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APPLICATION OF WEB INDICATORS TO THE LATIN-AMERICAN ACADEMIC SITES IN SOCIAL SCIENCES

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ABSTRACT

The purpose of this paper is to do a webometric analysis of academic sites of Latin-American Social Sciences applying three indicators: visibility, luminosity and network density. In order to undertake this analysis, we have used webmining, a method based on the use of tools that help in obtaining information from the Web. The search engine Alta Vista was employed to measure the visibility of websites. The mapping software *Link Xenu Steuth* was employed to calculate luminosity. Excel, Ucinet5 and NetDraw were employed to determine network density (they allowed us to estimate links, build up matrix and visualize connections among national and international networks). The results obtained in this research showed that within the 174 analyzed websites those which appear first in the ranking (the most linked or cited) are Brazilian, those which appear at the top in terms of luminosity (the ones that point or cite the most) are Mexican, and the country that appears to have the highest network density is Peru. Finally, we found out that the website with the highest number of links to websites from other countries is *Facultad Latinoamericana de Ciencias Sociales* of Mexico (FLACSO-MX).

Keywords: Information Metrics Studies; Webometrics; Cybermetrics; Webometrics Indicators; Visibility; Luminosity; Network Density; Academic Sites of Latin-American Social Sciences.

INTRODUCTION

At this work it will be presented a webometric analysis of the main Latin-American academic sites in the Social Sciences area. The main purpose of the study is to apply the web indicators to the chosen universe to try to discover what are the sites and the Latin America countries which stand out for showing the greatest number of received links, for linking the greatest number of external sites or for counting on the greatest number of connections. This way, it will also be possible, to

draw a profile both of the latin-american academic information in Social Sciences and its interconnections at the web.

Before, however, it is necessary to mention, in a summary way, some definitions of what is understood of webometric in the international literature and to examine the most used webometric indicators by the researchers who have dedicated to work with this new field of Information Science.

Accordingly, it can be noted that the webometric arose with the necessity to measure the information which started to be available at the web, with the advent of new technologies. It may be defined, however, as a quantitative method of the information analysis available at the World Wide Web, comparable to those already known fields of bibliometrics, scientometrics and informetrics, used to measure the information existing in printed material and in other traditional support.

Among the first authors who refer to this new field, stand out Almind and Ingwersen (1997, 4.404, our translation). They define the webometric as "the application of informetric methods to the World Wide Web". For them, the new method has as objective to investigate the communication models, the identification of research areas, the historic studies about the development of a discipline or domain and the evaluation of the search by countries, institutions or individuals.

Other investigators who also contributed to the establishment of the first definitions in this area are Abraham and Foresta (1996, online). For them, the webometric is "an original technique that arises with the purpose to elaborate cognitive maps and WWW mathematical models to comprehend its functioning as a model of social and cultural organization and the politic of the cyberspace". The same Abraham (1997), in another work, complements this definition claiming that such technique studies the relation between the main elements of the web: a web composed by nodes and connections, where the nodes meet the domains, sites and pages and the connections to the linkages or links which were established by such nodes, resulting in a matrix of links which involves all the extension of the WWW.

Subsequent, Lennart Bjorneborn (2004, p.12, our translation) defined the webometric as the "study of the quantitative aspects of the building and use of the information resources, structures and technologies at the web, using bibliometrical and informetric approaches"[i].

2 WEB INDICATORS

The web indicators are used to calculate each specific informative aspect of the web that makes it possible to measure this environment, specifically, the academical and scientific activities. They may be divided in three groups: descriptive, connectivity, of impact and density and, yet, the popularity indicators.

The descriptive indicators account the size or number of objects that a web space presents (pages, files, links) and are employed to measure the web penetration in countries, regions, organizations or groups of people, with regard to its content.

On the other side, the connectivity, impact and density measures save relation with the hipertextual character of the web and aims the connections examination between pages and sites through its links, focusing the external links that a web space receives and points, the volume of these regarding the contents which are linked (Web Impact Factor – WIF) or the construction of indices from the relative weight of the sites from where the links depart (the Google Page Rank, for example). Thanks to these measures, the researcher may realize the importance of the sites which are being consulted or analyzed with base in the links received by them.

Specifically about the density measurements, we can note that they have as specific purposes to estimate how much a population relates to each other inside a web or a virtual community, having in view the maximum number of relationships possibilities. These latest indicators are of great usefulness to the comparative studies (AGUILLO, 2003, online).

At this work, are presented and used such indicators, according to the following explanation.

a) Web sites size

There are two ways to measure the size of the web sites: the documentary and the informatics. In the first, the size of a web site is calculated through the sum of all pages which make part of the same domain, independent of the format they present. This indicator is important to the determination of the Web Pages Ranking

and to the calculation of the Impact Web Factor. In the second, the Web site is measured by the number of bytes that it contains, calculation adopted by the authors Almind and Ingwersen in their classic article *Informetric Analyses on the World Wide Web: methodological approaches to Webometrics,* from 1997*.* The first approach is the most relevant to the Information Science area.

b) Visibility

It is understood of visibility the number of links received by the analyzed site, disregarding the internal links or auto-links. To calculate this value it is used the command "advanced research" of search engines such as the Google, the Yahoo! Or the MSN and a search expression that, depending on the engine, include Boolean operators, graphic signs, etc. At the empiric work that contemplates the examination of the web sites visibility there is a preference, in general, by the use of Alta Vista, for being considered the search engine which offers the best operators of delimitation at the moment to filter and count the links. This is the case, for example, of investigations developed by Alastair G. Smith (2004) and of the project EICSTES (2002), project that performed successfully the task of promoting an integrated structure of concepts derivative from the Internet, with basis in indicators of scientific activities. The results achieved with this indicator are usually used in the determination of a site importance, of its traffic in the web, with the purposes to define the position that it should occupy in the ranking of the main search engines[ii].

b) Web Impact Factor (WIF)

Regarding the citations of sites or "sitations"[iii], there is an indicator which has been provoking a great interest between the scholars who perform in the webometric field: the Web Impact Factor (Web Impact Factor – WIF). Ciolek (1997), Rodríguez and Gairín (1997) and Ingwersen (1998) were the first to suggest de creation of a measurement similar to that of the Magazine Impact Factor – calculated by the ISI on its citations database – which would allow the comparison of the attractiveness degree of the sites or domains at the web. This indicator is calculated from the sum of the links number contained in external and internal web pages which refer to a determined country or site divided by the number of pages found in this country or web site. It may be represented by the following formula:

$$FIW = \frac{\text{number of pages which link determined site}}{\text{Number of pages of the linked site}}$$

Such indicator serves to measure and compare the attractiveness and influence that may reach distinct spaces at the web. The dynamic nature and in real time of the web suggests that the impact factors measurement may be useful to complement the traditional measurements. That allows it to show the degree of relative recognition which displays the countries or sites researches in the web in a determined point of time (INGWERSEN, 1998; SMITH, 1999). There are, basically, two kinds of web impact factors: the externals – those which reflect the number of linked pages out of the web space that is being analyzed – and the internals or autolinks – those which reflect the existing links inside the proper web space analyzed (SMITH, 1999). It is important to note along with Ingwersen (1998) that, in comparison with the scientific citations of magazines, institutions or individuals – the ones which may be stable or increase – the number of links which send out to a particular object inside the web may decrease or even disappear. This happens due to the possible closure or restructuring of certain pages which were available in any moment at the web and that changed or which are not any longer. What makes it impossible, on these cases, a retrospective calculation of impact factor.

d) Luminosity

The luminosity may be defined as the number of external links that presents a site, pointing to other different URLs which are, usually, from congeners institutions. This indicator measures the connectivity degree at the web. It may also be used to compare how the sites link the rest of the web. The project EICSTES above mentioned is a good example of how it is possible to measure the sites Luminosity at the web, from the mapping use. This, along with the Visibility, are fundamental indicators to reach one of the objectives of this research, since, as noted, reflect the relational and hypertextual character of the web.

e) Average Density by Link or Hypertextual Density

As Almind and Ingwersen explain (1997), the Average Density of the Links consists in the ratio or relation that may be established between the number of a site pages and the quantity of links that this site presents as a whole (including external and internal links and outlinks and inlinks). When performing the division of the

numbers of all the links by the total number of a site pages, it will obtained the average number of links for each page. This result corresponds to the Average Density by Link or to the "Hypertextual Density" (FABA PÉREZ et al., 2004, on line) of a site. It is a measurement that gets, however, to gather and normalize in an only value two informations: page size and link quantity.

f) Web Density

The Web Density is an indicator used in the Social Networks Analysis (SNA) which shows how much a population relates to each other. First the researcher should identify the population which he wishes to study inside the web: the "nodes" which are part of it. Afterwards, identify all the relations or links of the same type which are established by these nodes. Such data are then ordered in a matrix, containing one line and one column for each node, and in each matrix cell it is indicated or not the presence of links of each one of the nodes to the others.

3 MATERIAL AND RESEARCH METHOD

The material it was worked with were the sites of the members centres of the Latin-American Council of Social Sciences listed in its web page (www.clascso.org). The CLACSO is an international institution non-governmental and non-profit created in 1967, dedicated to promote research, discussion and academic dissemination in several fields of Social Sciences. It gathers 174 member centres in 19 countries of the region (Table 1) and counts on 23 Work Groups (data from 2006). On its site, the Council allows free and costless access to several information resources such as reading class (virtual library) with complete texts with more than 4.000 books and articles in Social Sciences; benchmark database of recent publications from its member's centres; descriptive database of researches which were made by each one of them, and researcher's database from these centres.

Table 1 – CLACSO Distribution of Members Centres by Country

Country	Members Centers	%	% Cumul.
Mexico	29	16	16
Brazil	25	14	30
Argentina	23	13	43
Colombia	20	12	55

Cuba	15	8	63
Peru	10	5	68
Chile	8	4	72
Ecuador	6	3	75
Uruguay	6	3	78
Bolivia	6	3	81
Venezuela	5	2	83
Paraguay	4	2	85
Costa Rica	3	1	86
Nicaragua	3	1	87
Guatemala	2	1	88
Panama	2	1	89
Dominican Republic	2	1	90
Honduras	2	1	91
Porto Rico	1	0	91
El Salvador	1	0	91
Haiti	1	0	91
Total	**174**	**100**	**191**

Source: Prepared by the Author.

As well as for the quantitative analysis of printed materials, the database of the Institute for Scientific Information (ISI) presents such resources which facilitate its measurements, the webometric studies also require certain mechanisms which allow to perform the search, the extraction, the quantification, the representation and the visualization of available information at the web.

The Web Mining – method which is characterized for making it possible the data extraction at the Internet – was used to calculate the Site Size, the Visibility, the Web Impact Factor, the Hypertextual Density and the Web Density, through specific tools such as the search engine Google and Alta Vista, the resources offered by the portal Marketleap Search Engine Market Services and the mapping programme *Xenu Link Steuth,* as detailed below.

They were also used to detect the different existing links on the pages of the academic centres affiliated to the CLACSO and to represent them graphically the softwares *Ucinet5 and the NetDraw.*

When performing the analysis of the **Site Sizes** of the CLACSO members centres were used two of the main search engines (Google and Yahoo) available today at the web. For that it was employed the option “Advanced Research” and the search interface that this option offers in both searchers. It was possible to observe

that there is a meaningful difference in the results offered by these two tools. In most cases, the Google presents a more elevated value than the Yahoo. This fact comes to confirm the superiority of the Google database regarding its coverage, as mentioned by some authors (AGUILLO, 2005; ARROYO, 2005). From such finding, it will be shown only the resulting values of searches performed with the Google.

To calculate the **Visibility** of the academic latin-american sites in Social Sciences, it was used the Alta Vista. Such engine offers this information in a direct way, when allowing the inclusion of Boolean operators in the search strategy "link" of the "Advanced Research", as observed by Smith (2004).

About the third indicator, the **Web Impact Factor**, it was calculated, from the data collected to the indicator Visibility and Site Size, using the Excel program.

For the calculation of **Luminosity** and the **Average Density by Link**, it was used the mapping *Xenu Link Steuth*, which allows to perform the automated quantification of information units smaller than those obtained through search engines, through the information extraction of each site and the navigation through its links, entering in distinct directories and subdirectories and accounting the resources that these ones present, whatever they are web pages, links, text files or multimedia files (ARROYO; PAREJA, 2003, on line).

In addition this program was chosen by the factor of offering an intuitive interface, of easy manipulation and for presenting the results in a simple way, characteristics that change it into a powerful tool, especially useful for the verification, accountancy and link analysis. Besides mapping a page, it offers the possibility of creating and presenting reports with the obtained results and the corresponding statistics.

The indicator **Web Density** is of extreme importance to this work, as it makes it possible to establish the degree of interconnectivity of a determined universe, for example, the interconnectivity that the sites of the centres affiliated to the CLACSO present. This indicator allows it to confront the potential number of relations which may be established between the nodes of a determined web and the number of relations which are effectively performed. For the calculation of a web density, it is divided the number of links that the web presents by the total sum of nodes multiplied by the same number minus one. In a way that each pair of nodes will be accounted

twice, because it interests to know the direction which each relation assume inside the web. It is not the same to say that the site A links the site B, than to say that the site B links the site A. In both cases, both are interconnected, however the direction is not the same. It is worth to clear that it does not interest here to account the relations which perhaps each node may keep to itself, so there should rest one from the multiplier.

The relation between the effective number of connections between pairs of nodes (*links)* and the maximum number of possible connections between pairs will reflect the web density[iv].

$$DR = \frac{l\ i\ n\ k\ s}{n.\ (n-1)}$$

For the matrices building and links viewing which bind the web sites of Latin-American Social Sciences were used the programs *Ucinet5 and NetDraw.* The *Ucinet* software has a structure which allows to import Excel data and to create the reticularis matrix that reflects the relations which keep themselves between the member centres sites of each country. On the other side the *NetDraw* is a program which allows to import Ucinet data, from the command File>Open which opens and read text files (DL). Such command was also used to access the data which were saved in a proper NetDraw program format (format VNA). Once imported the data with the command Open, the editor of nodes attributes and the NetDraw lines allowed to create each one of the diagrams of the relations between the institutions sites of each country which could be saved with format, colors, institutions names, etc. This analysis programs and viewing combined change, however, the data into reticularis matrices and in graphics which represent the webs, as in the examples shown below (Pictures 1 and 2):

	A	B	C	D	E
A	0	1	0	1	1
B	1	0	1	0	0
C	0	1	0	0	1
D	1	0	0	0	0
E	1	0	1	0	0

Picture 1: Reticularis Matrix.

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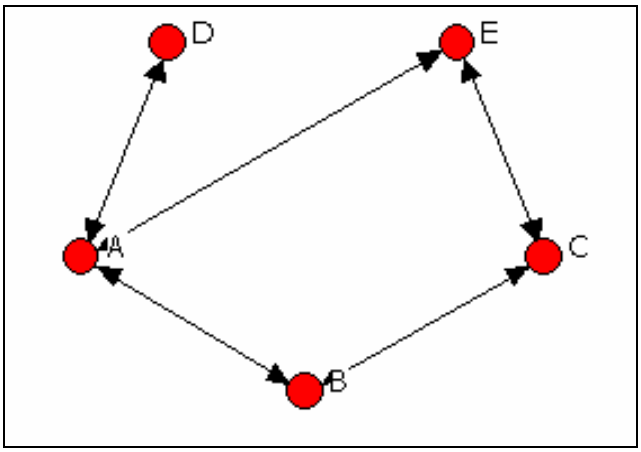


Picture 2: Web Graphic Representation.

4 RESULTS

Below, are presented the results reached with the chosen webometric indicators to the site analysis of the affiliated centres to the CLASCO, from the use of the described tools.

4.1 Web Sites Size

According to the data generated by the searcher Google, the site which appears in first place in size between those which represent the latin-american centres affiliated to CLACSO is the one from a Brazilian institution: that of the *Laboratório de Políticas Públicas* (LPP) from the *Universidade Estadual do Rio de Janeiro* (UERJ) with 41.500 pages. The Chilean institution named *Instituto de Ciencias Alejandro Lipschutz (ICAL),* with 22.100 pages on its site, is the one which ranks the second position in the continent general ranking. On the third position appears again a Brazilian entity: *O Centro Brasileiro de Análises e Planejamento* (CEBRAP), with a number also quite high: 16.100 pages on its site. On fourthly in the general ranking is the *Centro Peruano de Estudios Sociales (CEPES)*, with 13.600 pages, and on fifth the *Faculdad Latinoamericana de Ciências Sociales da Argentina* presenting 12.800 pages. From the sixth to the tenthly, the values go from 9.390 pages presented by a Colombian institution site, the one from the *Departamento de*

Ciencias Sociales da Facultad de Humanidades da Universidad Nacional Pedagógica (DCS/FH/UPN), until 3.990 pages for another Peruvian center site: the one from the *Grupo de Analysis para el Desarrollo (GRADE)* (Table 2).

Table 2 - Latin-American Web Sites Ranking According to its Size by the Google, June/July 2006

Position	URL	Country	Size
1º	http://www.lpp-uerj.net/	Brazil	41.500
2º	http://www.ical.cl/	Chile	22.100
3º	http://www.cebrap.org.br/	Brazil	16.100
4º	http://www.cepes.org.pe/	Peru	13.600
5º	http://www.flacso.org.ar/	Argentina	12.800
6º	http://www.pedagogica.edu.co/	Colombia	9.390
7º	http://www.colmich.edu.mx/	Mexico	8.010
8º	http://www.dei-cr.org/	Costa Rica	5.960
9º	http://www.crim.unam.mx/	Mexico	4.630
10º	http://www.grade.org.pe/	Peru	3.990

Source: Prepared by the author.

4.2 Visibility

With base in the data obtained through the searcher Alta Vista, the site which shows the biggest Visibility from all of the latin-american sites researched is the one of *Fundação Paulo Freire*, which receives 3.400 links from other domains. Follows the site of *Laboratório de Políticas Públicas* (LPP) from the *Universidade Estadual do Rio de Janeiro* (UERJ), with 2.960 links received. Both institutions are Brazilian. Thirdly appears the *Facultad Latinoamericana de Ciencias Sociales (FLACSO)* site, from Argentina, showing a visibility of 1.700 links. Given the international recognition these centres count on, it may be claimed that in these three cases it is noted a match between the real Visibility and the Visibility of these centres in the virtual world.

Fourthly appears the site of the *Departamento de Ciencias del Hombre da Universidad Iberoamericana León (DCH/LEON-UIA)* – with 1.095 occurrences. In this case there is no match between real and virtual Visibility, in so far as this Mexican academic institution is not among the most known abroad. Fifthly is ranked by another Mexican Institution, the *Centro de Estudios Sociológicos do Colégio de*

México (CES/COLMEX), which is pointed by 1.050 other sites, always according to the ranking generated by Alta Vista.

The sixthly and seventhly are two Peruvian sites, the one from the *Grupo de Análisis para el Desarrollo (GRADE),* with 1.049 links received, and the *Centro Peruano de Estudios Sociales (CEPES),* pointing 1.000 times (Table 3).

Table 3 – Latin-American Web Sites Ranking According to its Visibility / Popularity by Alta Vista, June/July 2006

Position	URL	Country	Visibility
1º	http://www.paulofreire.org/	Brazil	3.400
2º	http://www.lpp-uerj.net/	Brazil	2.960
3º	http://www.flacso.org.ar/	Argentina	1.700
4º	http://www.leon.uia.mx/organizacion/dch.htm	Mexico	1.095
5º	http://www.colmex.mx/centros/ces/	Mexico	1.050
6º	http://www.grade.org.pe/	Peru	1.049
7º	http://www.cepes.org.pe/	Peru	1.000
8º	http://www.coltlax.edu.mx/	Mexico	885
9º	http://www.flora.org.pe/	Peru	809
10º	http://www.piie.cl/	Chile	675

Source: Prepared by the author.

4.3 Web Impact Factor

The web Impact Factor calculation of the latin-american sites shows that the Mexican institution *Universidad Pedagógica Nacional – Hidalgo (UPN – Hidalgo)* gets the first position in the general ranking, having its site the biggest degree of attractiveness (1.095) of all analyzed. Secondly, quite below the first, corresponds to a Brazilian center: the *Departamento de Ciência Política da Universidade de São Paulo (DCP/USP) site,* with a 141 value WIF. The *Centro de Estudios Rurales Interdisciplinarios (CERI)* site, Paraguayan, offers a value of 119 WIF, thirdly among all the CLACSO affiliated centres. Now, the other centres get with a WIF in a set of ten, starting with the *Centro de Investigaciones Interdisciplinarias em Ciencias y Humanidades (CEIICH), from Mexico,* fifthly in the ranking with a 98 WIF and tenthly again the site of a mexican institution: the *Instituto de Investigaciones Sociales (IIS)*

of the Universidad Nacional Autónoma de México (UNAM), presenting a 29 value WIF (Table 4).

Table 4 – Latin-American Web Sites Ranking According to its Impact Factor, June/July 2006

Position	URL	Country	Size
1º	http://www.upn.mx/	Mexico	1.095
2º	http://www.fflch.usp.br/dcp/index.htm	Brazil	141
3º	http://www.ceri.org.py/	Paraguay	119
4º	http://www.ceiich.unam.mx/	Mexico	98
5º	http://www.ifcs.ufrj.br/~ppgcp	Brazil	52
6º	http://www.iiec.unam.mx/	Mexico	46
7º	http://quimbaya.udea.edu.co/~iep/	Colombia	42
8º	http://www.marilia.unesp.br/ensino/pos-grad/index.htm	Mexico	42
9º	http://www.uca.edu.ni/institutos/nitlapan/index.html	Nicaragua	31
10º	http://www.iis.unam.mx/	Mexico	29

Source: Prepared by the author.

4.4 Luminosity

The mapping prepared by *Xenu Link Sleut* showed that the first and second positions, regarding the Luminosity, correspond to Mexican institutions sites: the one of *Centro de Investigación y Docéncia Economica (CIDE),* pointing to 4.623 external sites, and the one of *Colegio de Michoacán (COLMICH),* which has links to 3.336 external sites. Thirdly and fourthly, already with Luminosity indicators quite smallers, are two Argentinean sites: the one of *Centro de Investigaciones Cientificas da Universidad de Cuyo (UniCuyo),* which presents 1.989 external links, and the *Centro de Estudios Avanzados da Universidad de Córdoba (CEA/UNCórdoba)* site, with 1.401 external links. Right after appears the *Centro Peruano de Estúdios Sociales (CEPES),* site, pointing to 1.138 URLs. These are the five first.

Sixthly, we have again a Mexican institution: the *Universidad Pedagógica Nacional – Hidalgo (UPN – Hidalgo)*, linking 1.059 sites. Seventhly, almost equaling to the earlier institution, is the *Facultad Latinoamericana de Ciencias Sociales, Argentinean headquarters (*FLACSO – AR), pointing to 1.057 external sites. Only after these, appears, eighthly, a Brazilian institution, the *Faculdade de Educação da*

Universidade Federal de Minas Gerais (FaeE/UFMG), the one which points to 431 external sites.

Ninthly and tenthly are found the *Programa de Investigación sobre Integración, Pobreza y Exclusión Social da Universidad Católica de Uruguay (IPES/UCU),* and the *Unidad de Post-Grado da Facultad de Estúdios Sociales da Universidad Nacional Mayor de San Marcos (UPG/FCCSS/UNMSM),* from Peru, with 401 and 270 external links respectively (Table 5).

Table 5 – Latin-American Web Sites Ranking According to its Luminosity, with Data from *Xenu Link Sleuth*, June/July 2006

Position	URL	Country	Luminosity
1º	http://www.cide.mx/	Mexico	4.623
2º	http://www.colmich.edu.mx/	Mexico	3.336
3º	http://www.fcp.uncu.edu.ar/contenido/index.php?	Argentina	1.989
4º	http://www.cea.unc.edu.ar	Argentina	1.401
5º	http://www.cepes.org.pe/	Peru	1.138
6º	http://www.upn.mx/	Mexico	1.059
7º	http://www.flacso.org.ar/	Argentina	1.057
8º	http://www.fae.ufmg.br/	Brazil	431
9º	http://www.ucu.edu.uy/ipes	Uruguay	401
10º	http://sociales.unmsm.edu.pe/Postgrado/index.htm	Peru	270

Source: Prepared by the author.

4.5 Average Density by Link

The value of Average Density by link which shows the first position at the general ranking is the one of the *Programa de Investigación sobre Integración, Pobreza y Exclusión Social da Universidad Católica de Uruguay (IPES/UNCU),* with a 343,5 DML, the highest value among the sites of all the latin-american countries. In the sequence appears a Brazilian centre site with an Average Density by link of 208: the one of the *Centro de Ciências Sociais (CCS)* from the *Universidade Estadual do Rio de Janeiro (UERJ)* and right after another Brazilian institution site with a 182 ADL, correspondent to the *Departamento de Ciência Política* (DCP) from *Faculdade de Filosofia, Letras e Ciências Humanas* (FFLCH) from São Paulo University (USP). After, fourthly and fifthly comes a Chilean site from the *Centro de estúdios em*

Juventud da Universidad Católica 'Cardenal Raul Silva Henríquez' (CEJU/UCSH), with a 69 ADL, and the site from the *Centro de Investigaciones y Documentación Socioeconômica da Universidad del Valle (CIDSE/UNIVALLE*), with a 63 ADL respectively. Sixthly, seventhly, eighthly and ninthly appear again Brazilian institutions sites: the *Programa de Pós-Gaduação em Ciência Política (PPGCP)* from the *Universidade Federal do Rio de Janeiro (UFRJ),* with a 58 ADL, the one from the *Programa de Pós-Graduação em Ciências Sociais da Filosofia e Ciências (PPGCS) from the Universidade Estadual Paulista de Marília (UNESP)* with a 52 ADL, the *Programa de Pós-Graduação em Geologia da Universidade Estadual Paulista de Presidente Prudente* (42 ADL) and the *Instituto de Pesquisas Sociais (INPSO)* from the *Fundação Joaquim Nabuco (FUNDAJ),* presenting a 29 ADL. Finally, tenthly is the site from the *Centro de Estudios Latinoamericanos 'Justo Arosemená (CELA),* from Panama, with a 28 ADL (Table 6).

Table 6 – Latin-American Web Sites Ranking According to its Average Density by Link, with Data from the Program *Xenu Link Sleuth* and from the Search Engine Google, June/July 2006

Position	URL	Country	Size
1º	http://www.ucu.edu.uy/Default.aspx?tabid=590	Uruguay	**343**
2º	http://www2.uerj.br/~ccs/index.html	Brazil	**208**
3º	http://www.fflch.usp.br/dcp/index.htm	Brazil	**182**
4º	http://www.ces-ucsh.cl/juventud_ces.htm	Chile	**69**
5º	http://chasqui.univalle.edu.co/cidse/cidse.html	Colombia	**63**
6º	http://www.ifcs.ufrj.br/~ppgcp	Brazil	**58**
7º	http://www.marilia.unesp.br/ensino/pos-grad/index.htm	Brazil	**52**
8º	http://www2.prudente.unesp.br/pos/geo/index.htm	Brazil	**42**
9º	http://www.fundaj.gov.br/docs/inpso/pesq/inpso.html	Brazil	**29**
10º	http://168.96.200.17/ar/cela.html	Panama	**28**

Source: Prepared by the author.

4.6 Web Density

As third and last indicator applied and considered, are shown the relations that the different centres affiliated to the *Conselho Latino-Americano de Ciências Sociais* Sciences establish between themselves, focusing the links which conduct from the centre site to another centre belonging to the same universe. The analysis

considers the graphic representation of the ties which bind the several sites from the same country (Picture 3) and the web density that results from there.

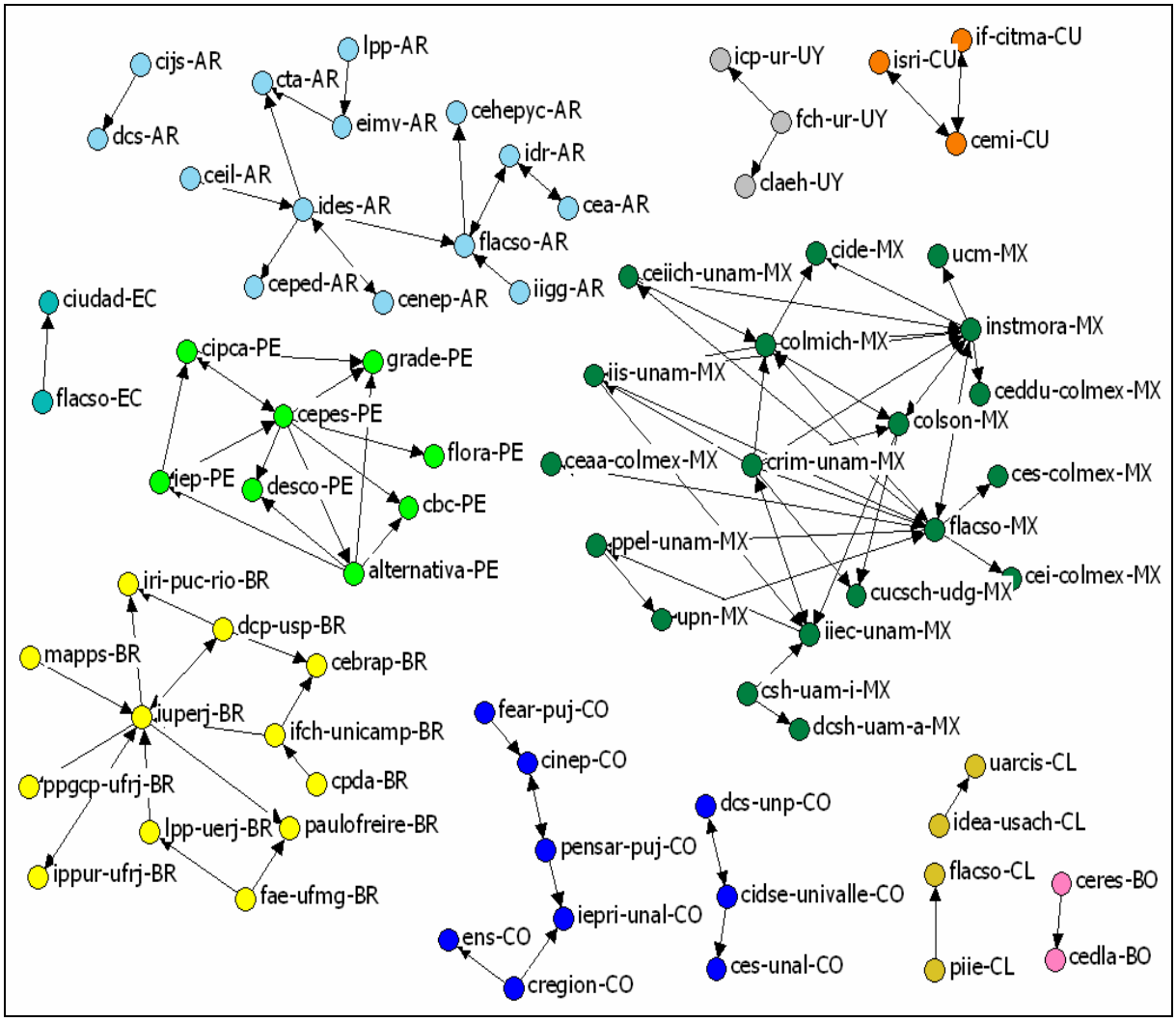
Through Table 7, it may be observed that the web density from all the countries is, in general, quite low. The country which stands out is Peru, with 16,7% and in second position is found Uruguay. With a 6,6% density. While those countries with higher number of centres, like Mexico, Brazil and Argentina, show a WD with values below the 5,0%. There is, however, an enormous potential untapped about the sites connectivity of the centres affiliated to the CLACSO with its peers.

Table 7 – Web Density by Country

*Country	Nº of Nodes	Potential nº of Connections	Effective nº of connections	Web density %
Peru	10	90	15	**16,7**
Uruguay	6	30	2	**6,6**
Mexico	29	812	40	**4,9**
Chile	8	56	2	**3,6**
Ecuador	6	30	1	**3,3**
Bolivia	6	30	1	**3,3**
Argentina	23	506	15	**3,0**
Brazil	25	600	16	**2,7**
Colombia	20	380	9	**2,4**
Cuba	15	210	4	**1,9**

Source: Prepared by the author.

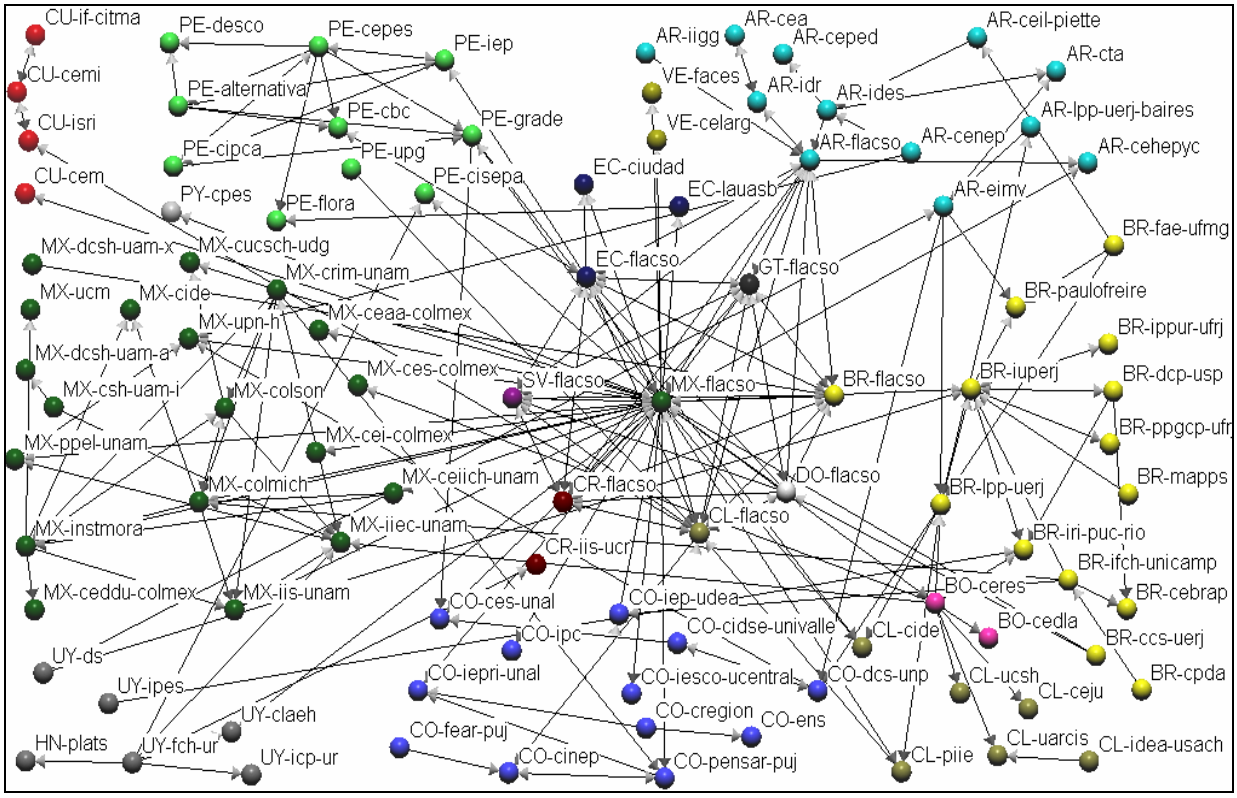
* Countries like Venezuela, Paraguay, Costa Rica, Nicaragua, Panama, Guatemala, Dominican Republic, Honduras, Haiti, El Salvador and Puerto Rico do not present connections between their centres affiliated to the CLACSO, what configures to a null web density.



Picture 3: Graphic Representation of the Connections (Links) from Each Country – Overview.
Source: Prepared by the author.

Regarding the international ties (Picture 4), there is a centre that shows a position very eminent: it is the *Facultad Latinoamericana de Ciencias Sociales do México (*FLACSO-MX), which sums 23 links to other centres affiliated to the CLACSO based in other countries, and receive 9 links of centres located out of Mexico (the whole, 32 international links). The second attention is given, with a number of links quite less expressive, to the *Facultad Latinoamericana de Ciencias Sociales,* with base in Chile (FLACSO-CL), which shows 17 connections (eight external and 9 internal).

After them, should be mentioned the bases of the same institution in Ecuador, Brazil, Guatemala, El Salvador, Dominican Republic, Argentina and Costa Rica. These FLACSO bases show, respectively, 16, 15, 14, 13, 9, 8 and 8 international connections, where these values disaggregate, through the order in: seven, six, six, five, six, zero and zero external links and nine, nine, eight, eight, three, eight and eight internal links. In continuing, appears the sites from the *Centro de Estudios da la Realidad Económica y Social da Bolívia (CERES-BO)* (four external and one internal link), the *Laboratório de Políticas Públicas da Universidade Estadual do Rio de Janeiro,* Brazil (LPP-UERJ-BR) (four internal links), the *Facultad de Ciências Sociales da Universidade de la República do Uruguai (*FCS-UR-UY*)* (four external links) the *Centro de Investigación y Desarrollo de la Educación do Chile* (CIDECL) (three internal links), the *Departamento de Ciencias Sociales da Universidad Pedagógica Nacional da Colômbia (*DCS-UPN-CO) (a external and two internal links) and the *Grupo de Análisis para el Desarrollo do Peru (*GRADE-PE) (two external and one internal link). However, it is observed that the first nine ranking positions are occupied by the FLACSOs of different countries, with values much more meaningful than the numbers shown by the other entities. Making an examination of the centres with which the mentioned in this paragraph maintain relations, we can observe, of course, that a good part of them take place inside the same institutional web, in case, the FLACSO web. Outside it, a few are the connections with centres based in other countries of the continent. Only as an example, it is worth mentioning that the web density FLACSO is of 90%.



Picture 4: Graphic Representation of the Connections (Links) Between the Sites Affiliated to the CLACSO.
Source: Prepared by the author.

4.7 Members Centres Connections with the CLACSO

Independent of the relations that the centres establish with their peers, it seems appropriate, finally, to make an examination about how many sites establish relations with the *Conselho Latino-Americano de Ciências Sociais,* either because they are linked through the Council or because they link it. On Table 8, it is observed that, out of the 29 Mexican centres, only 15 are linked by the CLACSO e 13 link the Council in their sites. Out of the 25 Brazilian centres, only 9 are pointed by the site CLACSO and ten indicate it. On the other side, in the case of Argentina, out of a 23-total site, 13 are pointed by CLACSO and only six have the CLACSO site among their links. From the Colombian sites, most of them are linked by the CLACSO (16 out of a 20-total), but only six link the *Conselho Latino-Americano. In the* other countries, the tendency repeats itself: there is a higher propensity to be linked by the CLACSO site than to link it. On a total of 174 centres, there are 94 sites from the

CLACSO member centres indicated by this and 62 links which result from them and indicate the CLACSO site. It is possible to reiterate, however, a huge untapped space referring to the connectitivity degree of the several centres among themselves and, in this concrete case, from the centres with the institution which mentions all of them, as it is the CLACSO (Table 8).

Table 8 – Members Centres Connections with the CLACSO by Country

Country	Nodes nº	Centres linked by the CLACSO	Centres which link the CLACSO
MX	29	cpolítica-ucol, cei-colmex, crim-unam, colson, flacso-mx, iihs-uv, colmich, ceddu-colmex, ces-colmex, cide, cucsh-udg, dcsh-uan-a, iiec-unam, iis-unam, icsyh-buap, cpolítica-ucol [15]	cpolítica-ucol, cei-colmex, csh-uam-i, colson, flacso-mx, iihs-uv, colmich, ceddu-colmex, ces-colmex, cide, cucsh-udg, dcsh-uan-a, iiec-unam [13]
BR	25	cebrap, iri/puc-rio, ccs/uerj, crh/ufba, dcp/usp, fae/ufmg,iuperj, lpp/uerj-br, ppgeo/uff [9]	cebrap, ceppac/unb, cpda/ufrrj, flacso, fae/ufmg, geicd, paulofreire, lpp-uerj, ppgeo/uff, mapps [10]
AR	23	cea/unc, cenep, ceil-piette, flacso/ar, idep, iigg/ubá, lpp/ba, cehepyc/uncoma, ceped/ubá, fisyp/rcc, ides, cta/instituto, iia/uba [13]	ceil-piette, fcp-uncu, flacso/ar, eimv, fisyp/rcc, ides [6]
CO	20	cijus-uniandes, ces-unal, cidse-univalle, iesco-ucentral, fear-puj, dcp-unal, fcs-puj, cinep, ceso-uniandes, ceanj-umanizales, cregion, ens, iepri-unal, ipc, iep-udea, iner-udea [16]	cijus-uniandes, iesco-ucentral, pensar-puj, cinep, cregion, ens [6]
PE	10	cbc, cepes, grade, desco, flora, iep [6]	cepes, grade, alternativa, iep, upg [5]
CH	8	flacso-cl, ical [2]	di-uarcis, piie, flacso-cl+, ical [4]
UY	6	ds-ur, icp-ur [2]	ciesu, ds-ur, claeh, ipes-ucu [4]
CU	15	ifc, cips, ciem, fanjnh, cemi, cem, mepla, isri, ifc [8]	ifc, cemi, ffh [3]
BO	6	ceres, ceplag, iese-umss, cedla, jaina, cides-unsa [6]	ceres, ceplag, cedla [3]
VE	5	cendes-ucv [1]	lacso, cendes-ucv [2]
PY	4	cde, cpes [2]	base-is, cde [2]
EC	6	caap, flacso-ec, diucuenca, ciudad, lauasb [5]	flacso-ec [1]
CR	3	flacso-cr, iis-ucr [2]	[0]
NI	3	cielac [1]	cielac [1]

DO	2	flacso-do [1]	flacso-do [1]
SV	1	flacso-sv [1]	flacso-sv [1]
PA	2	cela [1]	[0]
GT	2	flacso-gt [1]	[0]
HN	2	cedoh, plates [2]	[0]
HT	1	[0]	[0]
PR	1	[0]	[0]
Total	**174**	**94**	**62**

Source: Prepared by the author.

DISCUSSION, CONCLUSION AND RECCOMENDATIONS

Concluding this work, it is worth to remember the importance attributed to the increasing of the means and sources of non-traditional information, as one of the main factors which explain the interest arousing for new methods and new indicators guided to the measurement and to the analysis of the information flow in other environments. With the web, new communication modalities, as well as new ways of information interchange have been establishing themselves in the most several scopes and social spaces. The internet solidification as a privileged support to the accomplishment of certain human activities in the different performance fields, including the academic and scientific circles, have been stimulating the generation of new analytical tools e of new techniques which allow to accomplish the measurement and the evaluation of the scientific researches advance and of the intellectual production of investigators, academic centres and university institutions available at the web, in an analogous way to that one which was traditionally accomplished with the printed material.

With this research, we could find out that there are different degrees of Internet development and of the web in the several Latin-American countries. Consequently, the presentation, the structure and the informational resources of the web sites which represent the academic institutions from this region are also heterogeneous. The results obtained at the applying the webometric indicators to the set of academic sites in analysis (Size Site, Visibility, Web Impact Factor, Luminosity, Average Density by Link and Web Density) point to this direction. At the same time, they show their utility in the identification processes and the flow pattern analysis of information and inter-relation between academic institutions inside a virtual world,

allowing it to draw the configuration profile of the academic latin-american information in Social Sciences at the Web.

It is worth here to stand out the practical results obtained in each one of them, what permitted to test its applicability. This way, we can note that not all of them led to satisfactory results. This is the case of Web Impact Factor, indicator which tends to arouse a great interest among the scholars who perform in the webometric field. Based in the empiric work accomplished, we could conclude that the analogy that the authors are used to invoke among the Magazines Impact Factor, calculated by the ISI from its citations databases, and the Site Impact Factor at the Web, it does not seem really relevant. The analyses accomplished with the Social Science centres affiliated to the CLACSO arouse serious doubts about the utility of this relational indicator and to the results importance that it offers to the comparative investigations, after all when appear cases in which the sites size of eminent academic centres overcome widely the number of links which such sites receive, what results in very low or even null WIFs.

Similar situation was noted in the case of Average Density by Link or Hipertextual Density: the empiric work showed that this indicator, when establishing a relation between the number of a site pages and the links quantity that this site presents, tends to generate results whose meaning does not make sense to the light of importance of the web sites analyzed. It is worth to insist: indicators which measure the relation among the sites size and the links with which they count on (or the links that point to them or the sum of both) do not offer results which may be comparable with the analogous indicators used traditionally in the printed format, because they do not translate the importance that each site has inside the studied universe. We can then think over if there is really sense in applying these indicators in the web context.

On the other side, other indicators (Site Size, Visibility, Luminosity and Web Density), showed widely their utility in the identification processes and flow pattern analysis of information and inter-relation among academic institutions inside the virtual world and made it possible to draw the configuration profile of the latin-american academic information in Social Science and of its inter-connections at the web. It is important to emphasize the importance of Visibility, as status expression of

a site derivative from the number of times that this was “sited” or linked by other web spaces. In general terms, it is possible to say that inside the analyzed universe, it was observed that a tendency which indicates that the sites which have higher international recognition are also the more linked ones, establishing then a strong match between real Visibility and the Visibility of these centres in the virtual world.

The Luminosity analysis, as indicator that, along with the Visibility, shows that when the sites connect at the web, it became clear that the Mexican, Argentinean and Peruvian academic institutions sites are the ones which present more “relations”, since they reached the first positions at the ranking of this indicator.

About the Web Density, this one showed itself very useful to the analysis of the sites affiliated to the CLACSO, allowing it to discover in what degree they maintain mutual connections. As detailed in the precedent section, in general, in most of the countries, a good part of the centres establish a very few bonds with other centres from its country at the web, what gives place to a density of the respective national webs quite low, situation which tends to be repeated with the international unions (except the centres that already make part of the same institutional web, as for example the *Faculdade Latino-Americana de Ciências Sociais- (*FLACSO), with headquarters spread in several countries of the continent. This configurates a huge untapped potential with regard to the connectivity of the sites of members centres of CLACSO with their peers. The same way, when the links among the member centres of each latin-american country were analyzed with the CLACSO, it could be observed that there is a higher propensity of the centres sites be linked by the CLACSO site, than the opposite.

According to the results obtained, mainly regarding the Web Density, lays the suggestion to the CLACSO to adopt a reciprocity politic with the affiliated centres, asking for the inclusion of a link to the Council as a way to enlarge its relation web and also that updates or correct some links to their member centres which may be outdated or mistaken.

It would be also interesting, that other work like this was performed, with the purpose to continue testing the relevance of the studied indicators, to compare the same indicator in formats, supports or different environments, using two or more

metric, or to continue advancing at the comparative studies between regions, countries and continents.

REFERENCES

ABRAHAM, R. **Webometry**: measuring the complexity of the World Wide Web. Based on a talk in Vienna at FIS96, 6.15.96. Appeared in World Futures, 1997. Available in: <http://depleafproductions.com/utopicalibrary/text/abrahamweb.html>. Access in: 10 Mayo 2004.

_____; FORESTA, D. **Webometry**: chronotopography of the World Wide Web. 1996. Available in: <http://www.ralph-abraham.org/articles/MS%2389.Web3/webometry.html>. Access in: 24 Jun. 2004.

AGUILLO, I. F. (Coord.). **Factor de impacto y visibilidad de 4.000 sedes web universitarias españolas**. Madrid: CINDOC, InternetLab, 2005. Available in: <http://www.cindoc.csic.es/estudios_ea2004_0020_informe.doc>. Access in: 15 mar. 2006.

_____. Posicionamiento en el web del sector académico iberoamericano. **Interciencia**, Caracas, v.30, n.12, dic. 2005a. Available in: <http://www.scielo.org.ve/scielo.php? pid=S0378-18442005001200003&script=sci_arttext>. Access in: 25 mayo 2006.

_____. **Cibermetría**: la métrica de la Web. In: SEMINÁRIO BUSQUEDA: DEL ARCHIVO A LA RED. Madrid: Residencia de Estudiantes Fundación Francisco Giner de los Ríos, 2003. Available in: <http://www.archivovirtual.org/seminario/busqueda.htm>. Access in: 25 mayo 2006.

ALMIND, T. C.; INGWERSEN, P. Informetric analyses on the world wide web: methodological approaches to 'Webometrics'. **Journal of Documentation**, v.53, n.4, p.404-426, 1997.

ARROYO, N.; PAREJA, V. M. Metodología para la obtención de datos con fines cibermétricos. In: TALLER DE INDICADORES BIBLIOMÉTRICOS. PROCEEDINGS III. **Anais...** Madrid, 2003. Aballadle in:<http://www.ricyt.edu.ar/interior/normalizacion/III_bib/Pareja.pdf>. Access in: 15 mar. 2006.

BJÖRNEBORN, L. **Small-world structures across an academie web space**: a library and information science approach. PhD dissertation. Copenhagen, DK: Department of Informations Studies, Royal School of Library and Information Science, 2004. 399p.

EICSTES Project. **European Indicators, Cyberspace and the Science Technology Economy System**. 2002. Available in: <http://www.eicstes.org/index.htm>. Access in: 25 mayo 2006.

INGWERSEN, P.; CHRISTENSEN, F. H. Data set isolation for bibliometric online analyses or research publications: fundamental methodological issues. **Journal of the American Society for Information Science**, v.48, n.3, p.205-217, 1997.

SMITH, A. Web links as analogues if citations. **Information Research**, v.9, n.4, Jul. 2004.

VANTI, N. Da Bibliometria à Webometria: uma exploração conceitual dos mecanismos utilizados para medir o registro da informação e a difusão do conhecimento. **Ciência da Informação**, Brasília, v.31, n.2, p.152-162, 2002.

VANTI, N. Os links e os estudos webométricos. **Ciência da Informação**, Brasília, v.34, n.1, p.78-88, 2005.

VANTI, N. **Links hipertextuais na comunicação científica**: análise webométrica dos *sites* acadêmicos latino-americanos em Ciências Sociais. Porto Alegre: UFRGS, 2007. 299f. Tese (Doutorado) – Programa de Pós-Graduação em Informação e Comunicação. Universidade Federal do Rio Grande do Sul, Porto Alegre.

NOTES

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i In Brazil, the field of webometric studies is still on its primordial's. For more information in Portuguese about the historic and conceptualization of the webometric, see Vanti (2002; 2005; 2007).

[ii] Some portals (Outsource Strategies International and Marketleap Search Engine Marketing Tools) in the place of "visibility" use the concept of "Popularity" to refer to the same indicator. On the other side, determined authors understand the Popularity as expression of a different indicator. This is the case of Aguillo (2005, online), for whom the indicator Popularity expresses the number of visits received by a site, been this number measured in a determined period and counted only once when the visit comes from de same IP.

[iii] Neologism first used by McKiernan (1996) to define the citation or the links between web sites.

[iv] As an example, in a 10 nodes web, the maximum of mix possibilities will be of 90 times. If out of these 90 possibilities, only 18 were effectively implemented, the web density will be of 0,20 or 20%.

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