENDS</td>
<td>Library Trends</td>
<td>23</td>
</tr>
<tr>
<td>ONLINE</td>
<td>Online</td>
<td>23</td>
</tr>
<tr>
<td>TRANS</td>
<td>Transinformação</td>
<td>22</td>
</tr>
<tr>
<td>PCI</td>
<td>Perspectivas em Ciência da Informação</td>
<td>21</td>
</tr>
<tr>
<td>ARIST</td>
<td>Annual Review of Information Science and Technology</td>
<td>21</td>
</tr>
<tr>
<td>JIS</td>
<td>Journal of Information Science</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: Prepared by the Authors.
In Picture 3 it is possible to see the same data represented through MDS. The groupings are seen very clearly. It is important to point the overposition of the IPM and JDOC, strongly co-cited, and on the contrary the desaggregation of the cluster 'libraries/management', whose journals are found far from each other.
At last, it is obtained the same source of data represented through the social networks (Picture 4). It is observed clearly that the grouping ‘libraries/management’ do not have a clear internal coherence, locating each journal in function of its relation to the others, and not to themselves. The other two groupings appear more clearly represented. The dimension of the connections is directly proportional to the values of co-citation through the one it is possible to appreciate a strong relation of the locals, through the “path” PCI, CINFO and TRANS. The same occurs with JDOC, IPM, ONLINE and JASIS. Not only CINFO but also JASIS present the highest degree of intermediation in each group.
Regarding the age of the references it was established an average life (AL) of 7.2 years, found into the international parameters to the LIS established in the ranking between 6 and 12 years (MOYA; HERRERO, 2001).

CONCLUSIONS

Along the results exposed at this work it could be established with enough clearness a set of key aspects about the profile of one of the journals with higher history and prestige in LIS in Brazil. Despite that this publication is one among the
great number of publications of the specialty existing in this country, its path and visibility make any conclusion which may be extracted from its study have an additional value.

*Ciência da Informação* seems to be, to the light of the analysis carried out in the authorship, a wide journal and receptive of a great part of the research in LIS in Brazil, seen that does not exist a high concentration of work between a few authors. This statement is complemented when observing the institutional affiliation of the authors set in which it can be observed the great diversity of existing institutions (N=82), most of them Brazilian universities. This aspect rejects the possibility always latent in some journals, of falling in endogenous processes in the editorial development. The *Instituto Brasileiro de Informação em Ciência e Tecnologia (IBICT)*, editor responsible of the referred journal, occupies only 4% of the institutional division.

In the analysis of citation appear the most interesting aspects to point out. The mapping of the co-citation of journals demonstrates certain parallelism with studies similar to the conformation of groups belonging to the thematic identifiable fields. Information and libraries/management recovering glimmer themselves as very active fronts. At this line of analysis it may be claimed with certain degree of conviction that the articles referred to epistemological status of the discipline, development of theoretical marks and the social analysis of the phenomenon information and knowledge, also, retained attention. Prove of this constitute the disciplinar origin of an important portion of the most cited authors and the work which obtained more references. Part of this reality is observed also, in the co-citation map of authors.

Another aspect to point is the strong linking of CI with the journals *Transinformação* and *Perspectivas em Ciência da Informação* from the point of view of co-citation. This is a salient characteristic from the depth point of view of this line of research aiming to establish a probable intense nucleus of publications in LIS in Brazil.

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NOTES

1 It may be appreciated the degree of organization and articulation of research and, the formation in pos-graduation visiting the site of Associação Nacional de Pesquisa e Pós-Graduação em Ciência da Informação (ANCIB) in http://www.ancib.org.br/.

2 <http://www.abecin.org.br/portal/abecin/>.

3 Currently exist about 19 titles of journals and specialized reports in LIS in Brazil (http://ced.ufsc.br/bibliote/virtual/periodicos.html).

4 <http://www.scielo.br/>.

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