Investigación Bibliotecológica

ARCHIVONOMÍA, BIBLIOTECOLOGÍA E INFORMACIÓN

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CONTRIBUTING RESEARCHERS:

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Georgina Araceli Torres Vargas
Instituto de Investigaciones Bibliotecológicas y de la Información, UNAM. Torre II de Humanidades, Piso 12, Circuito Interior, Cd. Universitaria, Colonia Copilco Universidad, Delegación Coyoacán, 04510, México, D.F. Tel.: 5623 0347
E-mail: gatv@unam.mx

Jaime Ríos Ortega
Instituto de Investigaciones Bibliotecológicas y de la Información, UNAM. Torre II de Humanidades, Piso 12, Circuito Interior, Cd. Universitaria, Colonia Copilco Universidad, Delegación Coyoacán, 04510, México, D.F. Tel.: 5623 0327
E-mail: jrios@iibi.unam.mx

José Daniel Moncada Patiño
Ministerio de Cultura-Biblioteca Nacional de Colombia. Bogotá, Colombia
E-mail: jdmoncada@mincultura.gov.co

Manuel Blázquez Ochando
Departamento de Biblioteconomía y Documentación, Facultad de Ciencias de la Documentación, Universidad Complutense de Madrid. C/ Santísima Trinidad 37, 28010, Madrid, España. Tel.: 913946719
E-mail: manuel.blazquez@pdi.ucm.es

María Isabel Dorta González
Departamento de Estadística, Investigación Operativa y Computación, Universidad de La Laguna. Tenerife, España
E-mail: isadorta@ull.es

María Teresa Múnera Torres y Orlanda Jaramillo
Escuela Interamericana de Bibliotecología, Universidad de Antioquia. Medellin, Colombia
E-mail: mmuner@bibliotecologia.udea.edu.co
E-mail: ojara@bibliotecologia.udea.edu.co

María Victoria Nuño Moral
Universidad de Extremadura, España. Facultad de Biblioteconomía y Documentación Plazuela Ibn Marwan, 06071, Badajoz, España Tel.: 924 286400, Ext.: 86410
E-mail: mvnunmor@alcazaba.unex.es

Pablo Dorta González
Departamento de Métodos Cuantitativos en Economía y Gestión, Universidad de Las Palmas de Gran Canaria. Gran Canaria, España
E-mail: pdorta@dmc.ulpgc.es

Preiddy Efraín García, Carlos García Zorita y Elías Sanz Casado
Laboratorio de Estudios Métricos de la Información. Departamento de Biblioteconomía y Documentación. Universidad Carlos III de Madrid. Unidad Asociada IEDCYT-LEMI. (Spain).
E-mail: pegarcia@bib.uc3m.es
E-mail: czorita@bib.uc3m.es
E-mail: elias@bib.uc3m.es

Yolanda Martín González
Departamento de Biblioteconomía y Documentación, Universidad de Salamanca, c/ Francisco Vitoria 6-16, 37008, Salamanca, España
E-mail: ymargon@usal.es

Commentary

Reading and organizing: a new challenge

> *The deepest problems of modern life derive from the claim of the individual to preserve the autonomy and individuality of his existence in the face of overwhelming social forces, of historical heritage, of external culture, and of the technique of life.*
>
> Georg Simmel,
> "Metropolis and mental life", 1903

In the early twentieth century, Simmel discussed the struggle between the individual and power entailed in a society moving from nineteenth century rural life of the toward the consumer society offering a vast array of technological products. Because a century or so later most of these technologies are increasingly embedded in the social sphere, the likelihood of attaining independence from the technologies of the industrial revolution is very slim. The personality and lifestyle of the current human being is quite different from than that envisioned by Simmel, but even at that, his statement is timely; because over the last century and to date, researchers such as Manuel Castells have pointed out that because of the technological paradigm organized around information technologies we are now moving through one of those rare phases in history characterized by the transformation of our "cultural material."

This struggle for individuality is perhaps visible in Google's analysis of the frequency of words in a data base containing more than five million books published between 1500 and 2008. David Brooks comments on this analysis and specifically on the research of Jean Twenge, W. Keith Campbell and

Brittany Gentile, who found that that individualist words and phrases between 1960 and 2000 constantly outstripped communitarian diction. Brooks interprets this as signifying the apex of individualism, while also suggesting it as reflecting a concern for recovering independence from the consumer exigencies and habits imposed by contemporary society.

The human being from the time of Simmel is quite different from the current version, which has acquired new skills and additional modalities of knowledge, in contrast to the linear reading prevailing in the earlier stage. The rise of the image, communications and the transfer of information are the principal emblems of these changes.

The movie theater moved into the home with the creation and distribution of affordable video. Another important event was the beginning of television and the ability to watch any world event in real time. The telephone moved from being an instrument for voice transmission and recently has incorporated cameras for taking photos, video recognizing one's of nearby surroundings and transmitting text messages. The development of audiovisual entertainment in videogames, which are graphic, noisy and fast, must also be cited. The Internet, with its array of online and audiovisual interconnection services, is a seminal moment for modern life, as communication of the events is nearly concurrent with their occurrence.

There is a prevailing sense is that a part of the world population knows about a large part of the planet and even outer space, because it can observe images transmitted by satellite traveling through the sky. And it can also dream that it controls all of this by immersion in videogames.

Many of us have seen images of the killing fields of Ruanda, the moon landing, the smoke from the Twin Towers and their appalling collapse. Mexico shared the 1985 earthquake of 8.1 on the Richter scale with the world, and recently the floods of 2013 were widely disseminated. Several researchers, however, have called attention to a kind of defensive reaction to the overwhelming amount of information and stimuli.

It is possible to say that such knowledge might be minimal and misleading, as suggested by researchers such as Aldo Mazzucchelli; however, society appears to be quite conversant with prominent images and world events, something Library

Science should not be ignore in its role as an organizer of knowledge.

The information search habits of current online culture, unfortunately, promote superficial, quick reading, with little engagement of thought and generally meager attention to information and data obtained, which, moreover, is soon forgotten because of the luxury afforded by online memory and ease of retrieval. If we were to call this a weakness, there would probably be little argument.

In recent years there has been some research into changes in brain activity. Notably, Patricia Greenfield (2009) published a case study in *Science* examining the effects of diverse media on intelligence and ability to learn. She explains that all new media develops certain cognitive abilities, but always at the expense of others. New visual-spatial intelligence strengths appear which must be traded off against losses in higher order cognitive processes, entailed in abstract lexicon, attentiveness, reflection, inductive problem solving, critical thinking and imagination. Rafael Capurro also warns that the change in media necessarily involves loss and gain in specific qualities associated with the particulars of our situation in the world, in contrast to what happens with other living beings that are not evolutionarily tied to a determined program and communication medium.

The new approach to reading observed in young people and the new media they prefer has been implemented in the teaching of Library and Information Sciences, especially with regard to teaching indexing, which is a fundamental part of the organization of knowledge.

In addition to studying reading comprehension of the written support, the curricular approach also incorporates reading comprehension of the audiovisual medium. From the structural study of the image (objects, light, color, human figure, and relationships with the historical and social context) a type of reading unfolds requiring reflection, attention, imagination, critical thinking and inductive problem solving. This should be the object Library Science education, in conjunction, of course, reading comprehension training that promotes appropriation of grade-appropriate texts.

The comprehension of texts and the aptitude to transmit informative contents in an abbreviated form is the task of the

librarian as the natural agent of the informative process. The librarian is responsible to a given work, in any support, and may or may not have abbreviated previously information. In addition to enjoying the pleasure of reading and a taste for understanding all kinds of texts, the Library Science student must be trained professionally in the tasks of reading comprehension and transmission of texts to the social milieu.

Of course, Library Science reading cannot be merely mechanical; because not only is comprehension of the text needed, but also knowledge of the topic and the social context in order to make a rational analysis of the content. After his formal education, each student will complement the knowledge acquired with reading comprehension of a given topic or professional sphere of information, thereby acquiring the required speed.

In the second half of the twentieth century, the field of linguistics has grown exponentially, especially in the area of cognitive linguistics, which has helped change the ways texts are approached and understood. Moreover, linguistic approaches have permeated those sciences that base their respective research on textual association and discourses.

Knowledge organization systems are linked, no doubt, to the way knowledge is constructed. The current explosion in the audiovisual field and the characteristics of its organization involve empirical and rational facets, as well as meaning transmitted through the language, and expression of cultural evidence from the theoretical standpoint of a given domain.

When Simmel asserts: "We are all fragments, not only of the universal man, but also of ourselves"; we once again see why technologies are ever present and the social immersion for mastering them becomes increasingly necessary and real.

Perhaps, the most redeemable instance of individuality in the twenty-first century is the availability of organized knowledge based on a human appreciation within a given society, where Library Science can contribute by making these things available, thereby ensuring access to relevant information beyond that produced for commercial interests, as Dénis de Moraes and Simmel cautioned some time ago.

This is the true challenge of Library Science before the monopolistic concentration of the information-communication sector. It must, within its field of action, offer valuable information, properly understood and transmitted on the basis of deep understanding.

Catalina Naumis Peña

ARTICLES

Aggregate impact factor of scientific fields

María-Isabel Dorta-González *
Pablo Dorta-González **

Abstract

Science journal impact indicators are not comparable because of inherent differences in publication and citation behaviors from field to field. A breakdown of the field aggregate impact factor of databases shows that for the 22 fields and four areas considered by Thomson Reuters, the leading provider of science indicators, five variables largely explain variance in impact factor of a given field. Therefore, it is necessary to consider all these sources of variance in the standardization process of the impact indicators. A Principal Component Analysis is employed to find the sources of the variance and a Cluster Analysis is used to detect similarities.

*   Universidad de La Laguna, Tenerife, España. isadorta@ull.es
**   Universidad de Las Palmas de Gran Canaria, España. pdorta@dmc.ulpgc.es

Keywords: Impact Factor; Journal Evaluation; Principal Component Analysis; Cluster Analysis.

RESUMEN

Factor de impacto agregado según campos científicos
María Isabel Dorta González
Pablo Dorta González

Los indicadores de impacto de revistas no son comparables entre campos científicos debido a las diferencias significativas en los hábitos de publicación y citación. Una descomposición del factor de impacto agregado muestra, para los 22 campos y cuatro áreas consideradas en las bases de datos del principal proveedor de indicadores científicos (Thomson Reuters), que existen cinco variables que en mayor medida explican la varianza del factor de impacto de un campo. Por ello es necesario tener en cuenta estas fuentes de variación en el proceso de normalización de los indicadores de impacto. Para localizar las fuentes de la varianza se emplea un Análisis de componentes principales y para detectar las semejanzas se utiliza un Análisis clúster.

Palabras clave: Factor de Impacto; Evaluación de Revistas; Análisis de Componentes Principales; Análisis Clúster.

Introduction

The Impact Factor (FI) published in the *Journal Citation Reports* (JCR) by Thomson Reuters is defined as the average number of citations received by a journal in a given year of the "citable items" published in that journal over the previous two years. Since its presentation (Garfield, 1972), the FI has been criticized for certain arbitrary decisions entailed in its formulation. The literature has discussed aspects such as the definition of citable items (papers, reviews, conference reports and correspondence), and the focus and the two-year time frame as somehow representing the research front, etc. (Bensman, 2007). Moreover, critics have suggested numerous modifications (Althouse *et al.,* 2009; Bornmann and Daniel, 2008; Dorta-González and Dorta-González, 2013a,b).

The problem of comparing journals from diverse fields has its origin in institutional evaluation (Leydesdorff and Opthof, 2010; Opthof and Leydesdorff, 2010; Van Raan et al., 2010). The distribution of citations varies from

one scientific field to another, and in some cases even within the specializations of a given field (Dorta-González and Dorta-González, 2010, 2011a, b). Research centers; however, consist of researchers from widely diverse disciplines, who often strive to work in multidisciplinary groups. (Leydesdorff and Rafols, 2011; Wagner *et al*., 2011).

Most literature on the classification of journals into scientific fields has focused on correlating citation patterns (Leydesdorff, 2006; Rosvall and Bergstrom, 2008). Indexes such as the *JCR Subject Category List* classify journals into groups (Pudovkin and Garfield, 2002; Rafols and Leydesdorff, 2009). In this sense, Egghe and Rousseau (2002) define the Relative Impact Factor and FI similarly, taking all of the journals of a category as a single meta-journal. This indicator is called the Aggregate Impact Factor in *JCR*.

There are several statistical patterns exclusive to the fields. Garfield (1979a,b) proposes the term citation potential, based upon the average number of citations, to justify the systematic differences between scientific fields. For example, in the biomedical field lists of fifty or more citations is quite common, while in mathematics less than twenty citations is most commonly seen. These differences are owing to distinct citation cultures that significantly affect the FI by conditioning the likelihood of citation. The fractional recount corrects these differences on the basis of the sources cited (Leydesdorff and Bornmann, 2011; Moed, 2010; Zitt and Small, 2008). Thus, one citation of an article containing n citations counts as $1/n$ for the fractional recount, while it counts as 1 in the whole recount.

Another important variation exhibited between fields is the channel of dissemination exhibited in the results of the research activity. For example, researchers in social sciences and humanities publish more often in books than in journals, while those in computer sciences publish more often in conference reports than in journals. The differences between fields come about largely because of the proportion of *JCR* citations to other books and journals not included in the *JCR*, etc. (Althouse *et al*., 2009).

The objective of this paper is to identify the sources of variance in accord with scientific fields. The identification of these sources is fundamental for the purpose of implementing standardized, adjusted bibliometric indicators as appropriate for each field. In addition to the variables studied in the literature (the average number of citations and proportion of citation in the *JCR*), this paper examines three new variables: the field growth index; the proportion of *JCR* citations in the citation window, and the proportion of items cited and the citing party. Moreover, researchers present a breakdown of the impact factor into these five main sources of variance for all of the scientific fields and the fields in the Thomas Reuters data base.

The impact of a journal is a gauge of the number of times research papers in an established count period cite papers published during a previous citation window. The Impact Factor (FI) of a journal as provided by Thomas Reuters uses a tally period of one year and citation window of two.

The Aggregate Impact Factor (FIA) of a field is obtained by weighing all of journals in a field as a single unit. As an average, the calculation of FIA depends on two values: the numerator is the number of citations in the current year over any of the items published in the journals of the field in the previous two years; and the denominator is the number of citable items published in those two years. The items published include citable items, such as papers, reviews, conference reports and correspondence, as well as corrections, editorials, news items and other materials.

The aggregate impact factor of a field (F) in year (T) can be broken down as follows:

$$FIA_t^F = a_t^F \cdot r_t^F \cdot p_t^F \cdot w_t^F \cdot b_t^F,$$

where a_t^F is an indicator of growth of a field and $r_t^F \cdot p_t^F \cdot w_t^F \cdot b_t^F,$ are four indicator of citation habits in said fields. These variables are defined in *Table 1.*

Table 1. Variables employed in the breakdown of the impact factor.

Notation	Definition	Description
a_t^F	Growth ratio	Quotient of citable items in year t and those that appear in the citation window.
r_t^F	Average number of citations	Quotient between total number of citations and total number of citable items.
p_t^F	Proportion of citations in *JCR*	Quotient between total number of citations of journals listed in *JCR* (excluding work documents, minutes, books and unindexed magazines) and the total number of citations.
w_t^F	Proportion of citations in *JCR* in the citation window	Quotient between total citations from *JRC* in the citation window and the total citations in the *JCR* itself.
b_t^F	Proportion between of items cited and citers in the citation window	Quotient between the total citations received and the citations made within the citation window.

The growth of a field can be attributed to two root causes: the inclusion of new journals and the publication of additional items in journals already listed. Nonetheless, a field may also undergo contraction.Take, for instance, that $a_t^F = 0.5$, when the number of citable items in years t, t-1, t-2. Coincide.

If $a_t^F > 0.5$, occurs, then growth of the field in terms of the number of citable items is produced. When $a_t^F > 0.5$ occurs then contraction is produced.

Though most citations of a journal come from journals in the same field, some portion come from journals of other fields. When $b_t^F > 1$, the citations received by field F are greater than those produced in that field. On the other hand, when $b_t^F < 1$, the citations received by field F are less than those produced by that field. This indicator is, therefore, a gauge of the exchange of citations among fields. For example, when $b_t^F = 1$, the field F receives 10% more citations than it produces.

The other variables are proportions. For example, if $p_t^F = 0.5$, half of the citations are *JCR* items; and where $w_t^F = 0.25$, a quarter of the *JCR* citations belong to the citation window

Material and methods

The bibliometric data were obtained from the online version of the *Journal Citation Reports* (*JCR*) during the first week of October 2011 (T=2010). The *JCR* data base (provided by Thomas Reuters, Philadelphia) may be consulted at www.webofknowledge.com.

Thomson Reuters assigns each *JCR* journal to one or more categories in accord with citing and cited journal (Pudovkin and Garfield, 2002). The Sciences 2010 edition contains 8073 journals classified in 174 categories; and the Social Sciences 2010 edition contains 2,731 journals classified in 56 categories.

This paper examines two data aggregation levels. The first level corresponds to the 22 *scientific fields* and the second to four *scientific areas*, both of which are listed in the Thomas Reuters data base.

The variables employed are shown in *Table 1*. Main Components Analysis method was used for locating the sources of variance, and an Analysis Cluster was used to detect similarities.

Results and discussion

Table 2 shows the Aggregate Impact and the components for the scientific fields of the Thomas Reuters data base. The *JCR* journal categories comprising each field appear in *Appendix 1* next to the FIA of each category and the percentage obtained within each field. The FIA of Sciences is 2.920, 58% higher than the figure for Social Sciences of 1.848.

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Table 2. Aggregate impact factor and components for scientific areas
as per the Thomas Reuter data base.

Code	Field	Number of Categories	Categories FIA Components					
			a_t^F	r_t^F	p_t^F	w_t^F	b_t^F	FIA_t^F
C1	Agricultural Sciences	6	0.58	35.93	0.80	0.16	0.80	2.142
C2	Biology & Biochemistry	12	0.56	45.86	0.90	0.18	0.92	3.859
C3	Clinical Medicine	50	0.56	38.84	0.87	0.19	0.92	3.330
C4	Computer Science	9	0.54	30.22	0.63	0.21	0.72	1.529
C5	Chemistry	15	0.55	37.20	0.90	0.19	0.87	3.061
C6	Economics & Business	8	0.62	45.82	0.66	0.15	0.59	1.642
C7	Engineering	39	0.55	27.74	0.77	0.19	0.84	1.931
C8	Environment/ Ecology	8	0.54	44.55	0.76	0.19	0.75	2.569
C9	Geosciences	13	0.55	42.96	0.79	0.15	0.77	2.232
C10	Immunology	2	0.52	42.66	0.90	0.22	1.01	4.342
C11	Materials Science	11	0.55	30.80	0.88	0.20	0.91	2.714
C12	Mathematics	6	0.55	25.75	0.77	0.15	0.82	1.345
C13	Microbiology	5	0.56	43.25	0.90	0.19	0.91	3.638
C14	Molecular Biology & Genetics	5	0.53	51.64	0.92	0.19	1.06	5.083
C15	Multidisciplinary	1	0.58	36.81	0.84	0.21	2.55	9.747
C16	Neuroscience & Behavior	5	0.54	49.19	0.90	0.16	0.95	3.653
C17	Pharmacology & Toxicology	3	0.55	46.16	0.87	0.20	0.69	3.013
C18	Physics	11	0.52	30.21	0.90	0.19	0.97	2.617
C19	Plant & Animal Science	15	0.54	43.27	0.81	0.14	0.75	1.980
C20	Psychiatry/Psychology	17	0.55	50.28	0.79	0.15	0.83	2.663
C21	Social Sciences, general	51	0.63	44.33	0.61	0.21	0.49	1.736
C22	Space Science	1	0.47	56.59	0.78	0.24	0.92	4.621

There is a great assortment of fields in terms of size. While some fields are comprised of a single category, others include more than fifty. Those exhibiting the greatest impacts are C15 (9.747, Multidisciplinary), C14 (5.083, Molecular Biology & Genetics) and C22 (4.621, Space Science). Those with

the least impact are C12 (1.345, Mathematics), C4 (1.529, Computer Science) and C6 (1.642, Economics & Business).

The fields exhibiting the largest growth are C21 (0.63, Social Sciences, general) and C6 (0.62, Economics & Business). These growth indices are owing to new journals being included in several categories in recent years. The only field exhibiting contraction, with a ratio below 0.5, is C22 (0.47, Space Science).

The highest citation average is exhibited in C22 (56.59, Space Science) and C14 (51.64, Molecular Biology & Genetics). The lowest citation averages come in C12 (25.75, Mathematics) and C7 (27.74, Engineering). The largest *JCR* citation proportion is exhibited in C14 (0.92, Molecular Biology & Genetics) and the lowest in C21 (0.61, Social Sciences, general), C4 (0.63, Computer Science) and C6 (0.66, Economics & Business). The highest proportion of *JCR* items in the citation window is exhibited in C22 (0.24, Space Science), and the lowest in C19 (0.14, Plant & Animal Science). The highest ratios between cited and citing items is in C15 (2.55, Multidisciplinary) and C14 (1.06, Molecular Biology & Genetics); while the lowest ratios are exhibited in C21 (0.49, Social Sciences, general) and C6 (0.59, Economics & Business).

An Analysis Cluster has determined that C15 (Multidisciplinary) exhibits components that are significantly different from those seen in other fields. As such it cannot be grouped with any other field. The fields C6 (Economics & Business) and C21 (Social Sciences, general) share a first cluster, while the remaining nineteen fields would be assigned to a second cluster.

Table 3 and *Figure 1* exhibit components for scientific areas. The area with greatest impact is Life Sciences & Biomedicine. The most highly determinant component in this value is the average number of citations. The Social Sciences have the least aggregate impact despite having the highest growth and average citations. Their low impact can be explained by the low proportion of *JCR* citations and the cited vs. citing ratio. Technology has the second lowest aggregate impact despite having greater proportion of *JCR* items in the citation window.

Table 3. Aggregate impact factor and components for scientific areas as per the Thomas Reuter data base.

Área	Fields	FIA Components					
		a_t^F	r_t^F	p_t^F	w_t^F	b_t^F	FIA_t^F
Life Sciences & Biomedicine	C1, C2, C3, C8, C10, C13, C14, C16, C17, C19	0.55	42.80	0.87	0.18	0.90	3.391
Physical Sciences	C5, C9, C12, C18, C22	0.54	34.97	0.87	0.18	0.88	2.667

| Technology | C4, C7, C11 | 0.55 | 28.66 | 0.78 | 0.20 | 0.85 | 2.058 |
| Social Sciences | C6, C20, C21 | 0.60 | 46.15 | 0.67 | 0.18 | 0.60 | 2.001 |
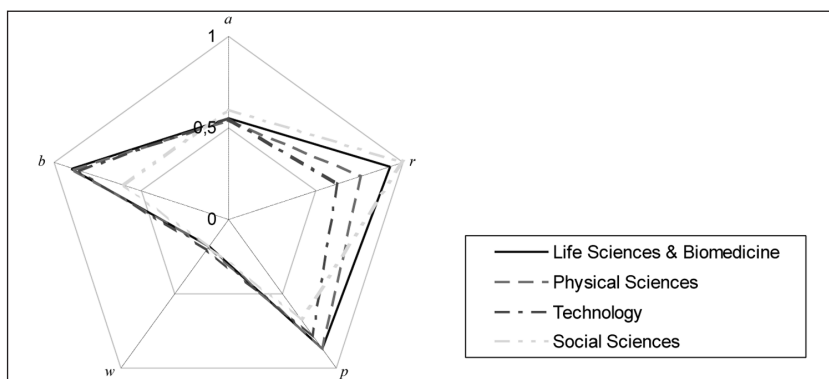
Figure 1. Components of the aggregate impact factor per the Thomas Reuters areas.

Appendix 1 shows the *JCR* journal categories that comprise each field with the corresponding aggregate impact of the category and its respective percentage within the entire field. The impact of Sciences is 58% higher than that for Social Sciences. Despite Social Sciences having on average 30% more citations, this disparity arises in part because most of these items are not included in *JCR*. In concrete terms, 40% of the Social Sciences citations are books and journals not indexed in the *JCR*, while for Sciences this figure is only 20%.

The impact variance is high within each edition. In Sciences, the categories exhibiting highest impact are those associated with biomedicine, while those with the lowest impact are in engineering and mathematics. Regarding Social Sciences, the categories with highest impact are psychology and economy, while those with the lowest are those associated with history.

A Main Components Analysis determines that most of the impact variance in Sciences is owing to three chief components: the proportion of *JCR* citations, the proportion of *JCR* citations in the citation window and the growth of the field itself. In contrast, this variance in Social Sciences is the result of only two chief components: the proportion of *JCR* citations in the citation window, and the ratio between cited and citing items. These main components also vary depending on the *JCR* edition, because the Social Sciences include disciplines, such as economy and history, which differ widely in terms of publishing habits and citations.

A Cluster Analysis initially identifies two journal group categories that generally include the Life Sciences which have the most significant social

component, and those social sciences that rely on mathematical methods, such as psychology, economy and business fields. There are, however, important differences between these two groups. A third group contains those social sciences that depend less on mathematical methods, such as education, sociology, language and law. Finally, a fourth group includes physical sciences and life sciences, e.g., mathematics, physics, chemistry, engineering and biomedicine.

Conclusions

The impact indicators of journals are not comparable between distinct scientific fields because of the systematic difference in publication and citation habits. The objective of this paper is to identify the sources of variance on the basis of scientific fields. The identification of these sources is fundamental to implement in practice standardized bibliometric indicators that are adjusted to the specifics of each field.

This paper presents a breakdown of the impact factor into five main variance sources. In addition to the variables identified in the literature, i.e., number of average citations and the proportion of *JCR* citations, this study establishes the existence of three new sources of variance: the field growth index, the proportion of *JCR* citations in the citation window and the cited vs. citing ratio. As such, in addition to weighing the two sources of variance cited in the literature, it is important to consider these new variables when attempting to standardize impact factors.

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Appendix 1
Scientific fields, JCR journal catgories,
percent within field and impacts

1. *Agricultural Sciences:* Agricultural Engineering, 6 %, 3.123; Agriculture, Multidisciplinary, 13 %, 1.673; Agronomy, 15 %, 1.774; Food Science & Technology, 40 %, 1.942; Horticulture, 7 %, 1.429; Nutrition & Dietetics, 19 %, 3.098.

2. *Biology & Biochemistry:* Anatomy & Morphology, 1 %, 1.976; Biochemical Research Methods, 9 %, 3.822; Biochemistry & Molecular Biology, 32 %, 4.435; Biology, 10 %, 4.114; Biophysics, 8 %, 3.291; Biotechnology & Applied Microbiology, 15 %, 3.256; Endocrinology & Metabolism, 9 %, 4.304; Evolutionary Biology, 3 %, 4.116; Mathematical & Computational Biology, 3 %, 3.038; Microscopy, 1 %, 2.293; Parasitology, 3 %, 3.056; Physiology, 6 %, 3.223.

3. *Clinical Medicine:* Allergy, 0 %, 3.844; Andrology, 0 %, 2.377; Anesthesiology, 1 %, 2.955; Cardiac & Cardiovascular Systems, 4 %, 4.277; Clinical Neurology, 5 %, 3.238; Critical Care Medicine, 1 %, 3.924; Dentistry, Oral Surgery & Medicine, 2 %, 1.966; Dermatology, 1 %, 2.525; Emergency Medicine, 1 %, 2.123; Endocrinology & Metabolism, 3 %, 4.304; Engineering, Biomedical, 2 %, 2.848; Gastroenterology & Hepatology, 2 %, 3.801; Geriatrics & Gerontology, 1 %, 3.158; Health Care Sciences & Services, 1 %, 2.154; Hematology, 2 %, 5.310; Immunology, 4 %, 4.585; Infectious Diseases, 2 %, 3.879; Integrative & Complementary Medicine, 0 %, 2.402; Materials Science, Biomaterials, 1 %, 3.729; Medical Informatics, 0 %, 1.893; Medical Laboratory Technology, 1 %, 2.208; Medicine, General & Internal, 4 %, 4.754; Medicine, Legal, 0 %, 1.787; Medicine, Research & Experimental, 3 %, 3.753; Neuroimaging, 0 %, 4.098; Nutrition & Dietetics, 2 %, 3.098; Obstetrics & Gynecology, 2 %, 2.397; Oncology, 6 %, 4.941; Ophthalmology, 2 %, 2.379; Orthopedics, 2 %, 2.048; Otorhinolaryngology, 1 %, 1.501; Pathology, 2 %, 2.763; Pediatrics, 3 %, 2.005; Peripheral Vascular Disease, 2 %, 4.612; Pharmacology & Pharmacy, 7 %, 3.134; Physiology, 2 %, 3.223; Primary Health Care, 0 %, N.A.; Public, Environmental & Occupational Health (Science), 3 %, 2.666; Public, Environmental & Occupational Health (Social Science), 2 %, 2.177; Radiology, Nuclear Medicine & Medical Imaging, 4 %, 2.972; Rehabilitation, 1 %, 2.103; Rehabilitation, 1 %, 1.632; Reproductive Biology, 1 %, 2.904; Respiratory System, 2 %, 3.475; Rheumatology, 1 %, 4.133; Sport Sciences, 2 %, 2.300; Surgery, 7 %, 2.272; Transplantation, 1 %, 2.876; Tropical Medicine, 1 %, 2.400; Urology & Nephrology, 2 %, 3.078.

4. *Computer Science:* Computer Science, Artificial Intelligence, 16 %, 1.940; Computer Science, Cybernetics, 2 %, 1.395; Computer Science, Hardware & Architecture, 7 %, 1.203; Computer Science, Information Systems, 15 %, 1.583; Computer Science, Interdisciplinary Applications, 18 %, 1.652; Computer Science, Software Engineering, 12 %, 1.240; Computer Science, Theory & Methods, 10 %, 1.404; Imaging Science & Photographic Technology, 3 %, 2.186; Telecommunications, 17 %, 1.331.

5. *Chemistry:* Biochemical Research Methods, 6 %, 3.822; Crystallography, 4 %, 1.681; Chemistry, Analytical, 7 %, 2.906; Chemistry, Applied, 5 %, 2.207; Chemistry, Inorganic & Nuclear, 5 %, 2.404; Chemistry, Medicinal, 5 %, 2.795; Chemistry, Multidisciplinary, 16 %, 4.586; Chemistry, Organic, 8 %, 2.853; Chemistry, Physical, 17 %, 3.615; Electrochemistry, 4 %, 3.615; Engineering, Chemical, 9 %, 1.940; Materials Science, Textiles, 1 %, 1.208; Physics, Atomic, Molecular & Chemical, 6 %, 2.344; Polymer Science, 6 %, 2.508; Spectroscopy, 2 %, 2.065.

6. *Economics & Business:* Agricultural Economics & Policy, 1 %, 1.088; Business, 14 %, 1.845; Business, Finance, 10 %, 1.602; Economics, 46 %, 1.459; History of Social Sciences, 2 %, 0.623; Industrial Relations & Labor, 2 %, 1.208; Management, 18 %, 2.249; Social Sciences, Mathematical Methods, 6 %, 1.392.

7. *Engineering:* Automation & Control Systems, 2 %, 1.532; Computer Science, Artificial Intelligence, 2 %, 1.940; Computer Science, Cybernetics, 0 %, 1.395; Computer Science, Hardware & Architecture, 1 %, 1.203; Computer Science, Interdisciplinary Applications, 3 %, 1.652; Construction & Building Technology, 1 %, 1.121; Energy & Fuels, 4 %, 2.912; Engineering, Aerospace, 1 %, 0.628; Engineering, Biomedical, 3 %, 2.848; Engineering, Civil, 3 %, 1.593; Engineering, Chemical, 6 %, 1.940; Engineering, Electrical & Electronic, 11 %, 1.541; Engineering, Environmental, 3 %, 3.258; Engineering, Geological, 1 %, 1.132; Engineering, Industrial, 1 %, 1.450; Engineering, Manufacturing, 1 %, 1.307; Engineering, Marine, 0 %, 0.207; Engineering, Mechanical, 3 %, 1.127; Engineering, Multidisciplinary, 2 %, 0.928; Engineering,

Ocean, 0 %, 0.998; Engineering, Petroleum, 0 %, 0.565; Ergonomics, 0 %, 1.436; Instruments & Instrumentation, 3 %, 1.675; Materials Science, Characterization & Testing, 1 %, 0.939; Mathematics, Applied, 6 %, 1.247; Mathematics, Interdisciplinary Applications, 2 %, 1.515; Mechanics, 4 %, 1.574; Nanoscience & Nanotechnology, 6 %, 4.365; Nuclear Science & Technology, 2 %, 1.025; Operations Research & Management Science, 2 %, 1.557; Physics, Applied, 12 %, 2.724; Physics, Fluids & Plasmas, 2 %, 2.151; Remote Sensing, 1 %, 1.948; Robotics, 0 %, 1.795; Spectroscopy, 2 %, 2.065; Telecommunications, 3 %, 1.331; Thermodynamics, 2 %, 1.608; Transportation Science & Technology, 1 %, 0.957; Water Resources, 3 %, 1.764.

8. *Environment/Ecology:* Biodiversity Conservation, 4 %, 2.688; Ecology, 20 %, 3.094; Engineering, Environmental, 13 %, 3.258; Environmental Sciences, 37 %, 2.507; Environmental Studies, 6 %, 2.027; Geography, Physical, 5 %, 2.323; Limnology, 3 %, 2.028; Water Resources, 13 %, 1.764.

9. *Geosciences:* Energy & Fuels, 20 %, 2.912; Engineering, Geological, 3 %, 1.132; Engineering, Petroleum, 2 %, 0.565; Geochemistry & Geophysics, 11 %, 2.358; Geography, Physical, 5 %, 2.323; Geology, 3 %, 1.868; Geosciences, Multidisciplinary, 25 %, 2.230; Meteorology & Atmospheric Sciences, 12 %, 2.475; Mineralogy, 3 %, 1.790; Mining & Mineral Processing, 3 %, 1.033; Oceanography, 7 %, 1.943; Paleontology, 3 %, 1.873; Remote Sensing, 3 %, 1.948.

10. *Immunology:* Immunology, 68 %, 4.585; Infectious Diseases, 32 %, 3.879.

11. *Materials Science:* Construction & Building Technology, 3 %, 1.121; Materials Science, Biomaterials, 4 %, 3.729; Materials Science, Ceramics, 3 %, 1.264; Materials Science, Coatings & Films, 5 %, 1.943; Materials Science, Composites, 2 %, 1.553; Materials Science, Characterization & Testing, 2 %, 0.939; Materials Science, Multidisciplinary, 48 %, 2.949; Materials Science, Paper & Wood, 1 %, 0.912; Materials Science, Textiles, 1 %, 1.208; Metallurgy & Metallurgical Engineering, 12 %, 1.346; Nanoscience & Nanotechnology, 18 %, 4.365.

12. *Mathematics:* Mathematical & Computational Biology, 7 %, 3.038; Mathematics, 29 %, 0.829; Mathematics, Applied, 30 %, 1.247; Mathematics, Interdisciplinary Applications, 10 %, 1.515; Physics, Mathematical; 14 %, 1.726; Statistics & Probability, 10 %, 1.241.

13. *Microbiology:* Microbiology, 56 %, 3.801; Microscopy, 3 %, 2.293; Mycology, 5 %, 2.059; Parasitology, 14 %, 3.056; Virology, 21 %, 4.122.

14. *Molecular Biology & Genetics:* Biochemistry & Molecular Biology, 53 %, 4.435; Cell & Tissue Engineering, 1 %, N.A.; Cell Biology, 24 %, 6.453; Developmental Biology, 4 %, 4.583; Genetics & Heredity, 18 %, 4.861.

15. *Multidisciplinary:* Multidisciplinary Sciences, 100 %, 9.707.

16. *Neuroscience & Behavior:* Behavioral Sciences, 8 %, 3.048; Clinical Neurology, 36 %, 3.238; Neuroimaging, 3 %, 4.098; Neurosciences, 50 %, 4.082; Psychology, Biological, 2 %, 2.682.

17. *Pharmacology & Toxicology:* Chemistry, Medicinal, 23 %, 2.795; Pharmacology & Pharmacy, 59 %, 3.134; Toxicology, 18 %, 2.765.

18. *Physics:* Acoustics, 2 %, 1.553; Imaging Science & Photographic Technology, 1 %, 2.186; Optics, 13 %, 2.204; Physics, Applied, 25 %, 2.724; Physics, Atomic, Molecular & Chemical, 9 %, 2.344; Physics, Condensed Matter, 16 %, 3.095; Physics, Fluids & Plasmas, 5 %, 2.151; Physics, Mathematical, 6 %, 1.726; Physics, Multidisciplinary, 13 %, 3.046; Physics, Nuclear, 3 %, 1.796; Physics, Particles & Fields, 6 %, 3.503.

19. *Plant & Animal Science:* Agriculture, Dairy & Animal Science, 7 %, 1.428; Entomology, 6 %, 1.409; Evolutionary Biology, 6 %, 4.116; Fisheries, 5 %, 1.579; Forestry, 4 %, 1.607; Horticulture, 3 %, 1.429; Limnology, 2 %, 2.028; Marine & Freshwater Biology, 10 %, 1.870; Mycology, 2 %, 2.059; Oceanography, 5 %, 1.943; Ornithology, 1 %, 1.182; Plant Sciences, 19 %, 2.692; Reproductive Biology, 5 %, 2.904; Veterinary Sciences, 15 %, 1.213; Zoology, 11 %, 1.613.

20. *Psychiatry/Psychology:* Behavioral Sciences, 8 %, 3.048; Criminology & Penology, 2 %, 1.260; Ergonomics, 2 %, 1.436; Family Studies, 3 %, 1.449; Psychiatry, 19 %, 3.507; Psychiatry, 12 %, 3.215; Psychology, 8 %, 2.741; Psychology, Applied, 4 %, 1.812; Psychology, Biological, 2 %, 2.682; Psychology, Clinical, 9 %, 2.459; Psychology, Developmental, 6 %, 2.572; Psychology, Educational, 3 %, 1.637; Psychology, Experimental, 9 %, 2.590; Psychology, Mathematical, 1 %, 1.840; Psychology, Multidisciplinary, 9 %, 2.098; Psychology, Psychoanalysis, 1 %, 1.147; Psychology, Social, 5 %, 1.835.

21. *Social Sciences, general:* Anthropology, 2 %, 1.381; Area Studies, 1 %, 0.640; Communication, 1 %, 1.271; Criminology & Penology, 1 %, 1.260; Cultural Studies, 0 %, N.A.; Demography, 1 %, 1.258; Education & Educational Research, 5 %, 1.242; Education, Scientific Disciplines, 2 %, 1.529; Education, Special, 1 %, 1.574; Environmental Studies, 3 %, 2.027; Ethics, 1 %, 1.232; Ethnic Studies, 0 %, 1.203; Family Studies, 1 %, 1.449; Geography, 2 %, 1.644; Geriatrics & Gerontology, 3 %, 3.158; Gerontology, 1 %, 2.335; Health Care Sciences & Services, 4 %, 2.154; Health Policy & Services, 3 %, 2.271; History, 1 %, 0.479; History & Philosophy of Science (Science), 1 %, 0.754; History & Philosophy of Science (Social Science), 1 %, 0.922; History of Social Sciences, 1 %, 0.623; Hospitality, Leisure, Sport & Tourism, 1 %, 2.212; Industrial Relations & Labor, 0 %, 1.208; Information Science & Library Science, 2 %, 1.430; International Relations, 2 %, 1.078; Law, 3 %, 1.495; Linguistics, 2 %, 1.471; Medical Ethics, 0 %, 1.581; Medicine, Legal, 1 %, 1.787; Nursing (Science), 4 %, 1.369; Nursing (Social Science), 4 %, 1.367; Planning & Development, 2 %, 1.233; Political Science, 4 %, 1.011; Psychology, Educational, 1 %, 1.637; Public Administration, 1 %, 1.199; Public, Environmental & Occupational Health (Science), 10 %, 2.666; Public, Environmental & Occupational Health (Social Science), 6 %, 2.177; Rehabilitation (Science), 2 %, 2.103; Rehabilitation, 2 %, 1.632; Social Issues (Science), 3 %, 1.721; Social Issues (Social Science), 1 %, 1.043; Social Sciences, Biomedical, 2 %, 2.002; Social Sciences, Interdisciplinary, 3 %, 1.227; Social Work, 1 %, 1.201; Sociology, 3 %, 1.111; Substance Abuse (Science), 1 %, 2.959; Substance Abuse (Social Science), 1 %, 2.261; Transportation, 1 %, 1.874; Urban Studies, 1 %, 1.211; Women's Studies, 1 %, 1.048.

22. *Space Science:* Astronomy & Astrophysics, 100 %, 4.609.

Digital Information Resources in European Documentation Centers: A case study from Spain

Yolanda Martín-González *

Abstract

The purpose of this paper is to provide a guide map for persons interested of information sources offered by the European Documentation Centers and specialized electronic resources in the European Union. The study examined thirty-seven centers in Spanish institutions of higher learning. The web pages of these institutions were thoroughly inventoried and categorized, allowing the researcher to conclude that European documentation centers, by virtue of the diversity of information sources they gather in one place, constitute an important tool for users wishing to search and retrieve information on the European Union. The research also revealed a bias in information centers for institutional sources and a conspicuous scarcity of information resources produced in the centers themselves.

*   Universidad de Salamanca, España. ymargon@usal.es

Keywords: European Documentation Centres; European Union; Information sources; Electronic resources.

Resumen

Recursos de información electrónicos en los Centros de Documentación Europea: el caso de España
Yolanda Martín González

El propósito de este trabajo es esbozar el mapa de recursos electrónicos que ofrecen los Centros de Documentación Europea con el fin de proporcionar una guía de fuentes de información especializadas en la Unión Europea, que sirva de herramienta a aquellas personas interesadas en esta temática.
Para la realización del estudio se eligieron como muestra los 37 centros establecidos en instituciones españolas de enseñanza superior. A través del análisis de sus portales web, se perfiló el amplio conjunto de recursos informativos que aquellos ofrecen y se procedió posteriormente a organizarlos.
Tras la elaboración del trabajo y, a tenor de los resultados alcanzados, podemos concluir que los centros de documentación europea conforman una importante herramienta en la búsqueda y recuperación de información de la Unión Europea dado el amplio y variado número de recursos que permiten consultar. Sin embargo, se constata una fuerte tendencia a ofrecer fuentes oficiales de origen institucional y una notable escasez de recursos informativos elaborados por el propio centro.

Palabras clave: Centros de Documentación Europea; Unión Europea; Fuentes de información; Recursos electrónicos.

Introduction

In any democratic institution or agency, access to information constitutes one of the pillars for the proper exercise of its functions. In the case of the European Union, this exigency is framed in its information and communication policy formally developed in the 1990s. With the ratification of the

European Union Treaty in 1992 and the treaty of Amsterdam in 1997, the principles of informational transparency and the right to access institutional documentation became the twin pillars of the European Union's actions (Olarán and Pérez-Trompeta, 2000; Sánchez Domínguez, 2001).

Nonetheless, concern regarding the creation of mechanisms to promote awareness of the policies and activities carried out by community agencies goes back as far as the 1960s, when the European Commission founded the European Documentation Centers for the purpose of multiplying information. These centers would eventually join others, and together comprise the European information system through which the EU attempted to solve the problem of information deficit, which for many observers lies at the root of the democratic deficit threating the Union itself (Marcella *et al.*, 1997).

Its diverse typology shall be directly associated with the public or with those sectors of society to which they are targeted (Moreira, 2002): The European Documentation Centres shall be in charge of meeting the information needs of universities; the Euro Info Centres shall do the same for the business sector; the Carrefours shall operate in the rural milieu and the Info Points shall be strategically located in urban areas.

The restructuring of the Euro-communitarian information system was launched in 2004; and the model for second generation information link up was defined (Llorente Pinto, 2007). The *Europe Direct* service, bringing together all of the contemporary information centers exclusively under the Directorate General of Communication of the European Commission, was also implemented.

As already mentioned, the European Documentation Centers (EDC) are one of the first information networks instituted by the European Commission. These centers have a dual thrust, acting as specialized information units and promoters of research and academic study in the European Community. Moreover, the EDC are installed in the libraries holding official EU documents and publications.

Because the EDC are located on university campuses, their main users are teachers, researchers, students and administrative or services personnel; although these centers are also open to the general public. Terra (2010) has written an interesting paper describing the profile and information needs of each of these groups with regard to their use of European documentation.

Among their diverse functions, the documentation centers are charged with facilitating user access to community information sources and directing citizens to those sources best suited to meeting their information requirements. Moreover, these centers carry out significant educational activities through courses, didactic and topical sessions, and other activities.

Currently there are 697 EDC worldwide, of which 403 are located on university campuses and research centers of EU member countries. Thirty-seven of these are located in Spain.

The deployment of the EDC in our country begin largely in the 1980s, after Spain joined the European Economic Community. The Universities of Deusto and Valladolid are among the first to be appointed European Documentation Centers, in 1980 and 1982, respectively.

The EU systematically sends the EDC without cost official EU institutional documentation and publications issued by the Office of Official Publications of the European Communities. With the launch of the official EU website *Europa* in 1995 entailing the availability of digitized documents, the role of the EDC has had to be reconsidered.

Moreover, the European Commission does not issue these centers any kind of common directives for the creation of web portals. As such, each information unit is responsible for determining the resources and electronic services it will provide to users. In this sense, as Terra (2009) observes, the specification of each country are reflected in the organization of the information provided through digital means in each center. Moreover, this often influences the type or resources and/or information offered by these centers, or the university faculty or department in charge of its management.

Even though EDC are visible in countries around the world, surprisingly very few studies have examined them. The scientific literature available focuses largely on document production of the European Union as a whole: such is the case of the monograph by I. Thomson (1989), which offers the first scientific approach to the topic, or that written by the Spaniard Maciá (1996), which constitutes the most comprehensive study to date of our country with regard to the Euro-community documentation repertoire. Other papers published focus on concrete aspects of European documentation and information, notably a paper published by Grau Gaudix (1998a), who provides a detailed analysis of the documents produced by the EU and a proposal for classifying the same. In a similar vein, Abiega (2000) contributes useful information for identifying the diverse documents produced by European institutions and the data appearing therein. In a manual illustrated with practical applications, Martín González (2007) describes the distinct tools that facilitate electronic retrieval of European documentation and information.

Other studies center on document groups or information tools such as official European publications (Masa and Salas, 1996), communitarian data bases (Fuentes García, 1993, 1994; Moreira, 2002), document production of a given community agency, such as that published by Martín González (2002)

on the European Parliament; and online access to documents (Aleixandre Baeza, 1996; Grau Gaudix, 1998b; Viesca, 1998; Martín González, 2005).

Taken as a whole these published scientific studies on the EDC do not address information resources. In this context, McCarthy (1996) published a brief paper on the role they play and the duties assigned them. In the same year, Thomson (1996) argues in favor of these centers on university campuses. In 1997, Algarbani published a paper on European information and documentation networks in Andalucia, describing the diverse nature of these information units which include EDC. Also in that year, Marcella, Baxter, Parker and Davies explored how users employ EDC in France and the United Kingdom. Finally, Olarán and Pérez-Trompeta (2000) published a paper on the resources offered in these centers and the access to this information through electronic means.

The choice of research focus is justified by the scarcity of scientific studies exploring specialized information resources offered by EDC, especially with regard to their typology and organization.

Thus, the main purpose of this study is to create a map of information resources, understood as fundamental resources of any agency or business (Moscoso, 1998), provided by the European Union through the web pages of the EDC.

More specifically, this paper also aims to:

- Offer a repertoire of digital information resources that helps solve the problem associated with locating EU documentation resources for interested parties and/or researchers or Spanish-speaking users.
- Provide order for the diverse specialized resources gathered and a classification model for the same.
- Inform those interested parties interested in European matter and/or those belonging to the Spanish-speaking community about online information resources produced by the EDC in Spain.

Methodology

Bibliographic review

The information search process was executed using diverse information sources.

Initially, researchers resorted to sources belonging to documentation sci-

ence itself in order to locate scientific studies on information and documentation repertoire in the European Union. Because of the transnational nature of the object of this research, researcher consulted largely monographs and widely recognized scientific journals enjoying international distribution. Researchers also explored data bases and collections in the fields of Library and Documentation Science. In light of the dearth of work studies on this topic, researchers proceeded to seek out EU institutional information sources in order to provide a more comprehensive perspective. As such, we consulted the official portal of the EU known as *Europa*; the Europe Direct network website, the official webpage of the Representation Office of the European Commission in Spain and the ECLAS catalogue.

The following search terms were used in all of the above cases: "European Documentation Center"; "European Union"; "information recourses", "recourses maps"; "electronic recourses" and "European information." The terms were combined in equations using Boolean and proximity operators.

Though we originally planned to limit the scientific literature review to more recent publications, the lack of studies and published materials on this topic obliged us to broaden the timeline under review.

Sample selection

A sampling methodology was chosen for this study. The total number of EDC in Spain constitutes the sample for this study.

Locating the EDC was achieved using two information sources in order to ensure the information offered coincided.

The first source used was the official portal of the European Union, *Europa* (http://europa.eu). Through this site we linked to the *Europe Direct* network (http://europa.eu/europedirect), which is comprised in part by the documentation centers. The second source consulted was the website of the Representation Office of the European Commission in Spain (http://ec.europa.eu/spain). In this case, using the *Resources link and European information points for citizens and businesses*, we located the EDC network for Spanish Autonomous Communities in which they exist listed in alphabetical order.

Having consulted both sources, we corroborated the existence of 37 European Documentation Centers in Spain. Thereafter, we proceeded to find out if each center had set up a webpage, and therefore, if one could gain access to information resources in digital format.

The localization of the URL addresses of the EDC was easy, because this information is provided by the European Commission Office in Spain by means of a link cited in previously. Other data are also provided, such as the

mailing address, telephone and fax numbers, the name of the director of the center and the documentation professional in charge, including the latter's email address, and office hours. With regard to the *Europe Direct* website, only the mailing address, telephone number and email address are provided.

The next step entailed ascertaining whether access to digitized information is allowed, which it was in most cases.

The EDC of the University of Las Palmas de Gran Canarias, the University of National Distance Education and the University of Navarra do not have web portals. The server hosting the University of Coruña webpage did not respond to repeated access attempts. In contrast, access to EDC digital information resources of the Complutense University of Madrid is achieved through a single web portal.

These circumstances resulted in the number of EDC under consideration to be abridged to 32.

Table 1. European Documentation Centers in Spain offering online access

University - CDE	Web link
Universidad de Córdoba	http://www.uco.es/webuco/cde/index2.htm
Universidad de Granada	http://cde.ugr.es/
Universidad de Sevilla	http://centro.us.es/cde/
Universidad de Zaragoza	http://www.unizar.es/derecho/cde/cde.html
Universidad de Oviedo	http://www.uniovi.net/cde
Centre Balears Europa (Palma de Mallorca)	http://www.documentaciocbe.eu/
Universidad de La Laguna	http://www.cdeuropea.ull.es/
Universidad de Cantabria (Santander)	http://www.buc.unican.es/CDE/
Universidad Autónoma de Barcelona	http://www.uab.cat/biblioteques/cde/
Escuela Superior de Administración y Dirección de Empresas (ESADE)	http://www.esade.edu/cde/
Universidad de Gerona	http://biblioteca.udg.es/info_general/unitats/cde/
Universidad de Lleida	http://www.sbd.udl.cat/sbd/cde.html
Universitat Rovira i Virgili (Tarragona)	http://www.urv.cat/biblioteca/cde/index.html
Universidad de Castilla La Mancha (Toledo)	http://www.uclm.es/centro/ceuropeos/
Universidad de Salamanca	http://cde.usal.es/
Universidad de Valladolid	http://www.cdoce.uva.es/
CDE Extremadura (Badajoz)	http://www.cdiex.org/
Universidad de Santiago de Compostela	http://www.usc.es/es/servizos/cede/index.html
Universidad Complutense de Madrid	http://www.ucm.es/BUCM/be/

Universidad Politécnica de Madrid	http://www.upm.es/institucional/UPM/Biblioteca/NuestraBiblioteca/BibliotecasCentros/CEYDE
Universidad San Pablo CEU	http://www.uspceu.es/pages/servicios/cde/centro-documentacion-europea-home.html
Universidad Francisco de Vitoria	http://www.ufv.es/investigacion.aspx?sec=291
Universidad de Alcalá de Henares	http://www.uah.es/biblioteca/biblioteca/cde04.html
Universidad Autónoma de Madrid	http://biblioteca.uam.es/cdeuropea/default.html
Universidad Carlos III	http://www.uc3m.es/portal/page/portal/biblioteca/sobre_la_biblioteca/colecciones/nuestras_colecciones/centro_documentacion_europea
Universidad de Murcia	http://www.um.es/biblio/cde/
Universidad del País Vasco (Bilbao)	http://www.ehu.es/p200-content/es/contenidos/informacion/cde_centro_documetacin_europea/es_cde/principal.html
Universidad de Deusto (Bilbao)	http://www.iee.deusto.es/servlet/Satellite/Page/1116406939495/_cast/%231116406939495/UniversidadDeusto/Page/facultadesTPL
Universidad de La Rioja (Logroño)	http://biblioteca.unirioja.es/cde/index.shtml
Universidad de Alicante	http://www.cde.ua.es/
Universidad Jaume I (Castellón)	http://sic.uji.es/cd/cde/
Universidad de Valencia	http://cde.uv.es/

Data collection and analysis

The data examined in this study were gathered by means of consulting each one of the EDC web portals. During this process, we found that some of the URL addresses provided by the Commission Representation Office were not correct. Such was the case for the EDC of the Autonomous University of Madrid, the University of Murcia and the University of Deusto. On other occasions, the Commission did not list the center's website, which we took to mean none existed. In these cases, we decided to carry out our own search, discovering that this assumption was not correct. Such was the case for the University of Cantabria, which in fact does offer online access to its information resources.

Once all of the websites were located and verified, we proceeded to extract a list of information resources provided by the centers in order to discern any repeating patterns or models. Our initial intention was to consider almost exclusively the resources grouped under links titled "Internet Information Sources," or some such similar designation; however, a detailed search of the diverse sections comprising the structure of the websites led us to broaden the scope of the study when we discovered that there were many more information resources lying beyond such designations and which needed to be taken into account.

Finally, we proceeded to design a grouping model allowing us to order information resources on the basis of a systematic structure using large categories.

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Even though diverse criteria were employed to design the model, we finally opted to classify resources on the basis of the type of information provided; since this option is considerably easier than trying to retrieve the information consulted by users. In this way the following categories were established:

- Juridical information recourses
- Institutional information recourses
- Contemporary issues information recourses
- Education information Recourses
- Bibliographic information Recourses
- Financial information recourses
- Statistics information recourses
- Information recourses 2.0

Results and discussion

The number and type of information resources provided by the EDC were quite significant. Some centers have even put together their own resource guides. The Autonomous University of Barcelona has issued a guide of information resources that is quite complete, containing not only official EU information sources, but also other kinds of sources associated with Europe in general. The University of Seville has made a listing European information sources into a sort of guide. Nonetheless, the creation of these tools is not the general habit among EDC.

There are other situations, such as the Autonomous University of Madrid, whose website offers only information on the center itself and does not allow access to other information or online services.

It is important to note that almost 90% of the information resources provided by EDC are supplied by the official site of the European Union *Europa*, which is the main source of information on Europe. In this way, the mediating role of EDC, whose work consists of redirecting the user to the primary source of information, is confirmed. In contrast, the lack of resources allocated to these websites is evident, as many are reduced simply to issuing informative bulletins.

The following lines provide a map (Figure 1) of the information resources of the Spain's EDC grouped by categories established on the basis of the type of information offered. Resources appearing frequently across all of the centers and those which stand out significantly, perhaps holding special interest for the user, are gathered for each case.

Blogs

Redes sociales

Bookmark sociales

R. 2.0

R. jurídicos

R. legislativos

R. jurisprudenciales

Documentos de trabajo

R. institucionales

Registro documentos

R. estadísticos

Eurostat

Otros

Eurobarómetro

e-Recursos informativos ofrecidos por los CDE

R. de actualidad

Prensa

Políticas europeas

R. financieros

Subvenciones y ayudas

Contratación

R. bibliográficos

Monografías

Pub. periódicas

Bases de datos

Otros

R. educativos

Programas y sistemas educativos europeos

Cursos especializados

Material de apoyo didáctico

Spanish	English
Blogs	Blogs
Redes sociales	Social networks
R. estadísticos	Statistical R.
Otros	Others
Euro-barómetro	Euro-barometer
R. financiero	Financial R.
R. bibliográfico	Bibliographic resources
R. educativo	Educational resources
Subvenciones y ayudas	Subsidies and aid
Contratación	Hiring and job openings
R. Jurídicos	Juridical resources
e-Recursos informativos ofrecidos por CDE	e-Resources offered by EDC
Monografías	Monographs
Pub. Periódicas	Periodicals
R. legislativos	Legislative resources
R. jurisprudenciales	Jurisprudence resources
R. institucionales	Institutional resources

R. de actualidad	Current events resources
Prensa	Press
Políticas europeos	European policy
Programas y sistemas educativos europeos	European educational systems and programs
Documentos de trabajo	Work documents
Registro documentos	Record documents
Material de apoyo didáctico	Didactic support materials
Cursos especializados	Specialized course offerings

Juridical information resources

The European Union produces a large quantity of juridical information, on one hand, the fruit of its legislative capacity and, on the other, of its jurisprudential faculties.

The resources regarding legislative matters can be accessed from practically all of EDC:

- *The Official Journal of the European Union* is the official bulletin of the European Union. It is published in both online and in print editions in the official languages of the member states. It is organized in series. The L Series covers the laws passed by institutions with power of decision. These acts include regulations, directives, rulings, recommendations and official reports. The C Series brings together the diverse communication and information issued by European institutions and agencies. The S Series contains notification of pubic tenders which are also available in the TED data base.
- *EUR-Lex:* This is the main legal web portal of the European Union, which collects the bills at different stages of the legislative and budget process, as well as legal documentation issuing from diverse institutions. That is to say, the legislative proposals of the Commissions (COM and SEC documents), consulting committee reports, joint council positions, regulations, ruling, parliamentary initiatives, etc. Likewise, the site allows users to consult the diverse document collections of treaties, international accords, current and consolidated legislations, jurisprudence and parliamentary questions, etc.
- *PreLex:* This data base brings together the documentation issued as a result of inter-institutional procedures. Updated on a daily basis, this tool provides all of the official texts generated during the legislative processes, such as proposals, recommendations and correspondence;

and issued by the Commissions to institutions holding power of decision (Council and Parliament), and advisory agencies.

- *Repertory of current community legislation:* This index of community legislation sources and references contains community acts, largely current derived law. This repertory exists for the purpose of keeping a record of modifications made to legislative acts, while providing references to source drafts and associated modifications when these exists.
- *Synopses of EU legislation:* This data base exists for the purpose providing synopses of community legislation across all areas of community matters. It is managed by the European Commission and is targeted at specialists or person interested in the operation and policies of the European Union. This link is not habitually available on EDC sites surveyed, though a link does exist on the webpage of the EDC of the University of Lleida.
- *Legislative Observatory of the European Parliament:* This resource is provided only in English and French and provides all of the information concerning legislative and budgetary procedures, and non-legislative matters, including internal resolutions, initiatives and organizational procedures of the European Parliament.

With the regard to the jurisprudence issued by European Community Tribunals, the most frequently linked resources in Spanish EDC web portals are the following: :

- *CURIA:* This site is the main resource for consulting European Community jurisprudence, allowing online access to the universe of sentences, legal acts, conclusions, reports and communiqués issued by the European Court of Justice, the General Tribunal and the Public Function Tribunals.
- *European e-Justice Portal* is a full-service window to European jurisprudence that is offered by very few EDC, one of which is the Rioja site that provides a links to it as part of its jurisprudence resources.

Some centers have prepared their own community law resource guides, such as the Universitat Rovira i Virgili. There are others; however, such as the University of Cordoba--more oriented to the field of economy-- which oddly do not offer any kind of legal resources to users. Others still go a step further, such as the University of Alicante, offering information organized by topic with regard to European Community legislation enforcement and transposition to Spanish law.

Institutional information resources

Documents drafted by EU institutions and agencies constitute a resource frequently listed on EDC portals because of the interest of researchers in European topics. Included among these documents are those produced by institutions in compliance with their respective mandates under diverse community treaties. Some centers have even prepared organized lists of institutional documents for the purpose of facilitating user access; such is the case of the EDC of the University of Laguna. Other institutional resources commonly included are:

- *EU General Activities Report:* This report is issued every February by the European Parliament to inform both parliament and general public about the past actions and future plans of community institutions and agencies, especially with regard to community policies.
- *The EU Bulletin:* Once published on a monthly basis, this bulletin provides a summary of activities carried out by the former European Community. The last issue was released in August 2009, and some centers allow users to access past numbers. After this date, the EU Newsroom service essentially replaced it.
- *Green Books:* These books published by the Commission are documents providing reflections on the political issues to be subjected to public hearings across Europe.
- *White Books:* These documents contain community action proposal in specific areas.

Established in 2001 within the framework of EU public access legislation, the document registries are an indispensable resource for access to institutional documentation. These registries provide reference information on documents produced by each institution so that they can be easily located by citizens.

Contemporary issues information recourses

In this category we have included two groups of distinct resources: in the first place, the resources drafted by communications media and, in the second place, the information associated with the distinct policies and activities executed by the EU. Both of these instances deal with news and current events in the EU.

With regard to the first group, news reports, press releases and the European agenda are the central pillars of EU current information content, and

these documents are provided in updated, comprehensive form by the EDC of the University of Valladolid through its webpage.

The resources most commonly provided in EDC webpages are as follow:

- *RAPID:* Belonging to the Spokesman Service, it is one of the Community's historical data bases, providing media outlets access to press releases regarding diverse EU policies and activities issued from Brussels.
- *Newsroom:* This unit constitutes the official press office of the EU, offering duly accredited media outlets current information and general materials to facilitate their journalistic tasks. Certain EDC, such as the one based in the University of Lleida, also allow access to press conference rooms of the European Commission and the European Parliament.
- *Euronews:* This is a press information service providing European news.
- *Aquí Europa:* This online daily originally issued from Spain and is now published in Brussels. It offers news on the European scene.

The University of Salamanca offers a wide, up-to-date list of information resources to mass media outlets, allowing journalists to consult *Euronews*, *Aquí Europa* and *Euroalert*, among others. The data base put together by the Complutense University of Madrid includes news and editorials published in leading Spanish newspapers from 1998 and in international dailies since 2003.

In addition to journalistic resources, EDC provide access to dossiers containing "current events." These dossiers include information on the current EU presidency, the Lisbon Treaty and the celebration of the European Year.

The other group comprising this category is called "Topics" by most EDC, and we have included it in order to fully describe the EU's diverse activities and policies. The broad repertory of online resources offered by EDC is organized into twenty categories as per the classification of the Directorate General of Communication of the European Commission. To see an example, consult the EDC of the Universities of Lleida or Salamanca.

Educational information resources

Among the educational resources available through EDC, we find three distinct groups.

The first group provides access to information resources on European education systems and programs, facilitating access to the following services:

- *PLOTEUS*, the EU official website in education and study opportunities in Europe.

- Information on European exchange programs: Erasmus, Tempus and Jean Monnet Action.
- Internships in community agencies and institutions: The EDC of the University of Deusto provides access to diverse institutional webpages containing information on paid and unpaid internships.

The second group offers an array of courses, master's degree studies and other formative activities organized by the center itself or by another party. The EDC of the University of Cantabria is noteworthy for offering a comprehensive catalogue of the formative courses it offers on a wide variety of EU topics.

The third group consists of centers that provide teaching and research resources. Almost all of those comprising this small group allow access to the *Teachers' Corner* website set up by the European Union. Others, such as the University of Laguna, facilitate information on the European Space of Higher Education. This access is also provided by the Universities of Cantabria and Valladolid. Still others provide access to the European Space of Research. The Complutense University of Madrid facilitates access to the digital collection of the central library of the European Commission and information on standards committees and agencies, patent offices and European calls for research projects.

The EDC of Tarragona stands out as a provider or didactic resources and a teacher support center, offering access to courses on European integration available at the university. For each course offered, the center provides a learning guide, basic bibliography and a list of EDC resources for professors and students enrolled.

Also outstanding is the virtual classroom offered by the University of Granada providing online support to students enrolled in its standard lecture courses.

Finally, the EDC of Seville, Cordoba and Granada have implemented a tool known as *Euroexperts*, which serves as a clearinghouse for locating expert teachers and researchers in European affairs working in Andalusian universities.

Bibliographic information resources

Within the large number of bibliographic and documentary resources supplied by EDC we must differentiate between the following types: monographs, periodicals, data bases and other resources.

Practically all of the European Documentation Centers consulted allow users to access monographs published by the European Union Office of Offi-

cial Publications (EUR-OP) and those supplied by the website *EUBookshop*. The centers also facilitate consultation of monographs published outside of the European institutional milieu. The EDC of the Autonomous University of Barcelona, for example, makes donated materials and other acquisitions from independent publishers, such as Cambridge University Press, Springer and Oxford University Press, available to users.

Our research distinguishes two subgroups of periodicals: specialized scientific journals and informative bulletins.

The access service provided Universitat Rovira i Virgili to abstracts prepared by New York University of papers published on European Community Law and Economy journals is especially worthy of note. The University of Castilla y la Mancha and the Polytechnic University of Madrid also facilitate consultation of specialized online journals addressing European affairs, though the listing provided by the former is not particularly comprehensive.

Moreover, the centers issue electronic bulletins vary significantly. There are news bulletins, such as that issued by the University of Seville, and informative bulletins, of which the bulletin issued by the EDC University of Valencia on European affairs is particularly outstanding and to which any user may subscribe in order to be kept up to date with regard to news and topics of events on weekly basis. The EDC of the University of Alicante publishes a bulletin for younger users, consisting of capsules on European affairs. The EDC of the University of Oviedo issues a repertory of abstracts of the journals it receives in the EDC center.

Finally, the EDC of the Universitat Rovira i Virgili makes a notable catalogue of books and duplicate journals available for users to consult.

Data bases constitute a common information resource on the EDC resource map. Generally, they facilitate consultation of data bases made available by the European Union and are organized either alphabetically or by topic. The EDC of the University of Lleida only allows direct access to the IATE terminology data base, while the EDC of the University of Valladolid has its own data bases, one providing titles and journals abstracts, and the other monographs (recent acquisitions); all of which are specialized in EU affairs.

Other resources to which the EDC frequently allows access:

- *Who´s Who*, the EU directory can be accessed from the EDC of La Rioja.
- *ECLAS*, the bibliographic catalogue of the European Commission can be consulted from the University of La Laguna.
- *EUTube*, the multimedia documentation site on European affairs. The University of Rioja provides specialized audiovisual documen-

tation on European affairs in conjunction with the European Film Archive.

- Documentary depositories with resources specialized in Community topics. The EDC of the University of Alcala offers access to E-Scidr, ESO (European Sources Online) or Archidok. The center of the University of Santiago de Compostela allows users to consult the *European Research Papers Archive* and other non-European repositories, such as AEIplus of the University of Pittsburg.
- Pamphlets, maps, posters and all manner of dissemination information are supplied by EUR-OP through EDC in both online and print versions.

Financial information resources

In this category, we include the set of informative resources on subsidies, support programs and European funding programs. The most frequently occurring are as follows:

- EPSO: European Personnel Selection Office posts information on job openings in Community institutions, agencies and Community organizations.
- EURES: This site lists job opportunities in the EU and is available to both businesses and citizens. The University of Deusto, among other EDC, provides access to this site.
- TED: This is a data base containing public hiring information.

Several centers also offer the following resources:

- SIMAP: This is the European portal on public hiring to which the Complutense University of Madrid allows access.
- CORDIS: The Research and Development Community Information Service
- INFOREGIO: This is the information service on regional investment polices (FEDER Funds, FSE and Cohesion Fund).
- Community funding guide: This catalogue is highly recommended accessing information on community supports, financing instruments and partner search for the purpose of executing research projects. It is offered by the University of Valencia and the University of Cantabria.
- EU help guide: This guide is issued by the Barcelona Deputation for local corporations and is offered by the EDC of the University of Valencia.

The Extremadura Information and Documentation Center offers interesting information on European funding opportunities through a search engine and a messenger service on programs to keep users apprised of European programs with short application deadlines. Curiously, this site also provides updated Euro exchange rate information.

Statistical information resources

Though this information is offered by all most of the EDC reviewed, the statistical resources are in fact somewhat scant and are derived largely from the following two sources:

- *Eurostat:* This agency is charged with developing official statistics, both general and specialized. The EDC of the University of Extremadura shows the diverse collections of statistics issued by Eurostat, which are displayed in series grouped around diverse topic areas.
- *Eurobarometer:* This publication brings together the diverse opinion surveys on European affairs.
- *Key European statistics:* This site consists of a series of EU statistics.

Several centers add statistical information prepared by the European Central Bank, perhaps because they believe it is relevant to the current economic crisis.

Other statistical resources come from the National Institute of Statistics, the Statistical Institute of the Madrid Community (available in the EDC of the Polytechnic University of Madrid), the barometer of the Royal Elcano Institute and the Sociological Research Center (use of the latter two as well as access to glossaries of nomenclature and statistical terms is provide by the University of Carlos III).

The EDC of the University of Valladolid redirects users to the search engine and the statistical data directories prepared by the Universitat Pompeu Fabra.

Information recourses 2.0

The broad listing of resources offered in the European Documentation Centers comprises the so-called "Information 2.0"; which the user can consult in real time and is bolstered by its own contributions. Moreover, these information units employ 2.0 technologies to achieve the greatest possible dissemination of their resources, services and activities. In this area we find:

- Blogs: The Autonomous University of Madrid operates a blog listing calls for papers issued by the documentation center. The information consists of announcements on scholarships, grants, seminars, congresses, etc. Access to blogs on European topics is currently offered by the University of La Laguna, which distinguishes between institutional and specialized blogs, and the University of Valencia.
- Social bookmarks: The Autonomous University of Barcelona employs the *Delicious* tool to group favorite websites with resources on European topics.
- Social networks are already available in the EDC of Extremadura, which maintains a Facebook page. The Francisco Vitoria University and the University of Valencia maintain twitter accounts.
- EDC of the University Extremadura, the University of Santiago de Compostela and the University of Valencia allow syndication of contents (RSS), and the latter also offers access to its information by means of tags.

Conclusions

In recent years the EU has shown consistent concern for providing information access. This task is facilitated by diverse information units, not the least of which it the European Documentation Centers that operate on university campuses acting as intermediaries between specialized information sources and citizens.

In order to improve their information access mission, the EDC have created their own websites where they offer access to sources and document services. Almost all of these user-friendly, well-structured websites allow users to consult a broad range of resources. Nonetheless, there are differences between the websites maintained by the diverse centers. At first glance, for example, the EDC of Gerona is obviously outdated, while the EDC of Zaragoza is deficient. In contrast, the EDC of Salamanca is quite rich, while that maintained by the EDC of Zaragoza uses information 2.0 technologies.

Moreover, since no European Commission policy requires centers to offer certain sources of information on their respective webpages, each center selects the information resources it wishes to offer. Nonetheless, this selection tends to favor the scientific areas of the director of the university, the EDC or the faculty.

With regard to the origin of the resources, most are prepared by the European Union itself. As such, the EDC act merely as mediators between the original source and the user. This circumstance, apparent in all the EDC worldwide, is most evident in the field of law, institutional documentation, and statistical and funding information, for which EDC link to official websites of the European institutions and agencies. The rest of the information is comprised of those resources prepared by the center itself or information from other, non-community sources, something observed frequently in bibliographical and educational resources, and those we have denominated 2.0.The second group features informative bulletins and news in formats similar to blogs specialized in European affairs.

In terms of size, the juridical information group is the largest, followed by institutional information resources. This circumstance is to be expected in light of the large legislative and jurisprudential reach of granted under European Union Treaties and their influence in the legal frameworks of the member states. In other matters, the set of work documents produced by European institutions and access to the same by means of document registries are often demanded by EDC users. Statistical information produced by the European Statistics Office (Eurostat), opinion surveys issued by *Eurobarometer* and information on the community funding and other current information (early on, the European Union has been concerned with informing the media about its policies and activities)are also in high demand. The presence of bibliographic and document resources is best understood in the context of the universities with EDC offices, and can be justified in their condition as drivers of academic studies on Europe. In contrast and noteworthy, despite their association with universities offering specialized courses and diplomas on the EU, there are scant resources offered to support teaching and research.

Special mention is deserved by the presence of EDC in social media networks, such as Facebook and Twitter. Of the total EDC examined, a very low percentage has a web 2.0 presence. Only the EDC of the Francisco Vitoria University, the University of Valencia and University of Extremadura offer any such visibility, which is surprising since social media has become a key means of dissemination of information, especially among young people who are a majority on college campuses.No doubt, the presence of the these information units on social media shall contribute to raising awareness about EDC and, by direct communication with their cybernauts, learning about the information needs of their users.

We can definitely conclude that given the large number and diverse nature of resources offered, the EDC comprise an important point of access to

EU information. Nonetheless, their role as mere transmitters of information, perhaps, should be recast, especially in light of the strong tendency to offer official sources with scant attention paid to the added value of providing specialized information produced by the EDC themselves.

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Re-broadcasting of bibliographic catalogues in MARC-XML format

Manuel Blázquez-Ochando *

Abstract

By using MARC-XML to modify the RSS code format, the technique habitually used by the media to rebroadcast news, bibliographical catalogues can also be re-disseminated. Among other things, this procedure offers the advantages of greater dissemination of collections, the possibility of sharing catalogues with other libraries, and allowing users to read and download catalogues. Researchers performed an array of trials to measure the building and recovery times for such bibliographical collections, while determining the sort of applications and functions needed to control these files. These experiences allow researchers to conclude that it is possible to generate, transmit and retrieve bibliographical catalogues using content syndication practices and methods.

*   Universidad Complutense de Madrid, España. manuel.blazquez@pdi.ucm.es

Keywords: Content syndication; MARC-XML; Transmission of bibliographic records; Bibliographic syndication channels.

Resumen

Redifusión de catálogos bibliográficos en MARC-XML
Manuel Blázquez Ochando

La técnica de redifusión de noticias habitualmente empleada en los medios de comunicación social puede ser utilizada en el contexto de los catálogos bibliográficos, modificando su formato de codificación RSS por MARC-XML. Las ventajas que se desprenden de este uso son una mayor difusión de los fondos, la posibilidad de compartir los catálogos con terceras bibliotecas y permitirles a los usuarios la descarga y lectura de éstos. Para lograrlo se han llevado a cabo diversas pruebas que miden el tiempo de creación y recuperación de tales colecciones bibliográficas. Por otro lado se determina qué tipo de programas se necesitan para operar con dichos archivos y cuál es su funcionamiento. Como resultado de estas experiencias se concluye que es factible generar, transmitir y recuperar catálogos bibliográficos mediante técnicas inspiradas en la sindicación de contenidos.

Palabras clave: Redifusión de contenidos; MARC-XML; Transmisión de registros bibliográficos; Canales de sindicación bibliográficos.

Introduction

Online bibliographic catalogues are basic tools in any information and documentation unit. The services commonly offered to the user range from the export of titles consulted for bibliographic management uses, their social labeling, referencing in new scientific works, subsequent consultation, and access to and retrieval of full texts. One of the challenges arising from the ongoing evolution of catalogues is to provide greater dissemination of the catalogues so that these are eventually evenly shared in their entirety with users at no cost. This goal can be achieved by converting bibliographic catalogues to MARC-XML format and their treatment using parser and XML-based structural analyzer programs.

The transfer of bibliographic records via http using MARC-XML files can be based on content syndication or association techniques, as suggested by Blázquez Ochando (2010: 228-392). This doctoral dissertation submits that content syndication techniques, first used in re-broadcasting news in social media, could be used to transmit and recover bibliographic catalogues completely or partially, something that is now underway in the Digital Library of Munich only a year after its publication (Münchener Digitalisierungszentrum Digitale Bibliothek, 2011). Another early experience demonstrating the interest of information centers in adopting MARC-XML as a standard is the doctoral dissertation catalogue initiative of the University of Seville, which allows export and free download of its records in this format (Universidad de Sevilla, 2011).

In the field of Documentation, the most commonly used syndication application consists of the creation of general information channels, the implementation of bibliographic alert services (*ANU Library: new titles*, 2011), re-dissemination of journal articles and contents (Rodríguez Gairín *et al*., 2006) or the grouping of consultations in personalized syndication channels (PUBMED, 2011; Dolan, 2011), where the field of bio-sanitary document management is particularly active.

This paper discusses how to create bibliographical catalogues in MARC-XML format for subsequent retrieval by means of parser programs similar to those used by readers of syndication channels. To verify this process, researchers have provided a trial to show the viability of the transmission of the bibliographic catalogues through the internet and subsequent execution of the programs in the *OrangeUP* platform set up for this purpose (Blázquez Ochando, 2011).

GENERATION OF MARC-XML CATALOGUES

Generating catalogues in MARC-XML format (Library of Congress, 2011) requires the availability of bibliographic records in a data base for complete management and treatment. Otherwise, it will be necessary to migrate the information. One method of executing the transfer of the bibliographic catalogue is by exporting it in CSV format, a frequent option used by most bibliographic managers and librarians. For the purposes of this study, we have put together diverse collections ranging from one thousand to one million records from the Library of Congress (Blázquez Ochando, 2010: 299). These collections are shown in *Table 1*.

Table 1. Characteristics of the bibliographic collections tested

Collection	Disc size	Number of records
1000_reg	0.77	1 001
5000_reg	2.68	5 002
10000_reg	5.05	10 004
25000_reg	13.33	25 008
50000_reg	28.34	50 036
100000_reg	54.95	100 054
250000_reg	144.00	250 146
500000_reg	280.49	500 309
1000000_reg	561.39	1 000 039

By taking this step and by means of a PHP-based export program, a MARC-XML catalogue corresponding to the initial bibliographic catalogue can be generated (Blázquez Ochando, 2010: 268-271). To this end, the basic structure of the record is reproduced as are the record node and its dependents as many times as there are tomes and volumes in the collection in question (see *Table 2*).

Table 2. Record model employed

```
<record>

<controlfield tag='001'>Nº Control interno</controlfield>
<controlfield tag='003'>Nº identificación del documento</controlfield>

<datafield tag='017' ind1='' ind2=''>
 <subfield code='a'>Depósito legal o Copyright</subfield>
</datafield>

<datafield tag='020' ind1='' ind2=''>
 <subfield code='a'>ISBN</subfield>
</datafield>

<datafield tag='022' ind1='0' ind2=''>
 <subfield code='a'>ISSN</subfield>
</datafield>

<datafield tag='035' ind1='' ind2=''>
 <subfield code='a'>Número de Control del Sistema</subfield>
</datafield>

<datafield tag='041' ind1='0' ind2=''>
 <subfield code='a'>Código del idioma del documento original</subfield>
</datafield>

<datafield tag='043' ind1='' ind2=''>
 <subfield code='c'>Código geográfico del documento original</subfield>
```

```xml
</datafield>

<datafield tag='082' ind1='' ind2=''>
 <subfield code='a'>Clasificación Decimal Dewey</subfield>
</datafield>

<datafield tag='100' ind1='1' ind2=''>
 <subfield code='a'>Autor personal</subfield>
</datafield>

<datafield tag='245' ind1='1' ind2=''>
 <subfield code='a'>Área de título</subfield>
 <subfield code='b'>Subtítulo</subfield>
 <subfield code='c'>Mención de responsabilidad</subfield>
</datafield>

<datafield tag='250' ind1='' ind2=''>
 <subfield code='a'>Nº de edición</subfield>
 <subfield code='b'>Mención de edición</subfield>
</datafield>

<datafield tag='260' ind1='' ind2=''>
 <subfield code='a'>Lugar de publicación</subfield>
 <subfield code='b'>Editorial</subfield>
 <subfield code='c'>Año de publicación</subfield>
</datafield>

<datafield tag='300' ind1='' ind2=''>
 <subfield code='a'>Área de descripción física</subfield>
</datafield>

<datafield tag='310' ind1='' ind2=''>
 <subfield code='a'>Periodicidad</subfield>
</datafield>

<datafield tag='490' ind1='0' ind2=''>
 <subfield code='a'>Serie o colección</subfield>
 <subfield code='v'>Nº de serie o colección</subfield>
</datafield>

<datafield tag='500' ind1='' ind2=''>
 <subfield code='a'>Área de notas</subfield>
</datafield>

<datafield tag='654' ind1='0' ind2=''>
 <subfield code='a'>Temática del documento</subfield>
</datafield>

</record>
```

The intervening factor in the process described above is the volume of codifications of the bibliographic records and associated descriptive extension. With regard to the catalogue extension, it should be noted that for collection sizes of 5000+ records the file size is more than 2 MB. This fact, which has also been subsequently contrasted and verified by IndexData (Schafroth, 2010), implies that generation of the corresponding catalogue in a single XML file multiples the size; since it includes characters devoted to its label making treatment, visualization and later retrieval difficult, something that was stated previously (Blázquez Ochando, 2010: 257-258).

The solution to this problem is to create an XML file for each one thousand records, which generally do not surpass 1 Mb in size. This makes file management easier. This approach means that large collections shall require many XML files, which encumbers access to the information in the catalogue. This difficulty can be overcome by employing an OPML file to group the files, as specified for this purpose by Winer (2007). In this way it is possible to retrieve complete catalogue in block (Blázquez Ochando, 2010: 278).

CATALOGUE RETRIEVAL IN MARC-XML

The method for MARC-XML format catalogue retrieval entails the use of parser programs capable of analyzing the structure of the XML file and transferring the information for use, whether for display, filtration or retrieval and storage in a data base. This is definitely a process that any aggregator or syndicated reader commonly executes, transposed to the context of bibliographical contents and especially relevant to the field of Documentation.

The example appearing in *Table 3* below is a parser program created in PHP capable of reading and recovering a bibliographic catalogue coded in MARC-XML, such as that shown in *Table 4*. The key to its operation lies in the *simplexml_load_file()* function, available in PHP GROUP (2011a). As specified, this function interprets any XML-based file and converts it into an object that can be accessed in all of its parts by means of DOM (PHP GROUP, 2011b).

Table 3. Field selection model with XPath

```
<?php

$feed = "catalogo.xml";
$xml = simplexml_load_file($feed);

for($i=0; $xml->record[$i]; $i++) {
```

```
    // Campos de control
    $tag001 = $xml->record[$i]->controlfield[0];
    $tag005 = $xml->record[$i]->controlfield[1];

    // Entradas principales
    $tag100a = $xml->record[$i]->datafield[7]->subfield[0];

  // Área de título y mención de responsabilidad
    $tag245a = $xml->record[$i]->datafield[8]->subfield[0];
    $tag245b = $xml->record[$i]->datafield[8]->subfield[1];
    $tag245c = $xml->record[$i]->datafield[8]->subfield[2];

    // Área de publicación
    $tag260a = $xml->record[$i]->datafield[10]->subfield[0];
    $tag260b = $xml->record[$i]->datafield[10]->subfield[1];
    $tag260c = $xml->record[$i]->datafield[10]->subfield[2];

}

?>
```

To verify this end, once the catalogue is loaded in the variable *$xml*, one can simply print to screen, using the *print_r($xml)* function, in order to obtain a result similar to that shown in *Figure 1.*

Table 4. Fragment of recovered data array from MARC-XML bibliographic catalogue

```
SimpleXMLElement Object (
[record] => SimpleXMLElement Object (
[leader] => cabecera[controlfield] => Array (
[0] => número de control
[1] => identificador del número de control
[2] => fecha y hora de la última actualización )
[datafield] => Array (
[0] => SimpleXMLElement Object (
 [@attributes] => Array (
 [tag] => 010
 [ind1] =>
 [ind2] => )
[subfield] => número de control de la biblioteca del congreso )
 [1] => SimpleXMLElement Object (
 [@attributes] => Array ...
```

To retrieve each bibliographic record, one must run all the *<record>* nodes of the MARC-XML catalogue. This task is executed by means of a *for loop* whose execution parameter is exactly the total number of XML file en-

tries to be processed. Within this execution, one can discern how the MARC format encoded labels, stored in variables that have their exact names, are selected. For example, the label *100$a*, which represents the lead author, is stored in variable *$tag100a* and corresponds to the node *<datafield>* placed in position number 7, whose value, in turn, is stored in label *<subfield>*. One can observe that in order to reach the value contained in these labels, the selection route from beginning to end must be indicated, starting with the matrix variable *$xml*, which as has been previously explained contains the entire catalogue content.

TRIALS WITH MARC-XML BIBLIOGRAPHIC CATALOGUES

To confirm the operation of the method of generating and retrieving the MARC-XML format bibliographic catalogues, a sync program was developed (Blázquez Ochando, 2010: 235-310), which allows execution of such operations while providing the execution times and the determining the success or failure of the experiment. The results obtained in *Table 5* demonstrate that the automatic generation of the catalogues takes longer than 15 minutes when the collection in question contains one million records.

Table 5. MARC-XML catalogue creation times

Collection	Time (seconds)
1000_reg	0.24
5000_reg	0.81
10000_reg	1.75
25000_reg	4.82
50000_reg	11.78
100000_reg	26.68
250000_reg	105.28
500000_reg	321.08
1000000_reg	1095.83

Even at that the values obtained with relatively large collections of 50,000 records come in at around 10 seconds. These data stand in contrast to those obtained in the catalogue recovery process. This makes sense because the information transfer operation only requires reading and writing from a known information source, i.e., the data base.

Table 6. MARC-XML Catalogue import times

Collection	Time (seconds)
1000_reg	1.68
5000_reg	8.36
10000_reg	16.85
25000_reg	42.63
50000_reg	92.88
100000_reg	184.64
250000_reg	510.92
500000_reg	1034.99
1000000_reg	2857.61

When the process is reversed, the parser program must read the XML file, generate an object that is accessible in DOM, select the route in which the information is found, display it on screen and, finally, insert it into the data base.

As shown in *Table 6*, this routine considerably increases the execution time and significantly encumbers the work, with times above three minutes, when processing large collections approaching 100,000 records.

EDITION AND PUBLICATION TEST OF MARC-XML AND RSS CATALOGUES

In order to identify the differences between the development of MARC-XML and RSS format bibliographic catalogues, an online edition and publication test was carried out.[1] Its operation responds to a chain of clearly delimited processes (*Figure 1*).

The *OrangeUP* system has been specifically developed to handle syndication channels and to demonstrate that regardless of format used to describe the bibliographic records or the information contents all of the XML-based formats will have the same transmission, sharing, edition, publication and reading properties. *Figure 1* shows the first steps of the creation of bibliographic catalogues in either MARC-XML or RSS by means of the same method of edition and formularies. Keeping its key code, the bibliographic records can be edited as per the MARC21 bibliographic description standards. Each bibliographic record is assigned a bibliographic syndication

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1 See OrangeUP demonstration program available at: http://www.mblazquez.es/testbench/orangeup/
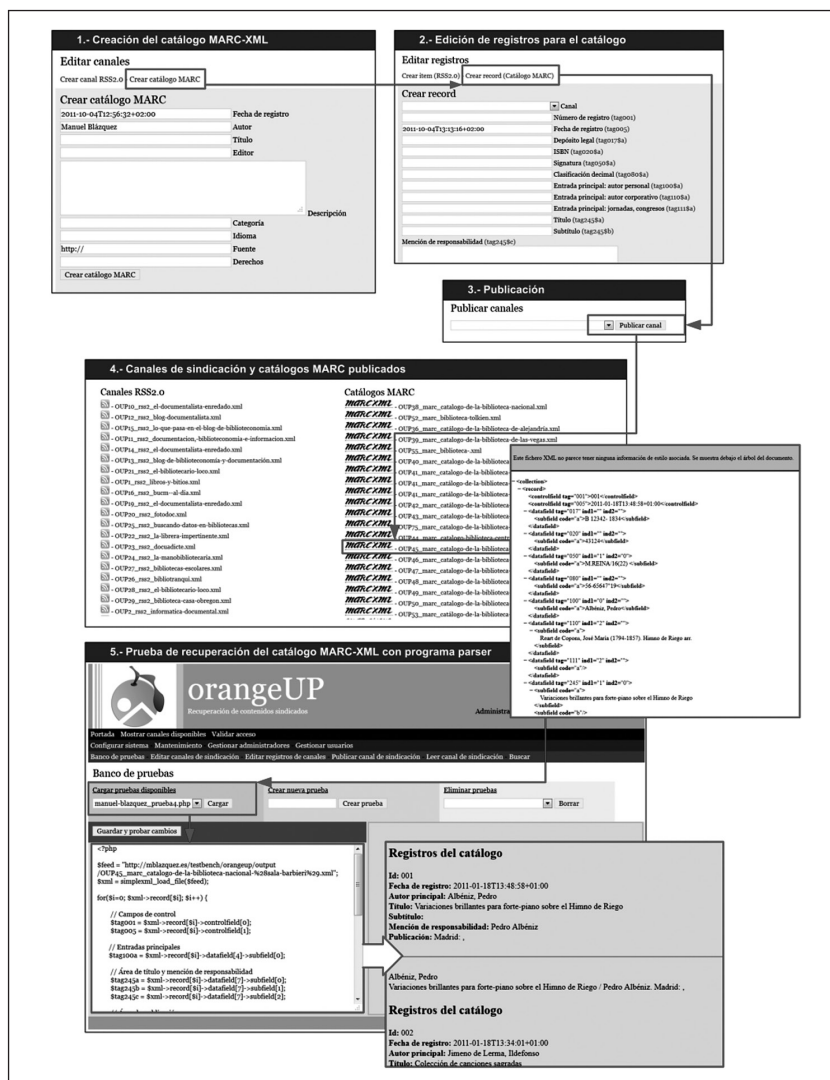
Figure 1. Bibliographic catalogue edition and publication sequence: http://www.mblazquez.es/
documents/orangeup-process.jpg

channel.In all events, the records created are practicable and modifiable, i.e., their meta-information, bibliographic fields, category, classification, title areas and mention of party responsible, etc. can be edited. During this process, the program stores the information in the MySQL data base for subsequent publication and encoding in files whose MARC-XML or RSS formats shall be selected by the user.

Subsequently, the registered user can employ the *test bench* function. This is a code editor for testing parser programs, which allows testing of codes such as the one summarized in *Table 3* and executing them in such a way that the results are displayed on the same screen. The result of this process is the complete display of all of the bibliographical records described in the catalogue in the same way the respective items would be displayed by a syndication channel reader. As such, the parallel between the technique of re-dissemination or syndication of contents and the re-dissemination of bibliographical catalogues is undeniable, though there are differences in encoding and evident bias favoring RSS over MARC-XML. To observe the process of edition and publication of the program, see the original video demonstration using *OrangeUp*, available at: http://youtu.be/kS2WiXuRFpM

Conclusions

Bibliographical catalogues can be retrieved in MARC-XML format using parser programs similar to those used to read syndication channels. This allows bibliographic catalogues to be shared between libraries using the methodology previously cited.

Bibliographic catalogue reading and retrieval times are greater than those needed for their creation, because of two key factors: on one hand, the MARC-XML encoding is considerably longer than that for RSS; and, on the other, because of the length of the catalogue document descriptions.

The use of syndication techniques for bibliographic catalogues, as currently in place the Digital Library of Munich, is becoming more and more common. In other cases, export of bibliographic records in MARC-XML format for sharing and reuse by third parties is already a reality. Such is the case of the doctoral dissertation catalogue of the University of Seville. This seems to indicate the initial phase of the implementation of such systems, and a new wave of interest in experimentation in the library and document management milieu.

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✥

Cooperation in the area of technology among Mexican digital academic libraries

Georgina-Araceli Torres-Vargas *

Abstract

In this paper researchers examine the current status of cooperation between Mexican digital academic libraries in the area of developing technological applications to improve operational performance. The study is based on a previously developed theoretical digital library model, in which the technological variable serves as a starting point to learn how to enhance cooperation between academic digital libraries in Mexico. The results help shed light on the degree and nature of cooperation between academic digital libraries in Mexico.

Keywords: Academic Digital Library; Mexican digital libraries.

* Instituto de Investigaciones Bibliotecológicas y de la Información de la UNAM, México. gatv@unam.mx

Resumen

La cooperación tecnológica entre bibliotecas digitales académicas de México
Georgina Araceli Torres Vargas

Se analiza si existe cooperación entre las bibliotecas digitales académicas mexicanas para desarrollar aplicaciones tecnológicas que ayuden en el mejoramiento de sus actividades. El estudio se basa en un modelo teórico de la biblioteca digital previamente armado, en donde la variable tecnológica sirve como punto de partida para conocer cómo se establece la cooperación entre las bibliotecas digitales académicas de México. Los resultados que se arrojan ayudan a conocer cómo se da la cooperación entre bibliotecas digitales académicas en el contexto mexicano.

Palabras clave: Biblioteca Digital Académica; Bibliotecas digitales mexicanas.

Introduction

This research provides information on cooperation in the area of development of technological applications.

Two methodological aspects, the theoretical and the empirical, are examined in this paper. The theoretical facet is based upon a digital library model (DL) resulting from immediately preceding research, in which the elements comprising the digital library were established. The empirical facet employed a social network methodology in order to obtain a map of the cooperation relationships among Mexican digital library academic personnel aimed at developing applications useful to libraries.

The development of technologies for digital libraries

It is important to begin with the definition I have proposed for a digital library (DL):

> *The digital library is a library that sustains an online document information system providing users both content and digital services.*[1]

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[1] This definition has already appeared in previous papers. See Georgina Araceli Torres Vargas, *Un modelo integral de biblioteca digital.*

The digital library consists of the following variables:

1. Communication and information technologies needed for accessing to DL collections.
2. Organized digital contents, distributed across diverse network levels, with distinct levels of accessibility. They can be simultaneously local and shared.
3. Digital services provided and managed in cooperation with other libraries.

In this case we are concentrating on the technological element. Though the technology is not at the center of the development of a digital library, it is undeniable that is holds considerable importance. The construction of a digital library depends in large measure on the advances in communication and information technology.

It is not; however, desirable to implement technologies simply because they are novel. It is important to analyze the purposes these technologies pursue in the development of collections and services, which as mentioned before are the other variables which provide structure to a digital library.

Moreover, it is well known that the TIC implemented appear in diverse contexts and that most of the time they are not devoted to the library. This is why it is increasingly important to develop technologies focused on the digital library, where new, better and streamlined library services and uses of digital information can thrive.

The development of technologies for digital libraries would help achieve harmony with the other variables or components of the library, but these would be directed expressly at supporting the specific needs of the user population.

With regard to academic digital libraries, it is important to learn about the use of the information required by the professor, researcher or student, in order to direct efforts toward the design and implementation of appropriate technologies. But in this case, it is necessary not to lose sight of the social focus, in which not only the tools are considered, but also contents and services. To achieve this is one of the most important objectives of all libraries, whether digital or traditional. The service rests on the collections, which in turn are determined by the information needs of the community.

The development of technologies for digital libraries is a topic that has not been duly analyzed. Most of the literature examines technologies that have been adopted in the heart of libraries; and, if on occasion innovation is discussed; it is understood erroneously, construing it merely as a matter of using the latest technology in the library

But innovation must be understood as a process comprised of stages (scientific, technical, commercial and financial, as warranted, aimed at the development and commercialization of new products or improved processes); and it implies the use of new or improved practices and equipment, or the introduction of a new service.[2] The process of innovation concludes when the product is introduced to the market or when it is used.[3]

In the case of libraries, innovation can be much more visible in the services than in any other area, but it is also necessary for internal processes and other aspects of library work. In this sense, Merlo's categorization[4] is useful for identifying possible technological applications for digital libraries. Observing the areas in which technological innovation can be developed is also key:

- Collections development (in the DL this can mean the creation of digital contents).
- Organization of collections
- Dissemination of collection
- Professional activity

Digital services would be added to this list. In each of the aspects it is necessary to examine everything from identification of needs to development and implementation of library innovations. This task can be carried out cooperatively, especially in the understanding that in the context of the digital library the task entails working in digital library networks.

A large part of the cooperation between digital libraries[5] is done through consortiums[6] which prioritize the acquisition of digital content and access to software packages.[7]

These consortiums exhibit the following features:

- They are created by means of a formal agreement between participating institutions, with signed commitments.

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2   Manuel Ruiz González, *La innovación tecnológica y su gestión*, 14.
3   *Ibid*., 20.
4   José Antonio Merlo Vega, "50 aplicaciones bibliotecarias en Internet".
5   Anglada states that cooperation is the establishment of strong ties between libraries that have common features (proximity, typology or specialization). Cooperation entails not only sharing ideas but also resources. *Cfr.* Lluís M. Anglada i de Ferrer, "Colaboraciones y alianzas: la inteligencia social aplicada a las bibliotecas universitarias".
6   The consortium is a partnership established by a group of libraries for the purpose of developing and sharing the resources among all of the members in order to improve library services and the breadth of resources available. *Cfr.* Heartsill Young, *Glosario ALA de bibliotecología y ciencias de la información*.
7   Miquel Térmens Graells, "Los consorcios, una nueva etapa de la cooperación bibliotecaria".

- They design a joint plan.
- They have organization and control systems to ensure attainment of objectives.
- It has been observed that consortiums do not carry out the work jointly when seeking to development technological applications.

In this regard in Spain, Anglada said that the weakest point of the library consortiums is perhaps the lack of innovative informational support for developing projects. This researcher emphasizes[8] the need to establish effective collaborations within universities allowing progress keeping pace with technological advances and innovations in service.

In regard to these, one might mention a study[9] detailing how the digital library does not have its own services, but rather has developed services aimed at bolstering those offered in conventional libraries. That is, even now more than a decade after the appearance of the digital library, the leap to establish a digital universe of services distinct from the print universe has yet to be made. In addition to this area, support technology must be developed for those facets of the library cited by Merlo.

In Mexico the consortium of academic libraries has not attained the promised benefits, especially because of the lack of commitment to strengthen the consortium itself, which is manifested in unequal contributions.[10] This imbalance comes about no doubt because member libraries view their contributions in terms of budget allocation, when it is clear equity of participation can only happen through the contribution of many other components not associated with money.

Uriarte points out that: "[…] the goal of library consortiums […] goes beyond joint acquisition, donations, inter-library lending or the retrieval of documents […]"[11] and exhorts consortium members to face the new changes and innovations arriving from the realm of digitized information. In line with this asseveration, one observes that academic library consortiums are determining factors in the creation and use of technological applications permeating diverse areas of the library; but in the first instance they must enrich the area of services, offering new advantages to users who belong to the network.

Collaboration between digital libraries for similar ends would naturally occur in a consortium, but it is not something that should be required. Generally, digital libraries work cooperatively in networks and not in consortiums.

8   Anglada, *op. cit.*, 14.
9   Torres Vargas, "Hacia un modelo de servicios en la biblioteca digital".
10 Lucía Uriarte Franco, *Consorcios en bibliotecas académicas*, 135.
11 *Ibid.*, 136.

It was said earlier that the DL is a system of online documentary information and that it is, as such, structured in nodes. Networks are structured in nodes capable of unlimited expansion. They do not have a center and they can grow by means of adding nodes.[12] In this light, the following two Mexican academic library networks are examined in terms of the cooperation their cooperative engagement in the area of technological development.

COOPERATION IN THE FIELD OF TECHNOLOGY AMONG MEXICAN ACADEMIC DIGITAL LIBRARIES THROUGH AN EXAMINATION OF SOCIAL NETWORKS

This study is focused on the academic digital library, because this kind of library is currently the most active worldwide thanks to the advantages it provides the community. The Mexican academic digital libraries that most closely fit the theoretic digital library posited are the following:

1. La Red Abierta de Bibliotecas Digitales (RABID) [Open Digital Library Network]

    > […] to contribute to the development of digital libraries in Mexico by means of an open network through which collections can be shared and services made available to diverse institutions while facilitating the integration of new institutions, services and users.[13]

    This network enjoys the participation of fifteen universities. Among these are the Benemérita Universidad Autónoma de Puebla (BUAP), el Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM Campus Monterrey) and the University of Guadalajara (UDG).[14] The network has addressed technological matters as follows:

    a. Development and creation of digital contents. The network provides digital content such as several thesis collections, digitized antique document archives, online journals of one of the member institutions and access to a network of online journals.

    b. Dissemination of the collection. This is a network documentary information system whose aim is to provide access to institutional repositories.

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12 Anglada, *op. cit.*, 10-11.
13 Red Abierta de Bibliotecas Digitales RABID, available at: http://ict.udlap.mx/rabid/index_es.html#documents.
14 For further details on the two networks, see Torres Vargas, "La biblioteca digital académica en México a través de dos casos".

2. La Red de Bibliotecas Digitales y Consorcio Bibliotecario ECOES [ECOES Digital Library Network and Librarianship Consortium]
   The mission of the Higher Education Commons (ECOES) is to strengthen the national, Latin American and Caribbean educational spaces by promoting joint institutional efforts aimed at transforming higher education and implementing innovative academic models in the context of the knowledge society. ECOES is currently comprised of thirty Institutions of Higher Education which account for about half of the higher education student population in Mexico.[15] The objective of the ECOES Digital Library Network and Librarianship Consortium is to consolidate a network of digital libraries by means of cooperation and integration of the member institutions support-ing ECOES programs.[16] Technologically, this network has made strides in developing and creating digital contents, which it promotes in each of the member institutions. In general, this network aims to facilitate the exchange of ICT knowledge.
   As already stated, one of the basic features of the digital library net-work is cooperation, which should occur at diverse levels:
   • Sharing of digital contents among communities (distributed contents).
   • Offering share information services.
   • Producing and using technological applications as a group for the purpose organizing and retrieving collections, providing services or for following up processes and communication between the member libraries.

After analyzing the diverse work documents of these two networks, social networks were elaborated allowing the technological cooperation relationships to be mapped.[17] It is important to note that the results were graphed with the help pf Pajek, a software application that allows analysis of social networks in order to identify the relationships established among member libraries of each network, and in this way learn more about the di-rection of their development.

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15 http://www.ecoes.unam.mx/
16 http://www.ecoes.unam.mx/red_biblio_pvp.html
17 Social network maps help show any factor involving collective intentionality. These factors cannot be seen at a glance. One must approach them with knowledge of the practices existing within the institutions. One way of doing this is through social network maps. For some re-searchers, the social network method means the mapping to make "reality" comprehensible. This mapping is graphed using sociograms.

In this way the following socio-grams were obtained:

1. Cooperation between institutions and consortiums
2. Cooperation networks and technological applications
3. Technological applications and institutions

The member institutions of RABID also collaborate in consortiums (these are graphed on the "others" node on the consortium socio-graph), and nine RABID members (UAEH, UNAM, BUAP, UASLP, UAA, IPN, UDEG, UAEM, UV) are also members of ECOES. The remainder of institutions works exclusively with ECOES.

The socio graph provided in *Figure 3* shows that ECOES is currently working on three library development or implementation projects; while RABID has nearly twenty-four development or implementation projects for its participants.

Here the disparity in the contribution of the members of the two networks is revealed, since only a very few institutions offer developments projects. One can also see that a very few institutions in both networks act in leadership roles.

Many cases reflect their adherence to networks that benefit individuals, since diverse institutions appear as members of these groups but in reality do not contribute beyond offering courses associated with the subjects they offer online.

With regard to implementations, it is important to note that the design of meta-searchers is a frequent project, though the current status of these does not make up part of the digital library, even though these systems help find the location of documents within the collections of all the participating libraries, this does not mean said documents are necessarily in digital format.

The same thing occurs when online catalogues of several libraries are associated on a webpage. This association does not entail a development of the digital library, but rather an iteration of conventional or traditional library services albeit through an electronic medium.

For these reasons, it is necessary to stress that a high percentage of implementations are not really connected to a digital library, but rather serve to support the processes and services of the conventional library.

Moreover, the membership in consortiums (such as Grupo Amigos and, Consejo Nacional para Asuntos Bibliotecarios de Instituciones de Educación Superior, A. C. [The National Commission of Library Affairs in Institutions of Higher Education] (CONPAB-IES by its Spanish-language acronym) maintained by some universities reflects the urgent need to buy licenses through the auspices of these groups and, consequently, the lack of in-house digital
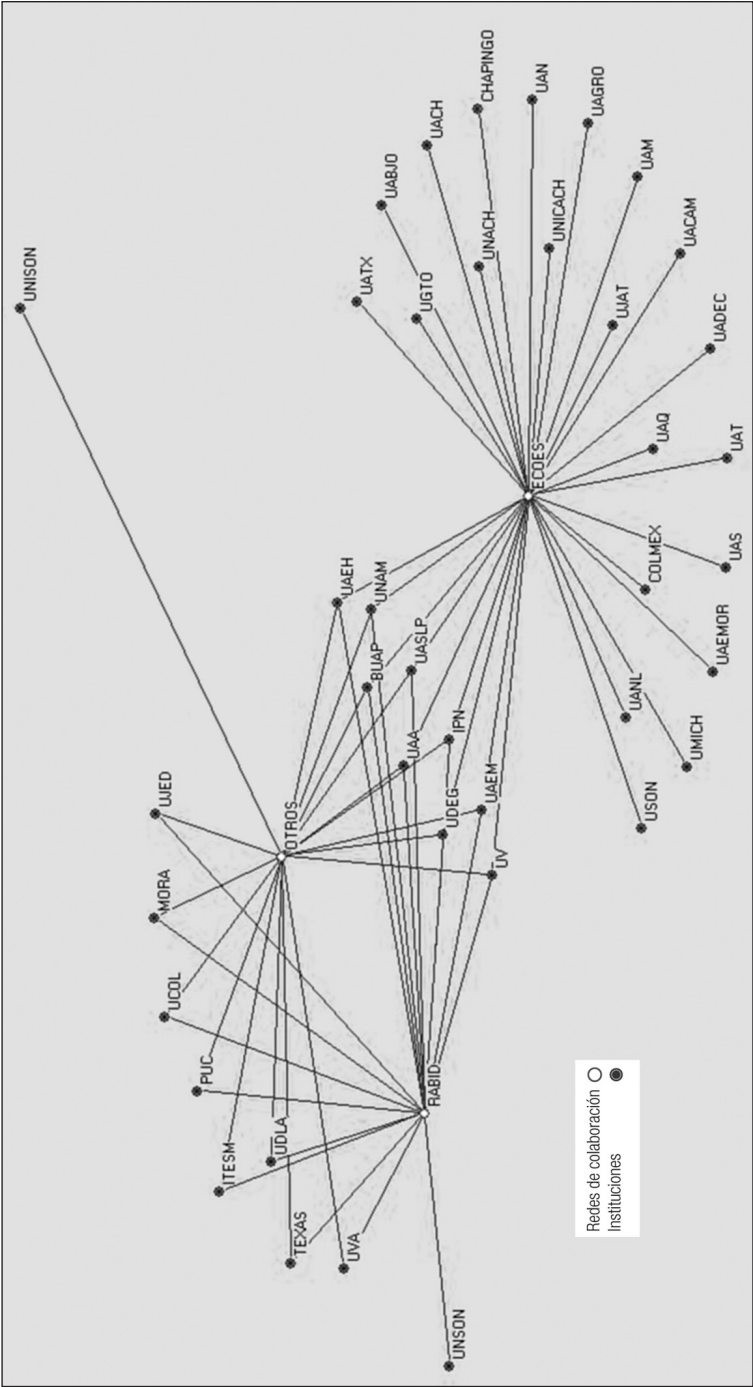
Figure 1. Cooperation of institutions through consortiums
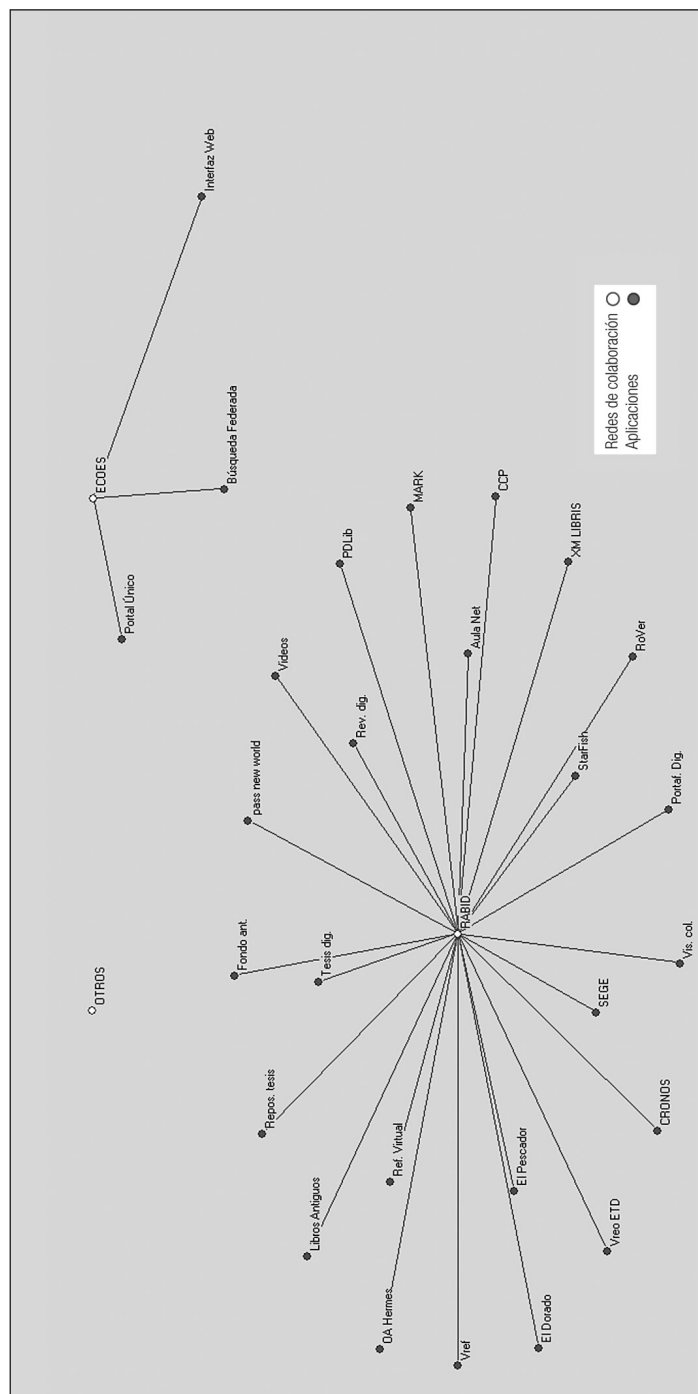
Figure 2. Cooperation networks and technological applications
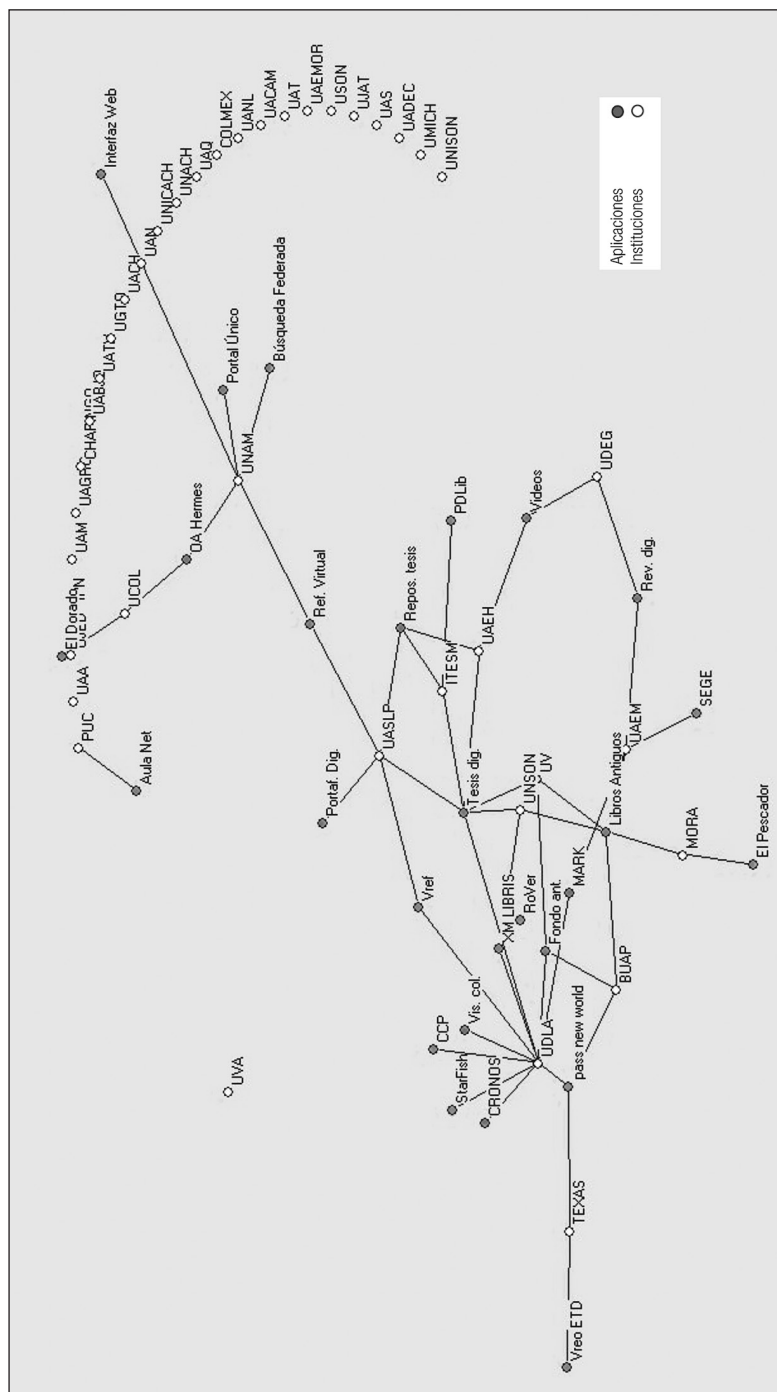
Figure 3. Technological applications and institutions

content development, which impedes cooperation in this area and also results in over-dependence on content providers to constitute the collections of the respective digital library. Outside of digitized theses, dissertations and old material, the digital content available in institutions of higher education in Mexico is very limited.

Conclusions

In line with what has been stated up to now herein:

a. Diverse applications have been designed by some institutions and these have been adjusted for implementation by the members of the network.

b. The relationship of some universities with library consortiums, such as Grupo Amigos and CONPAB-IES, has also been noted. These relationships are shown on the socio-graph as "other" node.

c. The adherence to digital library networks does not in itself imply that all the member institutions are effectively contributing benefits to the group. Many institutions that join become mere receptors of the developments made by other universities. The adoption of technological improvements developed by others undermines autonomy, as these developments tend to respond to the needs of the developing institution. All institutions must allocate budget resources and integrate their needs to those of the collective.

d. Universities have been prone to joining more than one library network, since each network brings certain benefits, which can in some cases be complementary. This trend reflects the individualism with which the construction of academic digital libraries is approached.

e. The implementation of developments from diverse origins and for diverse purposes prevents the existence of a cohesive, long-term digital library project.

f. What is needed is a formal regrouping of institutions in a great network, which explicitly establishes membership rights and duties with regard to balanced cooperation for the purpose of establishing a development plan based on an idea that is closer to what a digital library should be, while ensuring the existence of leadership groups in each of the diverse work areas.

If no revision and correction of the manner in which work is being done, the future of the academic digital library in Mexico shall hold little hope.

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Access and retrieval systems in Spanish-language digital newspapers

María-Victoria Nuño-Moral*

Abstract

Researchers offer a descriptive analysis of search access paths available to readers of Spanish online newspapers. A twin approach is used: the first examines website in terms of access tools, their typology and format; while the second approach provides a description of web search systems. The proposal put forth by Guallar and Abadal (2009) serves as a methodological framework of a working template for making descriptive and comparative evaluations of the sample under study.

Keywords: Information retrieval systems; Digital newspapers; Multimedia resources; Digital files.

* Universidad de Extremadura, España. mvnunmor@alcazaba.unex.es

Resumen

Sistemas de acceso y consulta en los diarios digitales españoles
María Victoria Nuño Moral

Se realiza el análisis descriptivo de las formas de acceso y sistemas de consulta con que cuenta el usuario en los diarios digitales españoles desde una doble perspectiva: por un lado señalar cuáles son las formas de acceso y la tipología documental o formatos que alberga cada uno de los sitios web analizados y, por el otro, exponer las características que presentan los respectivos sistemas de búsqueda. Para su realización se ha tomado como referencia la propuesta realizada por Guallar y Abadal (2009) y se ha elaborado una plantilla de trabajo basada en la evaluación descriptiva y comparativa de la muestra seleccionada.

Palabras clave: Sistemas de recuperación; Periódicos digitales; Recursos multimedia; Archivos digitales.

Introduction

The contents of online communications media have become a transcendent resource, not only in terms of their informative value, but also in terms of their role in preserving heritage. Currently from the general point of view, digital communications media are considered invaluable sources of information, and not only from the journalistic angle, whose uniqueness on many occasions lends them a inestimable value.

Since their appearance on the web, online newspapers are those that have led the way in the development of communications media. And without a doubt they have undergone greater change with respect to their print incarnations. In fact, it is now common to find video, audio, interactive infographics and photo galleries as part of the information offered to users.

All of this has been motivated not only by technological development, but also by competition, both in terms of their informative and entrepreneurial tasks, as well as their novel and exhaustive character in response to new user demands.

News in the online media is no longer limited to simple, expository text and an accompanying photo describing events. Currently, information is provided in

other media, including video and audio, etc., which on occasions not only complements information contained in the text, but also takes on an autonomous life that does not require any adjunct text in order to be fully understood.

Consequently, an essential feature of online periodicals is the facility to access and consult all of this material, especially that which we do not receive in print on a daily basis. The formulas for this access are several. This study shows that these methods range from the traditional means, inherited from print media and based on sections, to analysis, valuation statistics and the practices executed by users.

Currently, there are numerous studies of the presence of communications media on the web. Specifically, there are several that focus on online journalism. Worthy of mention are several monographs that describe the general, formal, historical and functional aspects that have revolutionized the *modus operandi* of journalism. Among these are studies authored by Álvarez Marcos and Parra Valcarce (2004); Salaverría (2005); García Jiménez and Rupérez Rubio (2007) and Palacios and Díaz Noci (2009). Another notable study was published by Pareja Pérez (2003, 2006), who alludes to the characteristics of the new communications media, breaking them down into the following facets: interactivity, immediacy, indefinite spatiality, multimedia or multiformat, functionality and personalization. For the question of immediacy, the second of these researchers mentioned has drafted a digital communication resources guide.

In conjunction with these analyses, other researchers have observed this topic from specific, specialized perspectives, providing an understanding of the evolution and current status of cyber-journalism, the field to which this study belongs. The following research papers are especially germane to the purpose of this study.

Luján Zavala (2003) focuses his attention on how interactivity and the appearance of blogs, or weblogs, integrated in the informative web site has modified the role played by the user in current journalistic practice. The impact of interactivity is analyzed by Parra *et al.* (2008), who emphasize the economic feasibility as a business providing new services for citizens. This economic vision also serves as a forerunner of the research by Marcos Recio (2005).

Moreover, at the *Fourth Cyber Society Observatory Online Congress*, Martín Herrera (2010) and García-Alonso Montoya (2010) reviewed the scene and novel tools available to the professional to make their work fit into this digital milieu and their impact in the workplace, all of this for the purpose of securing maximum profitability and communicative impact. The need to understand the future of the journalistic profession and production methods, and how these are undergoing change, are the axis around which the work of Esquivel Lozano (2010) revolves.He describes the current status of journalism, providing the

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opinion and reflections of acknowledged experts in the field of digital communication. This same concern about innovation in the field of production is presented by Fernández Beaumont (1999).

The transformation occurring under the documental perspective in examined by Marcos Recio, Sánchez Vigil and Serrada Gutiérrez (2009); Rubio Lacoba (2005, 2011) and García Jiménez (2002). In the first instance, the authors examine the metamorphosis undergone by document centers as one of the key elements intervening in the production of information. They also look at the changes occurring in the work performed by its professionals in the exercise of their duties. Their analyses center on several major American and European newspapers, with special emphasis on a Spanish case. The study done by Rubio Lacoba analyzes the journalistic, documental and technological profile of the document professional working in the digital medium in relation to those functions inherently entailed in the general field of informative documentation. In a dissertation offered in 2011 and read at the *Ninth International Documentation Colloquy*, the researcher establishes the keys to radical change of the forms and functions secured with the consolidation of digital versions of diverse existing media or those native to the digital milieu. As such, the researcher reinforces the ideas expounded in a previous paper titled: "Mejor que un buscador, un encontrador" [Better than a searcher, a finder] (Rubio Lacoba and Blanco García, 2010).

Papers by Caldera Serrano and Nuño Moral (2001); Nuño Moral (2003) and Acosta Valdés, Ramírez Céspedes y Marrero Santana (2011) provide descriptive analyses of the planning and structure of digital media. While the two former papers are based on a comparison of content, sections and informative services of the main Spanish newspapers reporting general information to readers, the latter assesses these variables in both local and foreign newspapers. Along these same lines, professor Albornoz (2011) has analyzed and evaluated the content and multimedia resources used, the degree of interactivity and associated market features.

Other authors focus their efforts exclusively on the products and services offered in online media. In this area, the research done by González Quesada and Fuentes i Pujol (1998) and López Carreño and Pastor Sánchez (2010) on the Value Added Services (VAS) are outstanding. López Aguirre (2009) centers his analysis on both the informative and documental aspects of the Mexican online press, while Guallar (2011) examines diverse documental products and services in order to explain the transformation undergone by the press, stressing the growth seen in digital archives.

Finally, from a broad standpoint, the generalized analyses of such things as visibility, hypertexts, usability, quality and opportunities in online dailies bears

mentions. Beyond the research presented by Rodríguez Martínez, Codina and Pedraza-Jiménez (2010, 2012) on interaction, communication and quality (usability, information architecture accessibility), the work of Albornoz (2006) on the use and function of hypertext in audio-visual and multimedia resources (audio, video and animated graphics) is worthy of note. In the same vein, Guallar, Rovira and Ruíz (2010) have offered research alluding to access systems and recovery of said resources.

As the reader can see, despite the existence of the references cited above, very few of these offer an exhaustive assessment of the role of archives or digital archives. As such, we are providing the following summaries of research focusing on such matters as background for this paper.

One of the pioneering evaluations in the field of digital newspaper archives was reported by Jiménez, González and Fuentes i Pujol (2000), who identifies, on one hand, the characteristics of this type of archives in terms of how they are accessed, consulted, their resources displayed, and the query and help resources available to users; while on the other accounting for the informative resources that users access in each case under study. These same authors published research in 2003, which is also noteworthy, focusing on access to audio-visual information both now and in the past. Two previous papers by Professor Jiménez López also merit mention. The first (2003) approaches the topic of commercialization of digital archives, providing a discussion of the cases of *ABC*, *El Periódico de Cataluña* (en adelante *El Periódico*), Diario de Navarra, *El Mundo*, *El País* and *La Vanguardia*. In the second paper titled "Recursos electrónicos de información periodística: el caso de la prensa digital mexicana" (2004), [Electronic journalistic information resources: the case of Mexican online press] the researcher examines the access services for all of the information contained in the medium.

In a similar vein, there are case studies of a specific daily or geographic area, such as the case of Sanz Calama (2003) on the archives of the newspaper *El País*; as well as research by Agirreazaldegi, Ronco and Camacho (2009) and these same authors in collaboration with Idoia Camacho and Carmen Peñafiel (2010). The first of these analyzes the situation of print media and audiovisual content in the Basque Country, including news agencies and communications groups; the second deals exclusively with the context that characterizes Basque daily newspapers. Finally we refer to the work of Martínez Rubio (2008, 2009), who evaluates the characteristic retrieval systems of Valencian and Andalusian dailies.

On the basis of existing research and using the aforementioned article by Guallar and Abadal (2009) as a touchstone, the main objective of this work is to carry out a descriptive and qualitative analysis of the access modalities available to the user of online daily newspaper sites. The sample consists of the

following media outlets: *El País*, *El Mundo*, *ABC*, *La Vanguardia*, *El Periódico*, *La Razón* and *Público*.

To achieve this end, we have considered the type of formats which can be accessed and the consultation systems used for each case. With regard to the latter, a detailed study is made of each search engine. In summary, the basic pillars sustaining this work are the documental typology to which the access method connects, and the features of the archives and search system.

Methodology

The following is a representation of the elements to be assessed in the dailies examined and which constitute the complete design of the research project:

a) Documental typology: the types of documental resources offered in the dailies, including news, charts, interactive infographics, photo galleries, videos and audio content. This analysis does not entail a quantitative analysis of the existing multimedia resources, but rather analyzes the existence of such elements as options for consultation (localization and search for multimedia resources, label or access tag, etc.).

b) Access methods: access methods for consultation and display of documental resources.

c) Recovery systems: based fundamentally on newspaper archives and key word searches. The following aspects are analyzed:
   1. Denomination and localization.
   2. Versions available and duration of coverage.
   3. Types of searches and query filters.
   4. Resources retrieved: formal aspects and aspects associated with the documental contribution appearing in the list of documents retrieved.

Results and discussion

Document typology

The textual format continues to dominate in digital dailies, though multimedia resources are increasingly relevant. The study shows that four of the six dailies under examination(*El Mundo*, *ABC*, *El Periódico* and *La Razón*) group such resources under the heading "Multimedia"; while the others provide di-

rect access to said documents. As can be seen in *Table 1*, videos and photos are present in all of the dailies except *La Razón*, which means photographs provided do not have a tag to take the reader directly to them.

Table 1. Types of multimedia resources available in online dailies

El País	El Mundo	ABC	La Vanguardia	El Periódico	La Razón	Público
Videos	Videos	Videos	Videos	Videos	Videos	Videos
Photos	Photos	Galleries	Photo-gallery	Photo-gallery		Photo-gallery
Infographics			Infographics			
		Audio files				

For the sample analyzed, multimedia resources are not fitted with their own search engine. Access to resources is achieved by means of general systems, as can be seen further on. What is observed is that these are simple search methods, based largely on calendar or key word options, which serve to locate such materials. The exception to this rule was the newspaper *La Razón*, which does not offer access ways to multimedia resources once the system is queried, but rather provides a listing of titles under the heading "Video Library."

The Spanish daily *El País* has its own consulting system accessed by selecting the heading "Infographics" which allows the user to search using the filters "Section" and "Calendar." The daily *ABC* also has a search function for the three options, using the filters "Format" and "Section." The daily *El Periódico* facilitates consultation of videos and photographs, and retrieval of both can be limited by "Calendar"and in the photo gallery by using "Topics." The daily *Público* has a video search engine limited by "Section"; while the daily *El Mundo* allows keyword searches with the filter "Document type" (video or photo), once the total is tallied. Finally, the daily *La Razón* does not provide any individual tool for this type of resources.

Access method

In addition to news, photos, videos or graphics appearing on the first page of the daily, or accessed under the Multimedia tag , online dailies have several consulting options for diverse resources.

Table 2. Access modalities to information resources

	El País	El Mundo	ABC	La Vanguardia	El Periódico	La Razón	Público
Latest new/Time	x	x	x	x		x	
Contents	x		x	x			
Standardized list				x			

"Most often…"	Seen/Read	x	x	x	x	x	x	x
	Commented				x	x		x
	Liked					x		x
	Sent					x		
Archive		x	x	x	x	x	x	x
Search system (Text box)		x	x	x	x	x	x	x

As seen in *Table 2*, there are six other options for locating documents sought. Of these options, "Most frequently seen/read"; "Archive" and "Search" by "Keywords" are provided in every case. In view of the complexity of making such comparisons and the need to provide a more detailed and exhaustive explanation, the latter two tools shall be examined in the following section.

We pause briefly to dwell on several matters that should be considered regarding the remaining alternatives. The service "Breaking News" or "Latest News"[1] exists in all of the dailies except *El Periódico* and *Público*, which together with *El Mundo* also do not provide access through the "Contents." This alphabetically ordered, thematic, onomastic index is also geographic, while the daily *ABC* offers access to artistic works.

The option denominated "Standardized List" consists of highlighting an average of five or six relevant current news stories. The three dailies that offer this option provide the link button on the top of the front page, *El Pais*, *ABC* and *La Vanguardia* under the tags "Now happening"; "In Depth" and "Highlights," respectively.

The third route allows display of contents as a function of user access statistics to the same. The "Most often…" section provides four options.

Retrieval system

As mentioned earlier, the sections "Archive" and "Search" (or "Key word") are the most important consultation instruments for accessing content. These options are provided in all of the sample dailies. In order to achieve greater clarity, we provide a descriptive and comparative analysis, which is derived from the assessment explained in the "Methodology: section of this study.

1. Denomination and localization
   All the dailies use the tag "*Hemeroteca*" except the daily *El Periódico*, which prefers the tag "Archives." Both the latter and the daily *La Razon*

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1   These options have been considered synonymous, although *ABC* differentiates between them as a function of origin of the resource. Thus, the label "Breaking News" includes breaking news from wire services, while "Latest News" uses information from the newspapers.

require access fees. While the former allows consultation, full display of contents is not free.

The daily *El País* even makes the distinction between "Archives" and "Print Archives". The difference consists in that for the former the search parameter "Calendar" (year, month, day, time span") only includes the last two months; while in the "Print archive" option the last two months are not stored and searches using "Key words" are allowed (as per the features offered in the "Search" option, which shall be explained further on).

The dailies *Público* and *El Mundo* provide the "Archive" activity in conjunction with the "Key word"; though *Público* has this second option for carrying out searches using an external search engine. That is, *Público* uses the tag "Archive" to execute internal searches and the "Search" tag to carry out searches using Google; while *El Mundo* tolerates such searches using both tools, allowing the user to select the universe to be searched in such a way that they may rightly be considered identical.

Finally, from the standpoint of information and perusal, *ABC* and *La Vanguardia* prefer to differentiate these options more markedly. Both dailies provide a manifest historical or retrospective character, which is discernible when one accesses either archive. In fact, both dailies offer the option "One day in your life" allowing users to search a specific date as far back as 1881 and 1891 for *La Vanguardia* and *ABC*,[2] respectively, provided in the latter case the search is made of magazine *Blanco y Negro* [Black and White]. The archive of *La Vanguardia* offers the option "Trends," which provides a counter showing the number of times the topic has been searched over the course of time.

To conclude, it is worthy of note that with the exception of the daily *Publico*, which when one accesses "Archive" displays a list of headlines organized in sections, the other dailies sampled provide a "Key word" search option, taking into account with regard to *El Periodico* the need to subscribe or the calendar constraints of *El Pais*, which are also the case for *ABC*. That is, the consultation of the archive using key words in the latter does not include the most recent fifteen days.

In terms of localization, the sample analyzed exhibits both "Archive" and "Search" on the front page.

2. Versions and historical coverage

The dailies *El Pais*, *ABC* and *La Vanguardia* allow a double alternative in that they display both online versions and the print edition of the daily.

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2   Queries of the newspaper go back as far as 1903 for the Madrid edition.

The historical coverage provided by each daily reaches back to 1976, 1903 and 1881, respectively. *ABC* offers archival access to its magazine *Blanco y Negro* as far back as 1891. The other dailies in the sample offer archival access to the years 2000 and 2001 (for *El Mundo* and *El Periódico*, respectively), while *Público* offers archival access to the year of its founding in 2007. The latter two and *La Razón* allow free access to their digital editions.

3. Type of searches and query filters

Except for *La Razón* and *Público*, all of the sample dailies offer both "simple" and "advanced" search options.[3] In these two cases, only simple key word search capability is offered in a single text query field and no search filter options are provided. Searches of the daily *La Razón* can be executed within the daily itself and using an external navigator, offering access to documents from external sources. In contrast, *Público* uses Google navigation technology, but the results obtained consist of documents and resources created by the newspaper itself.

We can safely assert that none of the sample dailies, except *El País*, is equipped to provide direct access to advanced searches. That is, the constraint or limiting level is always in place once the query is entered into the system in the simple search text field. After learning the organization and internal structure of the newspaper,[4] we can state that *El País* does in fact allow direct access to advanced search functions using the tag Archive web. Moreover, the simple query is carried out using the text box situated at the top of the front page.

The rest of the sample dailies exhibit the following specific options in their respective key words search systems as shown in *Table 3* on the following page.

The following is a brief description of some relevant aspects in order to achieve a better understanding. In the first place, the difference between "Temporal coverage" and "Dates" lies in the former providing the opportunity to select between previously set time parameters, such as "last week"; last year" or any given year; while the "Date" tag allows the user to select a specific date, or set time parameters by entering "from-to" limiters. The operation of setting of parameters by using query language is present on *ABC* and *La Vanguardia*.[5] The first allows the use of logic operators (and/or/not) and the verbatim phrases in order to retrieve search targets,

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3 Both labels are used in order unify the comprehension of the existing casuistic.
4 That is, the user must be familiarized with the organization and labeling system used in the daily in order to verify the double Access to which this refers.
5 Moreover, *La Vanguardia's* "Archives" allows the user to limit a search in three ways: "Edition" or "Supplement"; the exclusion operator "OR", and display of front page only.

while the latter only use the logic limiters of and/or in conjunction with the phrase constraint.

Table 3. Search filters in simple and advanced search systems

		El País	El Mundo	ABC	La Vanguardia	El Periódico	La Razón	Público
Simple search			Internal search or search of other sources				Internal search or search of other sources	
			Document type	Document type		Document type		
			Date	Date				
			Section	Section				
			Supplements					
			Temporary coverage	Temporary coverage				
				Print or online version				
				Edition				
						Uses Google technology		Uses Google technology
Advanced search		Date	Date/Range		Date/Range	Date/Range		
		Document type			Document type			
				Query language	Query lan-guage			
					Author			
			Relevance					
					Section	Section		

The dailies *El Periódico* and *Público* employ Google technology to provide search services. The difference between these dailies is that, in the former, Google is the exclusive option, while the latter offers its own internal search engine as well.

Finally, we might mention that the filters "Section" and "Edition" in the *ABC* site, and the "Date" and "Supplements" filters in *El Mundo* provide users information regarding the number of documents contained under each heading. Obviously, this information is germane to the following section.

4. Resources retrieved
    Of the universe of documents retrieved, results obtained are structured in two areas: Formal aspects and documental contribution.

    Formal aspects
    Four parameters are included within this block:[6]

    - Ordering and results
      With the exception of the daily *Público*, whose results appear classified by sections, the other sample dailies follow the ordering criteria of "Date" and "Relevance." Moreover, the daily *ABC* uses the "Relevance" criterion in conjunction with the "Date" criterion, but not vice-versa.
    - Display of the number of pages per document
      The dailies *El Mundo* and *ABC* allow the user to determine the range of documents he wishes to display by page on the basis of a resulting count of the total.
    - Displaying the print or online edition
      The default option when user enters the daily *El País* and which he or she is required to specify when making a query in *ABC*. Moreover, in the latter, one must take into account that the search system does not include the most recent fifteen days contents of the print edition.
    - Total number of document search results broken down by typology
      This alternative does not consist in evaluating whether the system permits internal filtering of documents by types. Its purpose resides in evaluating when records are obtained from a search query, whether the system indicates to the user the numerical value of resources obtained with specification of its distribution in accord with the documental typology established for each medium.[7]

    Documental data provided
    The following items are evaluated in the second block:

    - Data provided by each document
      Table 4 provides a comparison of the analysis done on each page of results after the formulation of the search query entered into

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6   The option "Management" (comment, print, etc.) as defined by Guallar and Abadal has been excluded from this section, because none of the dailies sampled provides this option in the search results.

7   For this section, it is important to remember the option provided by this daily and *ABC*, when it was explained that the results mentioned the number of documents and resources available through the filters "Section"; "Edition"; "Date" and "Supplement."

the system. The daily *Público* is excluded because the queries are executed exclusively thorough Google technology, and the only datum exhibited in all their records is the URL which takes one directly to the internal resource. For the other dailies studied result would bethe following:

Table 4. Information provided in the results lists[8]

El País	El Mundo	ABC	La Vanguardia	El Periódico	La Razón
Date	Date	Date	Date	Date	Date
Relevance	Relevance				
	Heading				
Title	Title	Title	Title	Title	Title
Subtitle	Subtitle	Subtitle	Subtitle	Subtitle	Subtitle
Author	Author	Author	Author	Author	
	Document type				
		Section	Section	Section	

The table above shows *La Razón* and *El Mundo* at either end. Interestingly, *ABC*, *La Vanguardia* and *El Periódico* offer the user the same data on each document. The indicator "Sub-title" is employed by *La Vanguardia*, which generally refers to the beginning of the text body.

- Links to related resources
  The dailies El País and *El Mundo* are the only newspapers of those studied in which a list with documents is exhibited in relation to the established query. Obviously, the link is assessed from the results page, not individually, once the user accesses each one of said records.

- Help for topical queries
  Like the previous point, the aforementioned newspapers are the only ones offering help from the standpoint of content. It must be noted that this parameter differs from other forms of access established in *Table 2* under the tags "Index" or "Standardized list."
  In this case, it is a question of evaluating the presence of terms (topics, or geographic or onomastic elements) that can be associated with the concepts employed by users in their queries, in such a way that the queries provide concrete results.

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8   In this case, it is excluded if the results page has attached photos and videos, because as has been shown on occasions a photo appears when the resources actually present in the document is a video. These cases have been observed in *La Vanguardia* and *Público*, for example.

Conclusions

With regard to the three blocks evaluated, conclusions come along two lines. In the first place, the inclusion of multimedia allows digital dailies have overcome the barriers implicit in the print media, equipping themselves with television, which even in its analogue days already used basic resources such as text, audio, photographs and video.

All of this has situated digital newspapers archives as a unique, exceptional source of information, both in economic and cultural terms. Compared against earlier studies cited herein, one can appreciate and increase in the multimedia resources providing information, despite the existence of significant lacunas, such as those exhibited in the daily *La Razón*.

Secondly, parallel to traditional search engines, the number of search options available to the user having gained access to contents continues to grow. The dailies *El País* and *La Vanguardia* are notable for providing six alternatives discussed under "Access methods" in this study.

Beyond the commercial feasibility of the search systems, digital media should plan their archives on the basis of the end user. This is the area exhibiting greatest vacuum and, consequently, requires the most attention and largest changes in order to ensure that the resources contained in it are available and useful.

Such aspects, such as explicitly indicating temporal coverage of a digital collection or of the digital or print version; avoiding unnecessary duplication of synonymous tags or precisely specifying the multimedia resource accompanying the informational text supplied in the search results page, are without a doubt aspect that should be reviewed and improved, as should the online newspaper web sites for the purpose of greater effectiveness and efficiency.

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Efficiency of scientific output of Venezuelan female researchers: Is parity the same as equality?

Preiddy Efraín-García
Carlos García-Zorita
Elías Sanz-Casado *

Abstract

Gender equality policies currently in place in many countries have spurred significant progress in advancing women in the fields of science. Nonetheless, numerous of recent studies have sought to measure differences between the scientific activity of men and women. The aim of this paper is to ascertain possible differences in scientific productivity in certain scientific disciplines carried out by men versus women and to determine importance of professional standing with regard to these scientific outputs. To this end, a bibliometric analysis was conducted of the *curricula vitae* of 6015 Venezuelan researchers participating in the

*   All three researchers belong to the Carlos III University of Madrid, Spain, Associated Unit IEDCYT-LEMI: España. pegarcia@bib.uc3m.es; czorita@bib.uc3m.es; elias@bib.uc3m.es

country's Researcher Promotion Program up to 2009. Findings show that the Venezuelan research system has more female than male participants, but fewer women in the highest professional echelons. Women also proved to be less productive, with performance varying significantly from field to field.

Keywords: Gender parity; Gender equality; Bibliometrics; Scientific productivity, Venezuelan researchers.

Resumen

¿Paridad equivale a igualdad? Eficiencia de la producción científica de las investigadoras venezolanas
Preiddy Efraín García, Carlos García Zorita and *Elías Sanz Casado*

Las políticas de igualdad de género promovidas desde distintos países y regiones han supuesto un avance importante a la hora de facilitar la plena incorporación de la mujer en la actividad científica. Esto ha dado lugar a la realización de numerosos estudios tendentes a determinar la posible existencia de diferencias en la actividad científica realizada por hombres y mujeres. El objetivo de este trabajo se ha dirigido a conocer si existen o no diferencias de productividad en determinadas áreas científicas en función del género de los investigadores, y la relación entre la posición en la carrera profesional de hombres y mujeres y su producción científica. Para ello se ha realizado un análisis bibliométrico de los 6015 *currículums vitae* de los investigadores venezolanos incluidos en el Programa de Promoción del Investigador (PPI) hasta el año 2009. Entre los resultados hay que destacar la mayor presencia de la mujer en el sistema de investigación venezolano, una menor presencia de mujeres en las categorías profesionales superiores, una menor productividad de las mujeres, o la diferente eficiencia que muestran las mujeres en función de las áreas temáticas consideradas.

Palabras clave: Paridad de género; Igualdad de género; Bibliometría; Productividad científica; Investigadores venezolanos.

Introduction

Interest in scientific activity from the standpoint of gender has brought about numerous comparative studies attempting to determine whether gender differences exist in the characteristics of scientific activity carried out between male and female researchers. To this end, bibliometric analysis has proven to be a valuable tool, allowing researchers to analyze research activities in an objective way, examine the development of this activity, and compare results against those arising from other fields of knowledge or geographic regions.

One question that has drawn the particular interest of researchers is whether or not there are gender differences in the scientific production of researchers. In this vein, Prozesky (2006) observes that male researchers in South African universities published papers at a nearly two to one rate versus those published by the most productive female researchers. This study also showed that the most productive male researchers easily outstripped their most productive female counterparts. The researcher also observed that these trends are very similar to those found in other countries analyzed, where women researchers also published fewer scientific papers than men (Prozesky, 2008).

Studies in Spain along these same lines, specifically in the fields of Science of Materials of the Supreme Council of Scientific Investigation (CSIC) (Mauleón and Bordons, 2006), reported a scarcity of women in the highest levels of the professional career, also publishing the fewest papers included in the journals listed in the *Science Citation Index* (*SCI*/Thomson Reuters) or fewer with similar impact to those published by male scientists. A later gender study (Mauleón, Bordons y Oppenheim, 2008) focused on an examination of scientific and technological activity of researchers in the CSIC showed that the average number of papers published by male scientists in journals included in the *Web of Science* were slightly more than the average published by women across most fields; but the differences were only significant on in the field of Nutrition, where women showed higher productivity and in Science of Materials and Agricultural Science, where men were more productive.

With similar objectives, Abramo, D'Angelo and Caprasecca (2009) obtained comparable results in their analysis of gender differences in the Italian academic system; however, De Filippo, Sanz-Casado and Gómez (2009) had different findings with regard to scientific productivity, finding there was no significant difference between the scientific productivity of male and female scientists.

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In this research, we are attempting to find out about gender differences in the Venezuelan research milieu. Starting in the 1990s in Venezuela, many actions were taken to encourage scientists to carry out research and publish. In 1990 the Venezuelan Research Promotion Foundation was founded to work toward such ends. This program has its origins in the 1980s when the Venezuelan Central University established a system to acknowledge its researchers (ONCTI, 2007; Marcano and Phélan , 2009). Article 2 of the decree establishing this groundwork states: "… the Foundation shall have as its objective the lending of economic assistance to cover the obligations as required and entailed in the implementation and development of the PPI program" (República de Venezuela, 1990).

The Researcher Promotion Program is one of the policies executed by the National Science and Technology Observatory (ONCTI), founded for the purpose of providing greater visibility to science and technology activities carried out by researchers residing in Venezuela. Researchers are evaluated by peers sitting on Area commissions and classified in three categories: Candidate, Researcher and Scientist Emeritus. The Researcher category consists of four levels, I, II, III and IV (Marcano and Phélan, 2009).

Likewise, this program is in charge of keeping a permanent registry of scientists in the country, having built its own data capture and storage tools for the information provided in researcher curricula vitae. For research scientists, the CV also represents a record of their scientific achievements and an administrative duty to be filed with authorities. As such, they are incentivized to keep their CVs updated and available.

In the field of scientific communication, the CV is one of the few, nearly universal, sources in terms of availability and significance. As such, the CV comprises an interesting source of data for evaluating the scientific activity of researchers (Sandström, 2009). Use of CVs in this way began in the decade of the 1990s; albeit with scant research to support their use as sources of supplementary information. (Cañibano, Otamendi and Andújar, 2008; Martín-Sempere and Rey-Rocha, 2003; Gaughan and Bozeman, 2002).

The purpose of this paper is to determine whether there are gender differences in specific characteristics of scientific activity carried out by Venezuelan researchers as reflected in the CVs they submit. Some of the main questions we hope to answer are: a) Are there gender differences in productivity in each of the areas scrutinized? b) Is there a relationship between the professional seniority held by researchers and their respective scientific output?

Likewise, it is important to point out that an analysis was made only of the scientific activity of those researchers who were still active at the time data was gathered. As such, the scientific output can be compared against the

population making the inputs. This fact serves to differentiate this research from other work which associates scientific output with the entire researcher universe, whether they are responsible for said output or not (Abramo, D'Angelo and Caprasecca, 2009).

Materials and methods

To carry out this research we gathered the CV data from 2010 of Venezuelan research sceintists registered in the PPI. These data were available on the webpage of the Researchers Promotion Program (García González, 2010). The data on the researchers were grouped by gender. A total of 6015 CVs on file in the system up to 2009 were gathered. As inputs, this analysis used the number of male and female researchers participating in each of the academic disciplines in which they were classified; and as outputs, the scientific production broken down by gender, as measured by the papers published in national and international journals in each of the areas.

For the descriptive analysis, functions of the free "base package" of the R statistical software (R Development Core Team, 2010) were used. For calculating the Gini indexes, the '*ineq*' package was used (Zeileis, 2012), whose calculation function is based on the Allison formulation (1978), and is compatible with other formulations used in the field of Infometrics (Rousseau, 1998, 2000). With regard to the number of researchers and their respective published papers, contingency tables were created combining the variables of gender and scientific field.

This paper groups Venezuelan researchers into three categories: Candidate (Ca), Researcher Level I (L_1) and PPI High Level Researches (Up_L). These three grouping levels were combined with the variables of gender and academic discipline, both in terms of the number of researchers (input) and the number of publications (output).

For the purpose of exploratory and visual analysis of contingency tables, mosaic plots have been developed using the '*vcd*' package (Meyer *et al.,* 2012). A mosaic plot provides a graphic representation consisting of "tiles", each of which is proportional to the dimensions, i.e., width and height, of each of the cells (observed frequencies) recorded in the corresponding contingency table (Meyer *et al.*, 2006).

Gender efficiency is measured using the *Gender Parity Index* (GPI) (UNESCO, 1997), which serves to determine the degree of integration of women in research tasks. This index is calculated for each of the academic disciplines under study, both at the level of input and output. On one hand, the GPI is

calculated against the resources employed in the research (GPI_r), which will result from the ratio of the number of female researchers compared to the number of male researchers. Values higher than the unit indicate a higher female presence. Moreover, the GPI is calculated with regard to the gender distribution in scientific publication (GPI_p), and is gauged by the relationship between the numbers of papers published by female researchers against those published by male counterparts. Values above one (1.0) show greater output by women researchers.

The Gender Success Rate (GSR) is defined as the capacity of researchers of a given gender to enjoy success in their respective scientific field. This value is calculated by relating the GPI_i index and the GPI_p index. Values above one (1.0) show greater output by women researchers.

RESULTS AND DISCUSSION

Distributions of the number of researchers (r) and the number of publications (p) by academic discipline

The total number of Venezuelan researchers analyzed in this study is 6015. Of these, 2823 are men and 3192 are women, all registered in the PPI. *Table 1* shows the distribution by gender and scientific field, as well as the distribution by gender and academic discipline for the number of papers published as reported in the CVs of the researchers. The data are organized in descending order of the total number of researchers in each field.

When the data shown in *Table 1* are analyzed, one observes the global percentage of women is 6.13% higher than men. This data is in line with the incorporation of women in higher education in Venezuela, which moved from 43% in 1959 to 59% in 2005 (Delgado de Smith and Rojas, 2009). This feminization of Venezuelan research, especially in the field of Life Sciences, has also been reported in a recent paper by Caputo, Requena y Vargas (2012). In Spain, a similar shift has been reported, though the range is somewhat lower. In 1972, women university professors stood at 15% and by the 1990s they represented 29% of the body of university faculties (Pérez Sedeño *et al.,* 2003). Nonetheless, in terms of papers published, male researchers account for 8.35% higher global percentage. With regard to published papers by Spanish researchers, there appears to be more output by male researchers (Mauleón and Bordons, 2006). When each area is analyzed, this percentage varies from field to field; the category Other is excluded from the analysis because it groups fields with few researchers and papers published. For exam-

ple, in disciplines of Medical Sciences (Med Sci), Pediatrics (Ped), Economy (Econ), Linguistics (Ling), Law (Law), Psychology (Psych) and Ethics (Ethics), the prevalence of women tops 60%. Nonetheless, when these percentages are compared to papers published by women in these fields, we find they are inferior to said prevalence, except for the field of Psychology, where the two percentages are nearly the same, i.e., 74.5% and 74.28%, respectively.

When the same comparison is made with regard to male researchers, the areas exhibiting percentages higher than 60% are Physics (Phys), Mathematics (Math), Earth Science (Earth Sci), Philosophy (Philo), and Astronomy and Astrophysics (Astro). When these values are compared to publication rates, we find these rates to be higher, except for the case of Philosophy, which came in slightly lower at 56.32%.

Table 1. Distributions of the presence of researchers in journals
by academic discipline and gender

Fields	Number of researchers (r)					Number of papers published				
	Man	Woman	Total	Man (%)	Woman (%)	Man	Woman	Total	Man (%)	Woman (%)
Life Sci	377	473	850	44.4	55.6	8062	6432	14494	55.62	44.38
Tech Sci	386	345	731	52.8	47.2	5993	5430	11423	52.46	47.54
Med Sci	226	436	662	34.1	65.9	4005	5818	9823	40.77	59.23
Agr Sci	341	289	630	54.1	45.9	6144	4186	10330	59.48	40.52
Ped	155	339	494	31.4	68.6	1796	3241	5037	35.66	64.34
Chem	240	203	443	54.2	45.8	5610	2995	8605	65.19	34.81
Econ	106	164	270	39.3	60.7	1087	1557	2644	41.11	58.89
Phys	205	43	248	82.7	17.3	3958	762	4720	83.86	16.14
Sociol	94	136	230	40.9	59.1	2096	2025	4121	50.86	49.14
Math	151	74	225	67.1	32.9	2174	881	3055	71.16	28.84
Arts	67	97	164	40.9	59.1	1384	1452	2836	48.8	51.20
Earth Sci	101	60	161	62.7	37.3	2248	979	3227	69.66	30.34
Ling	38	102	140	27.1	72.9	672	1512	2184	30.77	69.23
Hist	60	63	123	48.8	51.2	1328	1222	2550	52.08	47.92
Polit	57	60	117	48.7	51.3	1317	1003	2320	56.77	43.23
Law	35	77	112	31.2	68.8	554	891	1445	38.34	61.66
Psych	28	82	110	25.5	74.5	386	1115	1501	25.72	74.28
Philo	45	27	72	62.5	37.5	722	560	1282	56.32	43.68
Anthro	34	27	61	55.7	44.3	690	566	1256	54.94	45.06
Geo	20	21	41	48.8	51.2	259	232	491	52.75	47.25
Astro	15	5	20	75	25.0	491	110	601	81.7	18.30
Ethics	7	11	18	38.9	61.1	69	101	170	40.59	59.41
Other	35	58	93	37.6	62.4	207	286	493	41.99	58.01
Total	2823	3192	6015			51252	43356	94608		

Figure 1 is a box-plot diagram of the data appearing in *Table 1.* One can observe that the average number of female researchers is somewhat higher than male counterparts, with Life Sciences and Medical Sciences exhibiting atypical numbers of female researchers. Moreover, the average number of papers published is lower among female researchers at 1885 versus the average for male counterparts at 2228. The number of paper published in the area of Life Sciences behaves distinctly for both men and women. Additionally, these exhibit atypical behavior in the fields of Technological Sciences (Tech Sci) and Medical Sciences.

Neither of the distributions exhibit significant differences with regard to gender of researchers, as shown by the variance analysis test for the number of researchers ($F_{2,44}$=0.176, *p-value*: 0.6768) and for the number of papers published ($F_{2,44}$=0.3099, *p-value* = 0.5805).
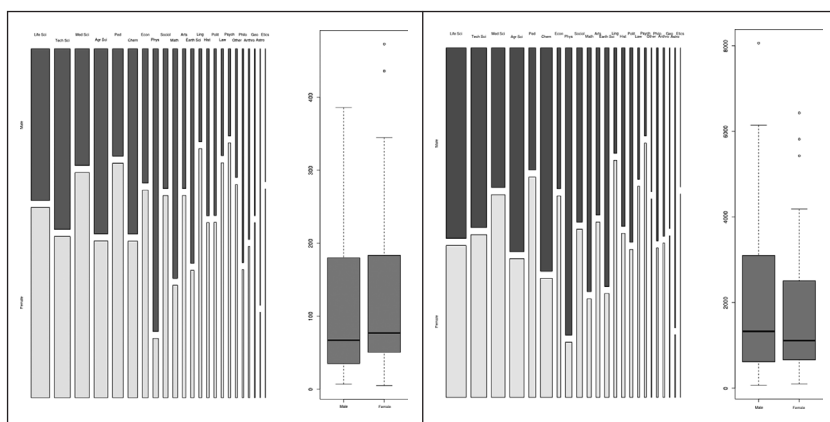
Figure 1. Mosaic plot and box-plot of distribution of researches and papers published by field and gender

The analysis of data by gender of the number of researchers and papers published against the professional grade is shown in *Table 2.* Said table shows in general terms that women researchers have a larger presence at the lower professional grade levels, such as L_1 and el Candidate (Ca), representing 22.1% and 18.57%, respectively, of the total number researchers, while male researchers are represented in the higher levels (Up_L) at 16.37% of the total. Other research has obtained similar results, showing a presence of women researchers higher than that of male counterparts in the lowest professional grade levels, and lower presence in the higher levels (Abramo, D'Angelo y Caprasecca, 2009; Mauleón y Bordons, 2006; Mauleón, Bordons y Oppenheim, 2008; Caputo, Requena y Vargas, 2012). In terms of scientific

Table 2. Number of researchers and papers published by gender and professional grade level

Fields	Number of researcher (r)							Number of papers published						
	Men			Women				Men			Women			
	Ca	L_1	Up_L	Ca	L_1	Up_L	Tot-r	Ca	L_1	Up_L	Ca	L_1	Up_L	Tot-p
Life Sci	51	144	182	118	219	136	850	307	1898	5857	493	2446	3493	14494
Tech Sci	166	144	76	126	140	79	731	683	2476	2834	544	2157	2729	11423
Med Sci	56	93	77	157	189	90	662	413	1351	2241	880	2426	2512	9823
Agr Sci	80	179	82	103	145	41	630	477	2786	2881	510	2451	1225	10330
Ped	67	54	34	157	142	40	494	294	597	905	668	1623	950	5037
Chem	41	76	123	54	78	71	443	116	884	4610	195	740	2060	8605
Econ	46	42	18	84	52	28	270	177	470	440	333	501	723	2644
Phys	31	77	97	7	21	15	248	86	717	3155	25	208	529	4720
Sociol	20	35	39	44	54	38	230	80	422	1594	187	655	1183	4121
Math	55	56	40	25	33	16	225	137	582	1455	109	345	427	3055
Arts	25	23	19	31	50	16	164	216	478	690	195	788	469	2836
Earth Sci	28	37	36	18	25	17	161	181	559	1508	92	446	441	3227
Ling	9	10	19	49	25	28	140	32	85	555	191	345	976	2184
Hist	13	16	31	17	22	24	123	121	213	994	106	320	796	2550
Polit	5	23	29	19	18	23	117	41	348	928	115	180	708	2320
Law	9	12	14	21	37	19	112	72	136	346	87	430	374	1445
Psych	9	6	13	25	35	22	110	31	61	294	93	410	612	1501
Philo	8	22	15	9	8	10	72	46	283	393	52	182	326	1282
Anthro	5	9	20	1	10	16	61	41	97	552	2	142	422	1256
Geo	6	9	5	8	9	4	41	30	80	149	33	82	117	491
Astro	2	3	10	1	1	3	20	10	49	432	0	6	104	601
Ethics	4	2	1	2	7	2	18	18	25	26	11	31	59	170
Other	23	7	5	41	9	8	93	27	106	74	51	69	166	493
Total	759	1079	985	1117	1329	746	6015	3636	14703	32913	4972	16983	21401	94608

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output of female researchers, this value came in higher at the highest professional levels (Up_L), at 22.6% of the papers published by women. Male researchers also boast higher scientific output at the highest level (Up_L), at 34.79% papers published by men, and at a proportion much higher than seen in women researchers.

An analysis of the presence of women researchers and their scientific output in each of the fields considered in terms of professional grade reveals that at the Candidate grade (Ca) women constitute majorities in 15 of the 22 fields, while men lead in the remaining seven, i.e., Technological Sciences (Tech Sci), Physics (Phys), Mathematics (Math), Earth Sciences (Earth Sci), Anthropology (Anthro), Astrophysics (Astro) and Ethics.

The number of publications by women at this level, however, is lower than the number of men in nine areas, including the seven already mentioned and in the Fine Arts and History (Arts).

At the next professional grade (L_1), there are fewer fields in which women are more numerous than men, since they are present in 13 of the 22 fields analyzed. In terms of papers published, the majority of fields in which women are more highly represented than men are also those in which they publish more numbers of papers, with the exception of Chemistry (Chem) where male researchers published 144 more papers than their female counterparts, despite being in a slim minority (two less researchers).

With regard to the highest professional grade (Up_L), the number of fields with greater numbers of women researchers falls to eight. When fields in which women researchers publish more papers than their male counterparts are analyzed, we find that seven of these fields coincide with those fields in which they are more highly represented. In Technological Sciences (Tech Sci), despite there being more women than men, the latter publish more papers than the former.

The gender and professional grade differences observed with regard to the number of researchers shown in *Table 2* are not statistically significant, i.e., $F_{1,136} = 0.4381$, *p-value* = 0.5092) and ($F_{2,135} = 1.236$, *p-value* = 0.2939), respectively. In contrast, the differences in the number of publications are significant in term fo professional grade, i.e., $F_{2,135} = 14.84$, *p-value* < 0.05; but not for gender which came to $F_{1,136} = 0.4894$, *p-value* = 0.4854.

To determine whether the numbers of researchers and their papers published are spread equally across the diverse fields, a Gini index has been calculated for each of these distributions. Moreover, a Lorentz curve has been developed for each distribution. These results are shown in *Table 3* and *Figure 2*, respectively, on the following page.

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As can be observed, the concentration levels are not excessively high. The global behavior of both the number of researchers (0.4824) and scientific output (0.4916) are very similar. It is understood that there is greater homogeneity among researchers at the highest professional grade (Up_L), and among these, the distributions are somewhat more uniform for female researchers than is the case for their masculine counterparts. As for the other two professional grades considered (Ca and L_1), these show distributions are more concentrated for numbers of papers published than for the numbers of researchers.

Table 3. . Gini Index: Distribution by area and gender

	Number of researchers (r)			Number of papers published (p)		
	Ca	L_1	UP_L	Ca	L_1	UP_L
Men	0.5207	0.5386	0.5028	0.5328	0.5704	0.5275
Women	0.5313	0.5406	0.4781	0.5521	0.5544	0.4815
Total	0.4824			0.4916		
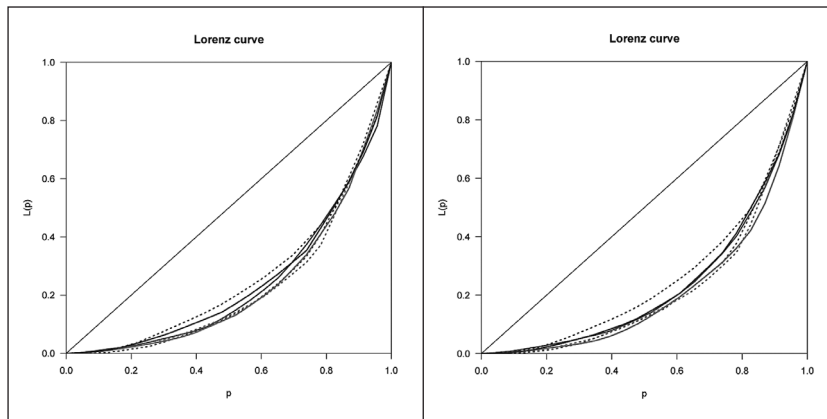
Figure 2. Lorenz curves de. Left.: by numbers of researchers. Right: by numbers of papers published. Men: Lines; Women: Dotted lines.

Gender Parity Indexes (GPI)

Table 4 shows the gender parity indices calculated for each of the professional grades and fields. Taking all of the fields together (as is the case for the *Other* category, which is not weighed since several fields are grouped therein), we can see that for the number of researchers belonging to each field,

eight of these fields (Pyschology (Psych, 2.929), Linguistics (Ling, 2.684), Law (Law, 2.200), Pediatrics (Ped, 2.187), Medical Sciences (Med Sci, 1.929), Economy (Econ, 1.547), Sociology (Sociol, 1.447) and Life Sciences (Life Sci, 1.255) female researchers are more prevalent than male researchers. In contrast, their values for professional output in these fields are lower than those for men across the board.Moreover, in two of these fields Sociology (Sociol, 0.966) and Life Sciences (Life Sci, 0.798), male researchers outperform female researchers, despite being in the minority.

From the standpoint of professional grade parity, for three grades the results vary significantly from field to field ($F_{2,66}$ = 3.234, *p-value* < 0.05). In general terms, it can be said that the results obtained in this research would show that the weight of women declines as their professional grade rises.

The average of the GPI value weighed as per number of researchers in each of the fields stands at 1.317 for the entire population, somewhat higher to the real proportion of women belonging to the system (3192/2823 = 1.131). This comes about because of the strong presence of women in the fields with higher numbers of human resources devoted to research, such as Life Science (Life Sci), Medical Sciences (Med Sci) and Pediatrics (Ped). The aggregate level of the presence of women declines with the professional grade, with the highest professional grade standing below the parity mark, since the values are above 1.80 at the lowest grade (Ca), and move to 1.47 at the middle grade (L_1), and to 0.83 at the highest grade (Up_L).

In terms of gender and field, a slightly different comportment is observed in the distribution of scientific output of men and women registered in PPI. The aggregate, as gauged by the weighted average of the number of publications, comes to a weighted GPI of 0.951, which signals, on one hand, global parity in the number of publications, but a loss of output efficiency among women, because it is lower than the value calculated for resources. As such, with regard to female output as a function of professional grade, one observes a relationship similar to that already obtained for the number of male researchers. This female output declines from its initial professional grade (Ca), where female output is 62.4% higher than their male counterparts, to much lower output values at the highest professional grades, where the balance tips significantly toward male output (0.734). At the intermediate professional grade (L_1), the output of women researchers begins to drop off, but in general terms remains above that exhibited by men by 37.6%. This diminishing output by female researchers (as they move up in professional grade) is seen across all fields, except once again in Technological Sciences (Tech Sci), where their output increases hand-in-hand with professional advancement. The differences observed in the parity indexes of the fields

are not statistically attributable to professional grade of the researchers ($F_{2,66}=1.805$, *p-value* = 0.1725).

Table 4. GPI (Gender Parity Index) of the number of researchers and number of papers published by field and PPI rank (Researcher Promotion Program).

	Number of researcher (r)				Number of papers published (p)			
	GPI-r				GPI-p			
Fields	Ca	L_1	Up_L	Total	Ca	L_1	Up_L	Total
Life Sci	2.314	1.521	0.736	1.255	1.606	1.289	0.596	0.798
Tech Sci	0.759	0.972	1.039	0.894	0.796	0.871	0.963	0.906
Med Sci	2.804	2.032	1.156	1.929	2.131	1.796	1.121	1.453
Agr Sci	1.288	0.81	0.5	0.848	1.069	0.88	0.425	0.681
Ped	2.343	2.63	1.176	2.187	2.272	2.719	1.05	1.805
Chem	1.317	1.026	0.577	0.846	1.681	0.837	0.447	0.534
Econ	1.826	1.238	1.556	1.547	1.881	1.066	1.643	1.432
Phys	0.226	0.273	0.144	0.21	0.291	0.29	0.168	0.193
Sociol	2.2	1.543	0.974	1.447	2.338	1.552	0.742	0.966
Math	0.455	0.589	0.4	0.49	0.796	0.593	0.293	0.405
Arts	1.24	2.174	0.842	1.448	0.903	1.649	0.68	1.049
Earth Sci	0.643	0.676	0.472	0.594	0.508	0.798	0.292	0.435
Ling	5.444	2.5	1.474	2.684	5.969	4.059	1.759	2.25
Hist	1.308	1.375	0.742	1.05	0.876	1.502	0.801	0.92
Polit	3.8	0.783	0.793	1.053	2.805	0.517	0.763	0.762
Law	2.333	3.083	1.286	2.2	1.208	3.162	1.081	1.608
Psych	2.778	5.833	1.692	2.929	3	6.721	2.082	2.889
Philo	1.125	0.364	0.667	0.6	1.13	0.643	0.83	0.776
Anthro	0.2	1.111	0.8	0.794	0.049	1.464	0.764	0.82
Geo	1.333	1	0.8	1.05	1.1	1.025	0.785	0.896
Astro	0.5	0.333	0.3	0.333	0	0.122	0.241	0.224
Ethics	0.5	3.5	2	1.571	0.611	1.24	2.269	1.464
Other	1.783	1.286	1.6	1.657	1.889	0.651	2.243	2.383
Weighted average	1.805	1.469	0.829	1.317	1.624	1.376	0.734	0.951

Gender Success Rate (GSR)

Table 5 presents the Gender Success Rates for female researchers. Said table shows the ratio of output (number of papers published) to input (number of researchers) as each is gauged by its respective GPI value. The GSR value determines the observed gender performance against the expected gender performance gauged as a function of the proportion of female researchers in both outputs and inputs. In order to better understand this indicator, one must take into account that if in a given field women account for 80% against

the population of men (GSR r=0.80), one would expect scientific output, as gauged by the number of papers published and reported in CVs to be similar. If the percentage of papers published by women against those published by men is higher than expected, then the GSR value would come in higher than 1.0, and we can safely speak of the greater success of women in the field where women outperform men.

These conditions of success occur regardless of gender proportions in any given field; which is to say, there are fields with higher proportions of females who also publish more papers than the their male counterparts. These fields are marked with double asterisks (**) in *Table 5*. Despite this, male researchers are more efficient; for example, in the fields of Med Sci (GSR=0.753) and Ped (GSR=0.825). Likewise, there are fields with a higher proportion of female researchers, but which nonetheless exhibit fewer papers published than those published by men. These fields are marked with an asterisk (*) in *Table 5*. In this sense, there are fields such as Life Sciences (Life Sci), where despite the fact that women constitute the preponderance of researchers, they are less effective in terms of the number of papers published (GSR=0.636). This is the case across the three professional grades. As such, the GSR at the entry grade (Ca) of 0.694 and at the intermediate grade (L_1, of 0.847 is worthy of note; which is to say: even when women publish more papers than their male counterparts, they do so at a lower than expected proportion.

Additionally, for fields in which women are in the minority, we never observe the circumstance of women outperforming men in terms of papers published; but there are fields in which none of the three scenarios described above occur. These cases appear in *Table 5* without asterisks. Interestingly, in this context, the field of Technological Sciences (Tech Sci), women are slightly more efficient than men (GSR=1.013), despite being in the minority (GPI-r=0.894) and less productive overall (GPI-p=0.906).

In the field of Physics (Phys), where women are in a small minority (GPI-r=0.21) and account for a low proportion of published papers (GPI-p=0.193), women exhibit gender efficiency near parity (GSR=0.919). In Chemistry (Chem) at the Candidate grade (Ca), women are more efficient than men; however, when analyzed as a whole, men turn out to be more efficient than women. In the social sciences, e.g., Economy (Econ, GSR=0.926) and Psychology (Psych, GSR=0.986), women exhibit values near gender parity, while in Sociology (Social) the index is much lower at (GSR=0.668).

Table 5. Output efficiency rate of male and female researchers
by field and professional grade

Fields	Gender Success Rate (GSR)			
	Ca	L_I	Up_L	Total
Life Sci	0.694**	0.847**	0.810	0.636*
Tech Sci	1.049	0.896	0.927*	1.013
Med Sci	0.76**	0.884**	0.97**	0.753**
Agr Sci	0.83**	1.086	0.850	0.803
Ped	0.97**	1.034**	0.893**	0.825**
Chem	1.276**	0.816*	0.775	0.631
Econ	1.03**	0.861**	1.056**	0.926**
Phys	1.288	1.062	1.167	0.919
Sociol	1.063**	1.006**	0.762	0.668*
Math	1.749	1.007	0.733	0.827
Arts	0.728*	0.759**	0.808	0.724**
Earth Sci	0.790	1.180	0.619	0.732
Ling	1.096**	1.624**	1.193**	0.838**
Hist	0.67*	1.092**	1.080	0.876*
Polit	0.738**	0.660	0.962	0.724*
Law	0.518**	1.026**	0.841**	0.731**
Psych	1.08**	1.152**	1.23**	0.986**
Philo	1.004**	1.766	1.244	1.293
Anthro	0.245	1.318**	0.955	1.033
Geo	0.825**	1.025**	0.981	0.853*
Astro	0.000	0.366	0.803	0.673
Ethics	1.222	0.354**	1.135**	0.932**
(*) Fields in which female researchers are majority.				
(**) Fields in which female researchers are majority who publish more papers than male counterparts.				

Finally, the relational chart in *Figure 3* presents the ten most productive fields for each of the three professional grades. The abscissa axis shows the GPI-r values and the ordinate axis shows the PPI-p values for the fields selected. Additionally, two axes have been marked at GPI=1 to differentiate those fields in which women are majority and in which their output is higher or lower than that of their male counterparts. The 45° line acts as a gender success boundary: the fields above it are those in which women exhibit greater success; and those below correspond to fields in which male researchers are most successful. *Figure 3* shows women are more successful at the grade of Candidate (Ca). This is also true in the fields of Physics (Phys), Mathematics (Math), Chemistry (Chem) and Sociology (Sociol). Women at the grade of L_1 are more successful in the fields of Pediatrics (Ped), Agricultural Science (Agr Sci) and Earth Sciences (Earth Sci). With the exception of the field of Physics,

which is shown practically atop the 45° boundary, there is no field in which women are more successful than men at the highest profession grade (Up_L).
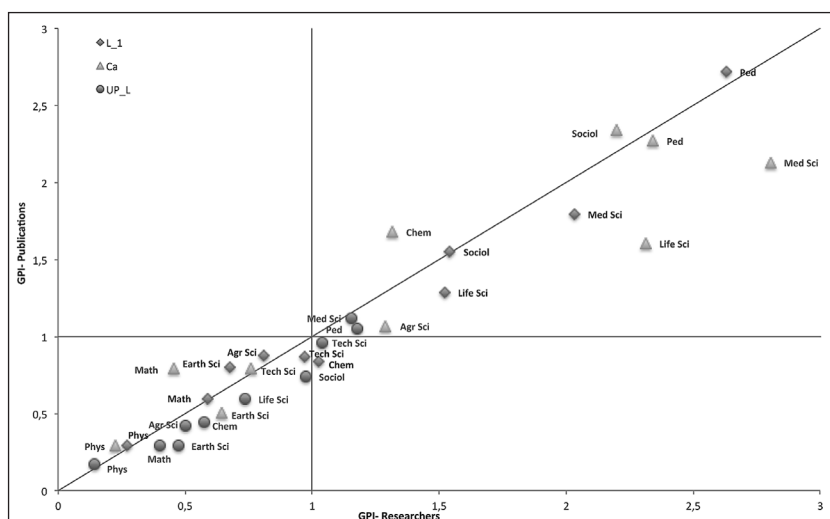

Figure 3. Relational graph. Ten most productive areas (>3.000 papers published). Three professional grades.

Conclusions

In general terms, research in the Venezuelan scientific system under the auspices of the Researcher Promotion Program is characterized by having larger numbers of women than men in research activity; however, in aggregate terms the scientific activity of men, gauged by papers published, is higher than that of women. When both distributions are broken down by field, no significant gender differences are observed (*p-value* > 0.05). From the standpoint of numbers of researchers in the five largest research fields, those of Life Sciences (Life Sci, 55.6%), Medical Sciences (Med Sci, 65.9%) and Pediatrics (Ped, 68.6%) exhibit a strong female population. We also must stress the larger proportion of women in social science fields with lower scientific research output, i.e., Economy (Econ, 60.7%), Linguistics (Ling, 72.9%), Law (Law, 68.8%) and Psychology (Psych, 74.5%).

This preponderance of female researchers is also evident in papers published in these fields, with the exception of Life Sciences (Life Sci), where women publish fewer papers than men. In general terms, however, the women's share of scientific output in these fields is lower than the share expected in terms of their respective populations. Caputo, Requena and Vargas (2012)

come to a similar conclusion with regard to Life Sciences (Life Sci), when they assert: "…Venezuelan female biologists are less productive than their male counterparts." This is a first indicator of the lower success of women in the Venezuelan scientific system, which could be caused by the greater difficulties faced by women who are trying to carry out scientific research. Moreover, this phenomenon has been observed in other countries (ETAN, 2000; Pérez Sedeño *et al.,* 2003).

When the data analyzed is broken down by professional grade and gender, we observe fewer from the global standpoint women than men in the highest professional grade (Up_L). When looking at numbers of researchers in the three professional grades of each field, we see that the differences are not statistically significant ($p > 0.05$); however, in view of the number of papers published these differences are significant ($p < 0.01$). In light of the fact that women at the highest professional grade are less productive than men at this grade, we can assert that this outcome is not caused by advancement, but rather by some other cause, insofar as these causes have already been examined in other research, such as research into the effects of age (Fox, 1983), child rearing (Prpić, 2002) or of observed gender differences in the degree of specialization in some fields (Leahey, 2006).

When parity indices are examined, we obtain results consistent with the aforementioned results. These measurements allows us to compare the degree of parity between both inputs (number of researchers) and outputs (number of papers published). Taken as a whole and as weighted averages, women make up a majority of researchers in the Venezuelan scientific system by a margin of 32% over men; however, their productivity is almost 5% less than that of their male counterparts. These differences are even more unambiguous at the highest professional grade (Up_L), where the average value of the number of women is 17% less than that of men and where women publish 27% less papers than their male counterparts. Even though the differences observed in the three professional grades are significant, one might say that they are not conclusive; since the value obtained ($p = 0.046$) is quite close to the critical value. When the number of papers published in the three professional grades is examined, the differences between men and women are not significant ($p > 0.05$).

In global terms, the calculation of the success rate of Venezuelan female scientists shows that women are slightly more successful than their male counterparts in three fields: Philosophy (Philo), Anthropology (Anthro) and Technological Sciences (Tech Sci). When the success rate is examined across the three professional grades, it is clear that parity is not linked to efficiency, because in parity situations favorable to women, their efficiency may be

greater or lesser than that of men in any of the professional grades. For example, across all of the professional grades of Life Sciences (Life Sci), despite women being in the majority and exhibiting higher outputs rates than men, it is lower than expected, which indicates that men, even with lower numbers, are more efficient than women in terms of scientific output.

Where parity does not favor women in terms of numbers of researchers and scientific output, they may well be more efficient than men. This is the case observed across the professional grades in the field of Physics (Phys) and at the Candidate level (Ca) in the field of Mathematics (Math).

In all of the fields where the women are majority and their scientific output is inferior, we find that female efficiency is also inferior to that of men. This occurs only in a few cases, such as in the professional grade L_1 in the field of Chemistry (Chem) and in the professional grade Up_L in the field of Technological Sciences (Tech Sci).

The results of this study allow us to state that the women constituting a majority in the scientific milieu has not helped them improve their productivity. In this sense, policies aimed at increasing the number of women in research positions are insufficient, because, as these results suggest, parity policies alone do not necessarily imply equal opportunities, though such policies are doubtless important to achieving such ends. As indicated in the ETAN Report (2000), many social, economic and political factors could explain the results observed in this study regarding the scientific careers of women. These factors are not easily addressed in the relatively short time that has transpired since actions have been implemented to correct this injustice.

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Self-assessment processes as objects of research in the Inter-American School of Library Science of the University of Antioquia

María-Teresa Múnera-Torres
Orlanda Jaramillo *
José-Daniel Moncada-Patiño **

Abstract

The article gives an account of the self-assessment process carried out in 2011 at the Inter-American School of Librarianship at the University of Antioquia for the purpose of renewal of the High Quality Certificate. This process is presented as an object of research and can serve as a benchmark for other institutions involved in similar activities.

Keywords: Accreditation; Self-Assessment; Science Information; Library Science; Quality Assurance.

*   Both researchers belong to the University of Antioquia, Colombia. (Maria: mmuner@bibliotecologia.udea.edu.co); (Orlanda: ojara@bibliotecologia.udea.edu.co)

**   Ministry of Culture-National Library of Colombia, jdmoncada@mincultura.gov.co

Resumen

Procesos de autoevaluación en la Escuela Interamericana de Bibliotecología de la Universidad de Antioquia, en clave de investigación
María Teresa Múnera Torres, Orlanda Jaramillo and *José Daniel Moncada Patiño*

El artículo da cuenta del proceso de Autoevaluación (2011), con fines de renovación de la Acreditación de Alta Calidad, que se desarrolló en la Escuela Interamericana de Bibliotecología de la Universidad de Antioquia, como una dinámica de orden investigativo, que pueda servir como referente a experiencias similares.

Palabras clave: Acreditación, Autoevaluación, Ciencia de la Información, Bibliotecología, Aseguramiento de la Calidad.

Introduction

The self-evaluation process for securing certification of higher education programs of the Inter-American School of Librarianship of the University of Antioquia promote ongoing innovation and improvement actions, in addition to providing an excellent opportunity for the institution to reaffirm its commitment to change, as it reviews its current status and projects toward the future, thereby ensuring its role as a socially legitimate institution and leading benchmark in higher education in the field of Information Science, both here and abroad.

Because the certification means to make oneself deserving of credit, which is to say one earns or ratifies the trust by producing the evidence of quality and believing in it, self-evaluation and certification processes allow the institution to verify and maintain societal and state supports, while facilitating dialogue with its peers in other national and international university programs.

This paper provides a description of the most salient aspects of the latest self-evaluation carried out in the Inter-American School of Library Science (EIB) as part of its certification process. Moreover, researchers describe a problem to be solved; a methodological approach and analysis of information gathered; while also examining the results of the measurement techniques deployed for the purpose of assessing the quality of the University of Antioquia

Library Science program. This examination is executed in light of current Colombian legal standards and culminates with conclusions and recommendations. The text of which is cited in *Resolution* 14957 (Nov. 19, 2012) issued by the National Ministry of Education, which brings together recommendations of the National Accreditation Board to the Program.

Methodology

The methodology developed for the accreditation process is executed pursuant to the guidelines issued by the National Accreditation Board (CAN), an agency of the Colombian Ministry of Education (MEN), and in the general terms is rolled out in three stages: self-evaluation, evaluation by external peers and final evaluation carried out by the CAN on the basis of the information gathered in first and second stages.

Statement of the problem

Since the formation successful professional practitioners is achieved through proper and efficient academic preparation, the quality of higher education is one of the most important aspects entailed in the performance of a professional equipped with a body of knowledge and competencies learned during his or her education. Nonetheless, some areas of professional performance exhibit limitations and other deficiencies that could be improved. Consequently, it is necessary to carry out a dynamic process to study the diverse aspects that influence, whether positively or negatively, in the academic formation of certain professionals. In this sense, governments of diverse countries in the world have created and promoted review dynamics and self-regulatory or self-evaluation processes in universities and corresponding academic programs. One of said dynamics is the definition of self-evaluation protocols with the aim of achieving high accreditation scores and attendant prestige in larger society. This paper aims to learn about the most recent self-evaluation carried out in the Inter-American School of Library Science of the University of Antioquia for the purpose of securing High Quality Accreditation for its Library Science program.

Objectives

The objectives sought by the self-evaluation process are set as per the guidelines issued by the National Accreditation Board of the Colombian Ministry

of Education. Consequently, the academic programs accreditation process pursues the following objectives: (Ministerio de Educación Nacional, Consejo Nacional de Acreditación, 2006a: 38):

a) To serve as an accountability mechanism for institutions of higher education before society at large and the state with regard to the quality of the educational services they provide.
b) To be an instrument by which the state attests to the quality of the higher education programs.
c) To provide reliable information to users of the higher education services and inform the National Information System created by law.
d) To promote improvement of higher education.
e) To promote the aptitude and solidity of academic programs, especially with regard to the Inter-American School of Library Science of the University of Antioquia.
f) To posit a quality paradigm for Colombian higher education programs, specifically with regard to the library science education.
g) To be an incentive for academic staff insofar as it explicates the purpose and credibility of their work and promotes acknowledgment of their efforts and achievements.
h) To promote the practice in institutions of verification of compliance with mission, purposes and objectives within the framework of the Constitution and the Law pursuant to their own by-laws.

ACCREDITATION PROCESS METHODOLOGY

The accreditation of process consists of the stages of self-evaluation, external evaluation and final evaluation, which are executed consecutively as described below.

Self-evaluation stage

Within the framework of high quality accreditation, self-evaluation constitutes an important instrument of reflection and support for the purpose of reviewing the degree of quality of the institution of higher education or a given academic program. This process includes an evaluation of the university or given academic program carried out by the institution itself on the basis of criteria defined by the agency coordinating the quality assurance programs in each country. In Colombia, this agency is the National Accreditation Board, which in turn is an

agency of the National Education Ministry. The self-evaluation criteria are expressed in factors, characteristics and indicators (MEN/CNA, 2006a: 49).

Each institution must implement a self-evaluation that includes the participation and commitment of constituent stakeholders; that is, students, teachers, administrators, directors, alumni and employers. Moreover, the following stages are required:

a) Establishment of the self-evaluation committee;
b) Process design and methodological development , and
c) Analysis and interpretation of results, and issuance of a final report.

External peer evaluation stage

This stage is carried out fundamentally on the basis of the self-evaluation report, on which basis results are verified. The stage also entails identification of the internal operation conditions of the university or academic program under study, ultimately allowing a judgment to be issued with regard to the quality of said university or academic program.

This activity is the responsibility of the external peer, who on the basis of the self-evaluation identify the internal operation conditions of the university or academic program, verify data, compare documentation and information gathered directly in meetings with stakeholders (teachers, directors, students, alumni and employers); and finally issue conclusions in a peer report submitted to the agency authorized in each country to coordinate the quality assurance process. In Colombia, this agency is the CNA. This process is carried out on the basis of program accreditation guidelines and legal standards governing the program accreditation process for accredited institutions.

Final evaluation stage

This stage entails the final evaluation issued by the coordinating agency in charge of quality assurance in the country, i.e., the Colombian National Accreditation Board, and includes the results of the self-evaluation and external peer evaluation.

Using the information supplied by external peers, who have issued an assessment of the quality of the program and recommendations for improvement of the same, the CNA assess the evaluation and submits its judgment to the National Education Ministry, the agency with final authority to renew the high quality accreditation.

Scope

The self-evaluation accreditation process examined herein is the most recent process executed by the Inter-American School of Library Science of the University of Antioquia. The period under review in the self-evaluation process extended from November 2004 to November 2010.

EIB Self-evaluation process

In the case of the Inter-American School of Library Science (EIB) of the University of Antioquia, the self-evaluation is the activity by which the Academic Unit analyzes and examines the condition and quality of one of its academic programs, i.e., the Library Science program. In fact, it is the key strategy used to examine its commitments and procedures, while gathering information needed to understand to what degree programs are fulfilling their mission and objectives; as well their relevance, quality and commitment to ongoing improvement. Moreover, this examination serves to assess to what degree the profession is socially viable. To achieve this end, the school implements and executes a self-evaluation process involving all stakeholders (students, professors, alumni, administrators, directors and employers), for the purpose of submitting results to the scrutiny of academic peers who in turn express their views regarding the conditions and quality of the Library Science Program.

In the Inter-American School of Library Science of the University of Antioquia, the self-evaluation process is deployed in three phases: (Universidad de Antioquia Escuela Interamericana de Bibliotecología, 2011: 40):

1. Establishment of the committee.
2. Methodological design of the process.
3. Process results.

Establishment of the committee

The coordinating committee consists of three professors with experience in the EIB in accreditation self-evaluation processes. The purpose of this committee is to consolidate the evaluation as a key component of the Library Science Program on the basis of a participative methodology in close contact with the actors involved in the evaluation process.

In order to have an instrument that can serve as a road map for the development of this activity, the committee designs a self-evaluation action plan,

which contemplates the tasks, calendar and duties involved. This plan is subject to ongoing review and adjustment. Moreover, the plan is shared with all of the stakeholders in the academic community, i.e., students, administrators, alumni and employers. This action plan becomes the basic tool for orienting and regulating the process, and its main purpose is to juxtapose the information gathered against the context and reality of the program under review. Consequently, the main activity is focused on the constant analysis of the information and communication with the academic community.

- Review and analysis of the existing document
  After drafting the action plan, the committee takes on the central task of reviewing and analyzing the information contained in the primary and secondary sources. This task is executed exhaustively, with rigor and objectivity, approaches that are essential to the process. The institutional information produced during the accreditation period under review (2003-2010) is approach in this way. Moreover, a review is made of the information contained in files on the EIB held by the University of Antioquia.
- Sensitizing the academic community
  In order to sensitize the community and disseminate the process, the following communication strategies are deployed: posters, motivational and readiness talks (in classrooms within the plan of study), email, School webpage, social networks and the discussion board of EIB.

Process methodology design

The self-evaluation process is designed and developed with a qualitative-interpretive focus, employing a case study methodology using primary and secondary sources of information. This approach employs documental analysis, surveys and group discussions. This stage entails the definition of the population, the techniques and instruments for gathering information, and the analysis and interpretation of the information.

- Population
  To achieve a broad scope, the self-evaluation involves the participation of every group that makes up the academic community of the school (teachers, students, employees, administrators, alumni and employers). These people are the actors and protagonists of the process. As such, their value to the process is duly acknowledged. Each group, as warranted, voluntarily establishes academic and logistical demands

which are taken into account in order to potentiate the work. Sensitization is essential insofar as it makes actors of the subjects themselves and helps the process move forward positively and in a timely way. With the support of the Office of the Vice-Rector of Teaching of the University of Antioquia, the department leading the self-evaluation process in the institution, the survey is applied to all of the groups via email, with the exception of the employers in Medellin who take the survey in person.

- Data collection criteria and techniques

  Documental analysis, surveys and group discussion are the techniques used to gather information.

  – Documental analysis: The documentation produced during the most recent accreditation period (2004-2011) was reviewed and analyzed.

  – Survey: A survey designed specifically by the Office of the Vice Rector of Teaching of the University of Antioquia for the institutional self-evaluation process was applied to each of the groups making up the academic community. This instrument was studied, revised and adapted to the characteristics of the program and the target population.

  – Discussion groups: This quick response technique allows evaluators to gather qualitative information by means of guided discussion in which opinions, perceptions and knowledge of the programs are expressed. This technique was a key source of information for understanding the full scope of the institutional culture. Professors and member of the School Board participated in these discussions which gathered their perceptions and assertions regarding the condition of the Library Science program.

- Survey application criteria

  Students: Students selected had to have completed at least twenty credits of the 144 total required for graduation. In this way, only students having completed at least one semester were eligible to take the survey. A total of 291 surveys were sent out.

  Teachers: The entire body of lecturers associated with the School, including members of the faculty, associate professors and tenured senior staff. A total of 41 surveys were sent out.

  Administrative personnel and employees: The survey was applied to employees with at least one year of service with Library Science program in the period from 2004-2011. A total of 13 surveys were applied to this group.

Alumni: This target population was selected on the basis of all alumni registered in the alumni data base after the year 2000 and from among those participating in activities of the Library Science School during the period 2004-2010. A total of 238 surveys were sent by email to members of this group.

Employers: Institutions known to hire EIB graduates and those with which the university has advisory and consulting contracts were selected. For the purposes of efficiency, the survey was sent out via email to all target groups, with the exception of employers in Medellin, Bogota and Cartagena, who answered the survey in person. *Table 1* shows the total sample and the rate of response.

Table 1. Analysis and interpretation of information and results of the process.

Target populations	Population universe	Total responses	Return rate
Students	291	248	60 %
Teachers	41	27	67 %
Administrators	13	11	90 %
Alumni	238	67	30 %
Employers	23	22	90 %

Once the documental information and the survey data were gathered, analysis and interpretation followed.

- Definition of categories and sub-categories

  For the purpose of analysis of the information, the following categories and subcategories were subjected to the analysis as per the eight features established by CNA for the purpose of self-evaluation of institutions of higher education. These eight features include: Institutional Educational Project; students; professors; academic processes; institutional well-being; organization; administration and management; physical plant and financial resources, which are in turn articulated in 42 specific characteristics and 152 indicators. The surveys were designed and applied to the diverse targets on the basis of these factors. The discussion groups were also informed by these criteria, which provide the basis for the analysis of the information (*Cf.* MNE/CNA, 2006a).

- Analysis of variables

  Once the surveys were applied, the responses per category of the diverse target groups were compared in order to obtained analytical variables. These variables allow one to observe the coincidences and divergences in the opinions expressed by respondents, and this information served to support the descriptive analysis information gathered on the program.

- Descriptive analysis

  Once the categories and sub-categories were defined, evaluators carried out a descriptive analysis of each of the factors of the self-evaluation process. This analysis is characterized by being built on the basis of the voice, perceptions, feelings and opinions of the actors with regard to the diverse processes analyzed in the report. On the basis of the survey designed by the Office of the Vice Rector of Teaching of the University of Antioquia, the responses of the diverse target groups were graphed. The trends observed in these categories, showing and are discussed and explained extensively in the evaluation report.

- Validation and triangulation of the information

  After executing the descriptive analysis, evaluators proceeded to execute the validation and confrontation of results in meetings and discussion with target groups, professors and the Board. This stage is a participative process in which the diverse stakeholders heard the interpretation of the opinions expressed in the surveys. In this process, they had the opportunity to compare, analyze and revise their respective outlooks and perception.

- Weighting of factors, characteristics and indicators

  The self-evaluation committee executed the weighting of the factors in accord with the following criteria:

  1. Guidelines are provided in the self-evaluation weighting of factors and characteristics document (MEN/CNA, 2006), which classifies the factors into three groups: Group 1 includes the institutional project, academic processes, professors, students and alumni; Group 2 contemplates organization, administration and management, physical and financial resources; and Group three entails institutional wellbeing.

  2. Improvement plan and the 2003 self-evaluation process results. Greater weight is assigned to the factors for which the program exhibits weaknesses.

  3. Academic processes considered the purpose of the program.

  As a result of the application of these criteria, the weighting of these factors is done as follows:

Table 2. Factor weights

Factor	Weight
Institutional project and educational project	15
Students	15

Professors	15
Academic processes	15
Institutional wellbeing	20
Administration, organization and management	10
Alumni and articulation with the milieu	7.5
Physical and financial resources	10
Total	7.5

- Characteristics

  The committee adopted the 42 characteristics contained in the self-evaluation guide of the University of Antioquia (2006). The weighting of these characteristics corresponded to the sum of the weights of the indicators corresponding to each one.

- Indicators

  Pursuant to the specifics of the program, the Committee adopted 152 of the 183 indicators included in the self-evaluation guide. Weighting was done with the participation of the professors belonging to the Library Science program and the administrative staff of the School. In accord with the strengths and experience of the teaching and administrative staff, the committee assigned indicators of each factor to a group of three professors who scored the indicators on scale of 1 to 5, as per their respective priority or degree of importance in the Library Science program. The assignment of three evaluators was done in order ensure higher degrees of objectivity in the evaluation process.

- Scoring and quantification of indicators and characteristics

  Once the descriptive analysis of the factors was executed and the corresponding validation by the respective target groups and the Board of the School was completed, evaluators proceeded to score the indicators and characterized evaluated. This scoring process is done in accord with the weights established for each characteristic in the process and the weighting established for each indicator established by the program teachers in their respective areas of expertise. The indicators of perception and characteristics were scored on a scale of 1 to 5.

  On the basis of the points assigned to each factor and the scoring of each indicator it is possible to define the weight of each characteristics in accord with its group of indicators. Once this score is obtained, the committee proceeded to define the determination and importance of each characteristic within the analytical process of the information.

  The final grade was applied to the three groups defined for scoring and weighting as per the percentages obtained in the following qua-

litative rubric: A. Full compliance; B. High degree of compliance: C. Acceptable degree of compliance; D. Unsatisfactory; E. Fail to comply.

Process results

The process of self-evaluation of the Library Science undergraduate program focused on the revision of the 2003-2007 Improvement Plan, in the light of the strengths and weaknesses found by CNA. It is also informed by a comparison of the documents that govern the institutional duties; the results of the surveys applied to the target groups within the EIB academic community; weights accorded to assessment factors; the scores earned for each characteristic and the indicators proposed by CNA.

Consequently, upon executing an analysis of the 152 indicators distributed among 42 characteristics established by CAN to evaluate the quality of the Library Science program, it became apparent that conditions exist to demonstrate the program's quality, as can be seen in the grades obtained in each of the eight factors which are described in more detail below.

Institutional Educational Project (IEP). The school has an IEP, but it needs to be updated in light of the new academic programs and changes in curriculum occurring in recent years. For the period evaluated, two curricular improvements were carried out, which is evidence of ongoing evaluation of the curriculum.

Professors. The faculty has continued to secure professional credentials. To date, all of the professors on staff hold or are candidates for master's degree or PhD. The school is also remarkable for its interdisciplinary character, which is staffed by professors boasting expertise in diverse fields associated with Library Science. The academic output and participation of professors in academic forums and conferences continues to grow, evidencing increasing visibility of the school in both national and international venues.

Students. Inclusion of ICT as part of the professional training of students is remarkable. In the area of research, the modalities of Students in Formation, Research Auxiliaries and Young Researchers are outstanding. Moreover student-professor interactions and communication, and the accessibility of administrative staff with regard to the student community are also worthy of note. A high percentage of students entered the Library Science School as a second option, and they are gradually developing a sense of belonging as they align their personal interests and motivations with the field.

Academic process. For the period under evaluation, several curricular improvements were effectuated, giving rise to the fourth version of the curricu-

lum, which has enjoyed the favor and acceptance of students, professors and extra-institutional sectors. These changes have favored reflection on the foundations of the profession and the roles of the information professional in society.

In addition to these curricular improvements, the school has launched new programs, inducting new cohorts into the Information Science master's degree program, the Publishing and Edition Specialization and the Archive Technology Specialist undergrad program; the latter of which arose from the Library Science School's efforts to respond to the requirements of professional practice. In this way, the school made the determination to strengthen the discipline by offering separate undergraduate studies and merging research activities with its post-graduate programs, bringing together all of these under the umbrella of information sciences."

Institutional wellbeing. The programs and activities of the School aim to provide an environment that promotes the consolidation of the academic community and the comprehensive preparation of the student, while also reducing desertion factors. To achieve this, the Wellbeing Coordination Office of the School carried out community-wide educational, cultural, recreational and financial aid activities, as well as targeted support actions in the areas of academics, and physical and mental health.

Administration, organization and management. One the School's most salient achievements lies in the area of curriculum management, which has received high ratings across the entire academic community, which praises the performance of the Academic Formation Office and acknowledges the outstanding work of the Directorate Office and administrative support personnel.

Alumni and impact in society. Outreach and external consulting efforts are very important for the School. Through such actions, the School establishes contact with larger society, allowing the academy to participate in society, while keeping abreast of the realities of the working world and identifying the needs and demands of employers. Moreover, by working in a consulting and advisory role, the School gathers invaluable feedback, which is used to improve the curriculum. According to the scores assigned, alumni-School interaction and the impact of ongoing professional education are areas in need of improvement.

Physical and financial resources. A university level educational institution requires appropriate budget management in order to operate properly. In this regard, the investments committed by the School in recent years in the physical plant, classrooms, equipment, furnishings and informatics resources are quite remarkable. Moreover, the School has made considerable efforts to support participation of stakeholders in academic event. All of these actions are key to ensuring the proper implementation of the program. A sig-

nificant percentage of these resources are devoted to providing university extension and outreach services.

Overall assessment of the program

In light of the strengths and weaknesses found by the CNA, the internal institutional comparison and the results of surveys applied to stakeholder groups in the EIB academic community, it is evident that the 2003-2007 Improvement Plan has fulfilled stated goals and has made a proper accounting to society. Moreover, the Plan carried forward actions to enhance the School's quality and social affiliation, as can be seen in the renewal of its qualified registration; and in the following academic programs: Library Science, Archival Technology, Specialization in Information Services Management, and Specialization in Publication and Edition. This outlook is also support by the launch of the Information Science master's degree program, and the approval of the professionalization of the Archival Technology program, as well as by a broad range of activities and supports associated with public policy in reading and libraries, the Student Talent Stimulus and Young Researchers programs, as well as management of profitable, professional consulting contracts.

The weaknesses in terms of students and professors that persist are structural in nature: that is, they correspond to the conditions of the country's educational system. Nonetheless, the School has implemented diverse mechanisms to achieve quantitative and qualitative improvements in its teaching staff, promoting and supporting teachers' effort to attain master's degrees and doctorates. This holds true for both staff faculty and associate professors. These actions include support for professors wishing to attend national and international events and for service on administrative commissions. Moreover, the School supports ongoing education and sabbatical leave for qualified candidates. The school has also had notable success in promoting public calls for papers among the professional teaching and research staff, which has had a positive impact on publication of research and concomitant improvements in remuneration.

Student desertion rates have been lowered, while making their passage through the program of studies much more agile. These achievements can be attributed to the many programs deployed by the University Wellbeing Office and counseling services provided by the Academic Formation Office. The executive directors have not failed to invite students to participate in diverse academic-administrative agencies.

The lack of flexibility of the curriculum is a weakness that is currently being addressed through the design of strategies to associate students with the three latest versions of the plan of studies, which include providing common

core courses in Archival Technology, promotion of the *Sígueme* [Follow me] program, recognition of elective course credits successfully completed in other schools and new professional elective options.

Moreover, the strengths identified in previous evaluation reports have been preserved and consolidated. These elements include: the *Revista Interamericana de Bibliotecología* (RIB) [Inter-American Library Science Journal], assigned to category A2 of Publindex, and the Grupo de Investigación en Información, Conocimiento y Sociedad [Information, Knowledge and Society Research Group], assigned category A in Colciencias; an overall increase in research and papers published and professional consulting contracts; continuity of the Student Talent Stimulus and participation in the Young Researchers program; ongoing curricular evaluation activities made patent in curriculum versions five and six; national and international acknowledgement of the School and its professors in the form of awards, including the Premio [Prize] Luis Florén (ASEIBI), Premio Rubén Pérez Ortiz (ASCOLBI) and the Juan del Corral Order of Merit from the Medellin Council. The prevalence of master's and doctorate degrees among the faculty is also remarkable. Finally, one of the principle strengths stressed by the CNA is associated with the administration and management of the program, which during the period under evaluation was consolidated and strengthened, as evidenced in the annual action plans and corresponding management reports.

Also remarkable are the implementation of innovative actions such as securing for the second time qualified registration of the program; the launch of the Edition and Publishing Specialization; the launch of the first cohort of twelve candidates in the Information Sciences Master's program, hailing from fields as diverse as engineering, library science, social communication and nutrition; numerous consulting contracts and participation in establishment of public policy in the areas of reading (CERLALC, National Plan for Reading and Libraries, Municipality of Medellin, Library Parks); the development of the Student Talent Stimulus program; participation in the Young researchers program directed by the Vice Rector's Office of Research of the University of Antioquia and the School's capacity to self-finance the program.

In accord with the guidelines of the National Accreditation Board and the results of the self-evaluation, we conclude that the Library Science program has earned a high quality score of 4.1 out 5 possible points, a score achieved on the basis of fully addressing and remediating the weaknesses cited in the 2004 report. We fully expect the School to preserve its strengths and to persevere in the implementation of innovative actions to promote the growth of the EIB in accord with the increasing demands of society, and within a context of multifaceted competition, complex interconnectivity and rapid change.

External evaluation

The external evaluation states that the factors undergoing self-evaluation within the EIB have an overall compliance rank of "in high degree." This evaluative judgment is supported by the following strengths observed:

> The faculty teaching staff is of a very high level, the staff has been expanded […] Strong incidence of staff studying for master's or doctorate degrees […]. The areas of research and outreach are quite solid and with the potential of generating high level knowledge that can be exploited much more in terms of bringing in revenue and ensuring the sustainability of the School. The School had Colciencias category A research groups with papers published. There is ample evidence of increased research activity in conjunction with the continuation of the Inter American Library Science Journal (RIB) in category A2 of Publindex; the participation of academic staff in national and international colloquies, in addition to a body of papers translated for publication in foreign journals […]. The academic community (students, teacher and administrators) is very strong and cohesive, working in an atmosphere of trust and security […]. The School has near- and medium-term plans to strengthen all facets associated with teaching, research and administration of the EIB (External peer evaluation report, July 2012).

Final evaluation and public acknowledgement of quality

On the basis of a review and analysis of the information contained in the reports on the processes of self-evaluation and external peer evaluation, the National Accreditation Board of Colombia submitted a definitive assessment to the Colombian Ministry of Education, which is the authority ultimately granting the renewal of the High Quality Accreditation of the Library Science Program. Consequently, on November 19, 2012, it issued *Resolution* number 14957 by which the High Quality Accreditation is extended for a term of eight years. This accreditation is granted on the basis of the program's continuing relevance, interdisciplinary nature, curricular flexibility in the service of developing students' research competencies , the strength of the teaching staff, increased academic output and the School's outstanding cooperative effort among local, national and international academic communities, as well as its collaboration with professional guilds and the "Information, Knowledge and Society" research group, classified by Colciencias in category A; the Inter-American Library Science Journal, classified at A2 by Publindex and the recognition of and awards earned by the School and its faculty from ASEIBI, ASCOLBI and local governmental authorities.

Notwithstanding having secured the renewal of the High Quality Accreditation, the Library Science program must focus its attention on strengthening the teaching staff, research activities, bilateral national and international mobility of teachers and students, and building relationships with alumni. The school should also seek a better balance between administrative and academic activities of faculty. It should also promote participation of the student body in decision making instances of the program, while improving the transition between the diverse versions of the curriculum and optimizing the quality of the supply of technology for the program and achieving further reduction in the desertion rate.

Conclusions

The accreditation processes are fundamental in the dynamics of evaluation and ongoing improvement of higher education. In Colombia these processes began to be introduced after the promulgation of the *Higher Education Act 30* in 1992. This Act stimulated the introduction of processes of ongoing improvement and quality assurance, an approach the country embraced enthusiastically, placing it among the leading nations in the development of new institutional self-regulating paradigms.

Colombian accreditation dynamics are executed on the basis of methodologies and procedures established by CNA, a government entity in charge of orienting and leading evaluation accreditation processes of diverse institutions of higher education in the country. Consequently, the stages of the accreditation process, such as self-evaluation, external peer evaluation, and final evaluation comprise an interesting activity of reflection and review of the academic and administrative realities of the institution and academic units offering professional training programs. It provides an opportunity to identify strengths and weaknesses, while introducing significant actions and innovations that contribute to improvement and modernization of these endeavors.

In 1997 EIB embraced this process which allowed it to recognize and reveal itself as the country's leading Library Science teaching institution. As a result in 1999, the Library Science secured accreditation from the Ministry of Education/CNA for a period of four years. In 2004 it was granted renewal of the accreditation for seven years, and in 2012 it secured high quality accreditation for a period of eight years.

The Inter-American Library Science School has been at the vanguard of quality assurance/accreditation processes Latin American. Through deploy-

ment of these processes, the school has earned recognition for educating high-quality professionals and their projection into society, while constituting a benchmark for the implementation of institutional assessment processes. Moreover, these processes have allowed the school to generate dynamics to improve the curriculum, while ensuring the quality of faculty and promoting research, which has resulted in greater academic output. The school has also been able to improve the physical plant and equipment required to develop the program.

The successful completion of the self-evaluation and accreditation places the EIB face-to-face with the challenge posed by its first international self-evaluation, the doorway to a new period of quality assurance. In terms of the results obtained in these three processes, the progress and quality of the School in the area of curriculum, research and retention of enrollment is clearly evident. Improvements in administrative and curriculum management, especially with regard to aiding teacher secure their master's and doctorate degrees are also patent. Quality assurance actions implemented in the first accreditation process, such as the publication of scientific journals, participation in national and international conferences and the sustainability of professional external consulting services, are also worthy of note. Interestingly, the scores earned on the self-evaluation and the eternal peer evaluation were very similar, a circumstance also reflected in the final evaluation report issued by the National Accreditation Board of the National Ministry of Education.

In general terms, the self-evaluation and accreditation processes have allowed the School to optimize curricular processes, develop planning on the basis of approaches established in the self-evaluations, which lend a long-term strategic character to the program, thereby clearing the way to re-structuring of both administrative and curricular processes for the purpose of modernizing the course of study and the Institutional Education Project. On the other hand, the School has also learned about certain weaknesses associated with the scant participation of alumni in its vocation, the lack of systemization to ensure permanent improvement, and the need to create and implement an effective communication plan with stakeholders in the academic community. Likewise, this process challenges the School to take on the task of securing international accreditation.

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The concept of information in Library Science, Sociology and Cognitive Science

Jaime Ríos-Ortega *

Abstract

The term *information* has become and essential concept in the field of library science and associated disciplines. The proper meaning of this term necessarily depends on epistemological context. Moreover, its intra-theoretical and polysemic potential has led the term to be used in multiples senses, ranging from the contexts of cognitive psychology to library science; however, the analysis offered herein underscores the need to define the term more precisely for use in library science and associated fields, so that its meaning is neither degraded nor over-simplified when building useful explicative models. This paper also shows that the meaning of this term has tended to stabilize as re-

*   Institute of Library and Information Sciences of the UNAM. jrios@ibi.unam.mx

quired by theoretical models in which it is employed, while as an isolated theoretical term it retains some degree of ambiguity.

Keywords: Information; Library Science Theory; Information and Society.

Resumen

El concepto de información: dimensiones bibliotecológica, sociológica y cognoscitiva
Jaime Ríos Ortega

El término *información* se convirtió en un concepto esencial para la bibliotecología y otras disciplinas afines. El significado adecuado de este vocablo depende necesariamente del contexto epistémico en que se utiliza. Por otra parte, su carácter intrateórico y polisémico ha multiplicado los sentidos en que se ha utilizado, como es el caso de la teoría de la información, la sociedad red, las sociedades del conocimiento, la teoría de sistemas, la psicología cognoscitiva y, por supuesto, la bibliotecología. Sin embargo, el análisis que se hace en este artículo demuestra la necesidad de precisar el significado con el cual ha de aplicarse, principalmente dentro de la bibliotecología y las disciplinas afines, con objeto de no degradar o simplificar al máximo la utilidad teórica requerida en la construcción de modelos explicativos. En este artículo también se prueba que el significado de este término tiende a estabilizarse, aunque necesariamente articulado a las entidades teóricas de la disciplina y no más como un término teórico aislado.

Palabras clave: Información; Teoría Bibliotecológica; Información y Sociedad.

Introduction

The concept of information is increasingly ubiquitous and the same has occurred with the information processing technology. Both of these areas have undoubtedly been protagonists on the world stage for several de-

cades in national and international academic communities. Moreover, the upsurge of information theory and technological-scientific development accompanying it has exerted multiple impacts on society, culture and the diverse disciplines of science. Consequently, Library Science is no exception, and far from being exempt from this influence, it has had to reconfigure its explanatory and normative theoretical models in the light of information theory and attendant technology, and social, linguistic and cognitive conceptions.

This paper identifies three major currents of thought regarding information theory. The first is the sociological approach, the second cognitive and the third arises from Library Science itself. The researcher endeavors to describe the meaning of each concept and the theoretical framework in which each unfolds. It is worth mentioning, that the facets analyzed are an initial approach from the perspective of Library Science, which has the intellectual advantage of establishing the theoretic limits or the empirical scope of the concept of information, something that is key to contributing to the construction of transparent theoretical models in the discipline of Library Science.

FROM THE STANDPOINT OF INFORMATION THEORY

Common sense tells us that over the course of several decades the word information has become indispensable in practically every situational context or discipline. In the common parlance, we know the term has multiple meanings, or otherwise takes on arbitrary meanings; and this rather indifferent usage is something that must be corrected.

Let us begin by reviewing the definition provided by the Dictionary *of the Spanish Language* (DRAE)[1], which basically enumerates eight meanings for the word *information*, herein abbreviated "I": In the first instance, the dictionary states I as the action or effect of informing; the second definition mentions it as the juridical or legal office where something is informed, the third states that I is the juridical and legal investigation of an event or crime; the fourth specifies it as the proof regarding the quality and circumstances needed for a person to secure employment or honors; the fifth describes it as acquisition or communication or knowledge allowing broader or more precise understanding of a given matter; the sixth calls I the knowledge either communicated or acquired; the seventh definitions understands I as the in-

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1   *Diccionario de la Real Academia de Español,* 22th ed., *s.v. información.*

trinsic property of certain biological polymers, such as nucleic acid, originated by the sequences of the component units, and the eighth designates it as education or instruction.

On the basis of dictionary definitions, the diverse contexts are circumscribed to 1) the action and effect of informing; 2) orientational nature of legal proof; 3) cognitive and communication processes; and 4) the biological sphere. The DRAE also mentions the old manner of understanding I as education or instruction.

In the early 1980s, Campbell provided an interesting summary of the cultural and scientific fields in which I played an important role. In this regard he asks:

> What do the codes used to send a message from space and the DNA molecules have in common? How is the second law of thermodynamics, elucidated by a physicist, related to communication in such a way that it is possible to speak of "entropy" of a musical score, a page of text or a conversation? Why are the intricate mathematical theories of probability related to the way in which we express ourselves in spoken and written language? The answer to these questions is "information," and the fact that a single term can link these disparate ideas reveals its great breadth and power.[2]

Campbell goes on to assert that the meaning of I has yet to be determined, something which is still true today, and he mentions that in the Middle Ages the term had several popular and literary uses, but that it also possessed the more active and constructive meaning of: "[…] something which gives a certain form or character to matter or mind, a force that models behavior, trains, instructs, inspires or guides."[3]

Campbell describes that once the concept of I was defined scientifically in the decade of the forties, the impact was so great that the word recovered other meanings, stressing the active sense, as something that "informs" the material world in a way similar to the messages carried in genes, which instruct the machinery of the cells to build the organism, or the signals emitted by a radio transmitter that guide a space ship. Thus, in addition to a scientific definition and its theoretical and technological implication, the concept became a universal principle, which operates and "gives form to the formless, specifying the particular character of living forms and even helping to deter-

2　Jeremy Campbell, *El hombre gramatical*, p. 13.
3　*Idem.*

mine by means of special codes the models of human thought."[4]In this way, according to Campbell, I spans across disparate fields from the space-age computing, through classical physics, molecular biology, human communication and evolution of language to human evolution itself.

The creation of a scientific concept of I can only be accomplished from a theory of information, that is, as part of an explicative system that strives to resolve theoretical or abstract problems and other issues both phenomenological and practical. Campbell explores said theory and posits it as a gateway to a field of knowledge as vast as nature itself and as complex as the human mind. Interestingly, I should be understood within the framework of complementary forces that allow for an explanation of the world, that is, entropy as an agent of chaos in which I is not simply a chance element "that exploits the inherent incertitude in the principle of entropy in order to generate new structures for the purpose of conforming the world in new ways."[5] Likewise, the central idea posited is summarized as follows:

> The information theory shows that there are good reasons to believe that the non-accidental forces are as universal causality, even when entropy has been presented as the most overwhelmingly powerful principle. The appropriate metaphor for the process of life perhaps is not the tossing of two darts, nor a spin of the roulette, but rather the phrases of a language which carry information that is partially predictable and practically unpredictable. These phrases are produced through rules that obtain a lot from very little, generating an unlimited wealth of meanings from a limited set of words, allowing language to be both familiar and surprising, limited while entirely unpredictable within its boundaries.[6]

In this way Campbell concludes with a universal assertion that can be understood by virtue of information theory and which stands counter to the assertion of entropy (exception and confusion as a rule governing the world), which states that sense and order can prevail against chaos in such a way the order is also completely natural.[7]

As such, in conjunction with common uses of I, distinct concepts have been proposed, even though on occasions one gets the impression that it is a matter of a *presupposed* concept whose use in other theories generates *theo-*

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4   *Ibid.*, p. 4.
5   *Ibid.*, p. 9.
6   *Ibid.*, p. 10.
7   *Idem.*

ry-dependent concepts, or that the idea has achieved the status of *meta-scientific* concept.[8]

In the era of information and the knowledge society

In this intellectual track, the concept of I also became a sociological theory, as a way of observing and explaining the development of society. This conception is a regular fixture in the discourse of the so-called "Information Society."[9] Similarly, I became so relevant that Castells coined the phrase "the information era," which includes the economy, society and culture. Since both conceptions have been discussed broadly in specialized literature, I will merely highlight some facets which I believe are particularly relevant.

Regarding the first term, I stress the overview provided in the UNESCO report titled *Toward the Knowledge Society* with regard to the Information Society, which, it is asserted, is based on technological progress. Nonetheless:

> […] despite the fact that we are witnessing the coming of a global information society in which technology has surpassed all prediction regarding the growth in the amount of available information and the speed of its transmission, we still have a long way to go in order to achieve genuine knowledge societies.[10]

The shift in perception of I to knowledge is key to understanding the paradigm shift of social development. Similarly, a serious criticism is made of the limits placed on societies that base their progress on the expansion of information and communication technologies. Thus:

> Even though it can be "improved", for example, interferences or erroneous transmission aside, a piece of information does not necessarily create meaning.

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8   León Olivé has explained the existence of terms whose meanings are built from a given theory, but this does not exclude them from appearing in other that depends on the first. Consequently, the second theory *presupposes* the first, since the latter bestows fuller meaning to the terms in question. In contrast, when a concept is qualified as meta-scientific, it is obvious the terms is common to all scientific fields and it must be developed at a different level tan scientific theories. See León Olivé *El bien, el mal, y la razón: facetas de la ciencia y la tecnología*, Mexico. Paidós, UNAM, 2000.

9   Note 2 from Chapter I of the UNESCO report, titled: "De la sociedad de la información a las sociedades del conocimiento", states that the first part of the World Summit on the Information Society was organized by the International Telecommunications Union (ITU) and was held in Geneva from December 10 to 12, 2003. The second part of the Summit was slated for 2005. See: UNESCO, *Informe mundial de la Unesco: Hacia las sociedades del conocimiento*, p. 231.

10   *Ibid*., p. 19.

Moreover, the information will continue to be a mass of undifferentiated data until everyone in the world enjoys equal opportunity in the field of education and thereby are capable of dealing with information available with discernment or critical spirit, analyzing, selecting and assimilating what they find relevant to a base of knowledge. *Many will realize that instead of mastering information, they are dominated by it*. Moreover, the excess of information is not necessarily greater knowledge. The instruments to use, treat and handle information must be equal to the task.[11]

The UNESCO report clearly establishes that these conceptions of society should not be conflated. In all events, the birth of the Information Society founded on the basis of the revolution of new technologies is merely an instrument to achieve the model of the knowledge society. This assertion also implies differentiation between the use of the concept of I with regard to knowledge, since "Information is effectively an instrument of knowledge, but it is not knowledge in and of itself."[12] Moreover, the social dimension is important in order to distinguish a conception of a more just society, since:

Information potentially is a sort of merchandise that can be bought and sold in a market, and whose value is based on scarcity; while knowledge, despite certain limitations such as, for example, State secrets and traditional esotericism,legitimately belongs to any reasonable mind, without prejudice to the need to protect intellectual property rights. The excessive importance granted to information with respect to knowledge reveals the degree our relationship with knowledge has been modified by the spread of the economic model of knowledge.[13]

One component driving the spread of the concept of the Information Society was the implied promise regarding the possibility of get to scenarios of beneficent social development based on technological leaps and the immense potential they offer. In line with this analysis, Manuel Castells (1996) stated that the technological revolution focused on information technologies was quickly modifying the material basis of society and stressed that it was a matter heralding the "information era."[14] Specifically, Castells proposes the concept of a society that is at once informational and global. From a techno-economic and socio-technical standpoint, Castell stresses that during the last two decade of the twentieth century, the information technology revolution was

11   *Ibid.*, p. 20. My italics.
12   *Ibid.*, p. 10.
13   *Ibid.*, p. 19.
14   The monumental, three-volume work by Castells published in the mid-1990s is titled: *La era de la información: economía, sociedad y cultura.* The first volume addresses the network society; the second deals with the power of identity, and the third analyzes the end of the millennium.

in full swing. To explain how new information technologies flourish, Castell believes several factors are essential: in the first place he points out the role of macro-research programs in the United States and the vast market developed by the State. He also alludes to decentralized innovation by a technologically creative culture and models allowing rapid personal success, such that "they immersed themselves amid networks of companies, organizations and institutions to conform a new socio-technical paradigm."[15]

It is useful to discuss the author's considerations of the technological transformation undergone by society. From the de decade of the 1990s, a new epistemological paradigm shared by scientists and researchers has arisen in opposition to "chaos theory" to which Campbell also refers.[16] This new proposal was identified with the term *complexity* and it is centered on the understanding of the advent of self-organizing structures that create complexity from simplicity "and an order superior to chaos by means of diverse levels of interactivity among the founding elect working at the origin of the process."[17]

He adds that thought about complexity must consider a method of understanding diversity rather than a unified meta-theory, and points out that the epistemological value comes from the acknowledgement of the gifts of nature and society to reveal themselves without setting out to do so. Of course, one cannot work without rules, "but the rules are created and changes in a process of unique, deliberate actions and interactions."[18]

Using language reminiscent of Luhmann,[19] Castells asserts that the paradigm of information technology does not evolve toward closure as a system, but rather toward opening up as a multifaceted network.

He qualifies this paradigm as powerful and imposing in its materialness, but its historical development is also adaptable and open, in such a way that its qualities reside in its integrative character, complexity and interconnectivity.

Contrary to Campbell's assertion, Castell refers to I more objectively and without pretending to turn it into a universal principle, indicating that I and knowledge have always been crucial components of economic growth. For Castells the evolution of technology has determined the productive capacity of society and the quality of life, as well as the social forms of economic organization. He also mentions that:

15 Manuel Castells, *La era de la información: economía, sociedad y cultura,* p. 87
16 Campbell, *op. cit.*
17 Castells, *op. cit.,* p. 91.
18 *Idem.*
19 See Niklas Luhmann, *Introducción a la teoría de sistemas: lecciones publicadas por Javier Torres Navarrete.*

The rise of a new technological paradigm, organized around new, more powerful and flexible information technologies makes it possible for information to become the product of the production process. To be more precise, the products of new information technology industries are devices used to process information or the processing of the information itself.[20]

In view of this situation and by transforming information processing practices, new information technologies intervene in all domains of human activity and establish infinite connections between these diverse domains, agents and elements of said activities.[21]

One of the central ideas Castells contributes for gaining a better understanding of the technological revolution consists of characterizing the application of knowledge and I to knowledge generating devices and "processing of information/communication"; which cumulatively feeds back into innovation and its uses. Consequently, what is distinctive is not knowledge and the I as such, but rather their application as per the terms indicated. In other matters, he summarizes the Information Technology Paradigm in accord with five features:

1. I is its raw material and they are technologies for acting upon I.
2. The permeating capacity of the effects of new technologies. This new technological model can mold the entire process of individual and collective existence, though it does not determine them.
3. The interconnection of all systems or sets of relationships using these new technologies, therefore, the network morphology is best adapted "to the growing complexity of interaction and unpredictable patterns of development that arise from the creative power of that interaction."[22]
4. The flexibility and capacity for reconfiguration, without destroying an organization, since the material basis of said organization can be reprogrammed and reequipped.
5. Growing convergence of specific technologies within a highly integrated system, from which the old separate technological trajectories become indistinguishable.

Castells establishes that at the end of the first volume of the Information Era that, if the technological revolution to which I is associated and knowl-

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20   Castells, *op. cit.,* p. 94.
21   *Idem.*
22   *Ibid.*, p. 88.

edge are analyzed in sociological terms, the societal network represents a qualitative shift in the human experience, whose touchstone is the social action model for changing the relationship between nature and culture. Under such a light, this premise indicates that three models have existed: the first is characterized by the imposition of nature over culture; the second arose in the early Modern Age and is associated with the Industrial Revolution and the triumph of reason, which allowed culture to dominate nature. The third model is distinguished by "culture referring directly to culture," which is to say: once nature is mastered it arises anew or is preserved artificially as a cultural form.[23]

One of his conclusions closely related to I is:

Owing to the convergence of historical evolution and technological change, we have entered into a model that is purely culture, consisting of social interaction and organizations. As such, information is the key ingredient of our social organization, and the flow of messages and images from one network to another constitutes the basic fibers of our social culture […]. It is the beginning of a new existence and, in effect, of a new era, i.e., the era of information, marked by the autonomy of culture before the material foundations of our existence. This is not, however, a time for rejoicing, because alone at last in our human world, we are forced to look into the mirror of historical reality.[24]

In other matters, Castells summarizes the essential sense of the era of information in the "Finale" of the third volume of his work:

The promise of the information era is the unprecedented unleashing of the productive energies of the mind. I think, therefore I produce. By doing so, we shall have free time to experiment with spirituality and the possibility of reconciling with nature, without sacrificing the material well-being of our children. The dream of the Enlightenment, that reason and science would solve the problems of humanity, is now within reach. Nonetheless, there is an astonishing gap between our technological overdevelopment and our social underdevelopment.[25]

In this final reflection, Castells comes quite close to the postulates and problems of justice and knowledge enunciated by UNESCO,[26] as well as

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23 *Ibid.*, p. 514.
24 *Idem.*
25 *Ibid.*, p. 394. My italics.
26 See UNESCO, *op. cit.*

those matters examined by Nussbaum[27] and Sen and in the UN[28] Human Development Reports. [29]

The Information Age is indispensable to understanding the technological revolution occurring in recent decades, but it is particularly important for researchers in the discipline of Library Science, because the central agents of this movement into a new age directly involve I, and knowledge and information technologies. As previously discussed, Castells identifies it as the informational development model. In said model, the source of productivity lies in two interdependent processes: on one hand, the technology to produce knowledge and, on the other, the processing of I and symbols.

The informational model is characterized by the action of knowledge on itself as a source of productivity. With regard to processing of I, this focuses on the triumph of said processing technology. In short, the model refers to the interaction of sources of technological knowledge and its application in order to improve the production of knowledge and the processing of information.[30] Consequently, the work of the Library Science discipline is enriched under this informational development model serving as an auxiliary in the action of knowledge upon itself and the processing of information and communication of symbols.

Interestingly, in his book Castells make use of only a single note in order to clarify his understanding of information and knowledge.[31] This is odd since both concepts are essential to clarifying the informational development model. It is pertinent, therefore, to revisit the definitions he uses. Castells resorts to Daniel Bell, who defined knowledge as a series of organized affirmations of fact or ideas that offer a reasoned judgment or an experimental result that is transmitted systematically to others by way of some communications media. For the definition of I, he cites Porat: "Information are the data that have been organized and communicated."[32]

In note 4 of the Introduction of to the UNESCO Report[33], the definitions used by Castells also appear, but these are inserted in completely different intellectual contexts, as both concepts, in the case of the informational mod-

27   See Martha C. Nussbaum, *Crear capacidades: propuesta para del desarrollo humano*, Madrid, Paidós. 2012.
28   See Amartya Sen, *La idea de la justicia*, México, Taurus, 2010.
29   Human Development Reports are available online at: http/www.undp.org/cpontent/undp/es/home/librarypage.html.
30   Castells, *op. cit.,* p. 43.
31   *Ibid.* Note 27 of vol. I. See also Daniel Bell, *El advenimiento de la sociedad posindustrial,* Madrid, Alianza, 1975, and Marc Porat, *The information economy: definition and measurement*, Washington D.C., Telecommunications Office, Wash. D.C., 1997.
32   Castells, *op. cit.,* p. 43.
33   See UNESCO, *op. cit.*

el, are articulated toward a theory centered on productivity to explain the advent of the information era. In contrast, the perspective of knowledge societies offered in the UNESCO Report folds these concepts into a normative theory, whose philosophical and political grounds are derived from political theories of justice and capabilities, something amply expounded by Sen and Nussbaum, and in the Human Development Reports of the UN.

It is also worth observing that the UNESCO, in addition to stressing the concept of knowledge, in no way rejects the postulates and assertions established in the informational model; but rather considers said model as a precursor to achieving a more just society, in such a way that economic and scientific productivity shall be focused on the human development of societies. In this way, the informational model acquires an instrumental character.

As such, the rise of new information and communication technologies has created new conditions for the appearance of the knowledge society, and he adds that:

> The gestation of the *world-wide information society* shall only be realized if it becomes a medium in the service of a higher and more desirable goal: the construction at the global level of *knowledge societies* that are sources of development for all, and more importantly for the least advanced countries. To achieve this end, two challenges posited by the information revolution take on special importance: access to information for all and a future of freedom of expression.[34]

Likewise, in the opinion UNESCO, the central element of the knowledge society is the capacity to identify, produce, treat, transform, disseminate and use the information with the vision of creating and applying the knowledge needed for human development. The report also mentions these societies "are based on a vision of the society that encourages autonomy while bringing together notions of plurality, integration, solidarity and participation."[35]

UNESCO's criticism is aimed at the consequences of the third industrial revolution, i.e., the new technologies and the new phases of globalizations accompanying it, since:

> […] they have radically modified numerous points of reference widened the existing gaps between rich and poor, industrialized and underdeveloped countries, and even between the citizens of the same country. The UNESCO estimates that the edification of knowledge societies is that which "opens the way toward the humanization of the process of globalization."[36]

34 *Ibid*. p 29.
35 *Idem*.
36 *Idem*.

It is important to reiterate that the theoretical paradigm shift proposed in the information era with respect to the knowledge societies pursues different epistemological objectives. The first of these paradigms is descriptive and explicative, while the second is normative, i.e., it possesses an instructional character. This is key, because several problems cited in the UNESCO report were also discussed by Castells; however, the distinct treatment in each paradigm obeys argumentations seeking difference ends. Thus, with regard to the information era the following observation is included in the conclusions: "The twenty-first century shall not be a tenebrous era, nor will it be able to provide the promised miracles to the majority of people, despite the most extraordinary technological revolution in history. Rather, it is characterized by informed perplexity."[37]

As for knowledge societies, the work concludes with instructions and recommendations of the following type:

> Faced with these challenges, the international community –since we are dealing with governments and international governmental and non-governmental organizations and the private sector—should prioritize three initiatives that will constitute additional pillars upon which authentic knowledge societies can be erected for all:
> - An improved appreciation of existing knowledge in order to help close the cognition gap;
> - A more participative focus regarding access to knowledge, and
> - Better integration of knowledge policies.[38]

Because of its high social value and tie-in to the work of Library Science, it is importantto enumerate the recommendations proposed at the end of the UNESCO Report:[39]

1. More investment in quality education for all in order to guarantee equal opportunity.
2. Multiply community sites for accessing information and communication technology.
3. Encourage universal access to knowledge by increasing available contents.
4. Work in the "co-laboratory" toward an improving shared exploitation of scientific knowledge.
5. Sharing environmental knowledge to promote sustainable development.

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37 Castells, *op. cit.,* p. 392.
38 UNESCO, *op. cit.,* p. 207.
39 *Ibid.*

6. Prioritize linguistic diversity: the challenge of multi-linguicism.
7. Advance toward a certification of knowledge of the internet: toward quality denominations.
8. Intensify the creation of association promoting digital solidarity.
9. Increase the contribution of women in the knowledge society.
10. Measuring knowledge: Toward indicators of the knowledge societies?

As can be seen, Library Science has the institutional capacity to exert influence in all ten of these recommendations aimed at achieving development for all. Moreover, the sphere of knowledge Library Science cultivates through research, education and professional practice remits to three areas of great economic, social and cultural relevance: 1) Information and productivity; 2) Information and research/education; and 3) Information and human development.

Given that diverse formulations have been touched upon, i.e., the birth of the theory of I, the informational society model and the knowledge societies (and these have provided general models for observing society,[40] since each of these concepts of I is invariably associated with the concept of knowledge, whether as an antecedent or consequence), the concepts of information and knowledge technologies are also included.

The methodological issue consists of limiting the theoretical framework in which the aforementioned concepts are used, since their indiscriminate use has led to extreme banality; so much so that without the theoretical benchmark the concept is inevitably used make false or superfluous assertions. In this regard, Moulines states that scientific disciplines are characterized by their use of specific vocabularies, "certain words and expressions that are not in the common parlance, but rather are introduced specifically in a scientific context. The meaning of such terms cannot be fully expressed if one does not have a minimum threshold of knowledge of the context discipline."[41] Moulines adds that the essential aspect of such terms "is not their scientific origin, but rather that their use can be sanctioned by a scientific theory and only those who grasp this theory well can may genuine use of them."[42]

With regard to the terms in question, it would be useful to specify what is meant when we refer to I or a piece of knowledge as a "theoretical term," or

40 This concept is taken from René Millán, *Complejidad social y nuevo orden en la sociedad mexicana*, México, UNAM, IIS, Miguel Ángel Porrúa, 2008.
41 Ulises Moulines, "Conceptos teóricos y teorías científicas", p.147.
42 *Ibid.*, p 148.

"theoretical concept." For example, Shannon's theory of information, which re-defines I, in essence posits a "theoretical term."[43] In contrast, both Castells and the UNESCO report cited herein posit "theoretical concepts." The difference between these is that the former is a linguistic entity appearing in the canonical formulation of a theory, while the latter is a more general expression without venturing a more specific formulation.[44]

On the basis of these clarifications and to answer the question about what kind of concept is conveyed by the term "information"; we can state that depending on the theory, three uses are evident:

1. Information as a metrical concept or measure of magnitude
2. Information as idealization; and
3. Information as a term with a real referent, but in principle unobservable.

The first case constitutes a fundamental contribution by Shannon, who

[…] choose as his information unit the binary digit or bit. A bit is a measure of an amount of information, something like a gallon, once or inch used to measure volume, weight and length, respectively. A bit is merely a choice between two equally probably messages. It is the answer, either yes or no to the hypothetical question: This one? If the answer is yes, all incertitude in the mind of the recipient is resolved, because he knows which of the two possible messages is real. If the answer is no, this incertitude is also resolved, because he knows the real message is not the first alternative, but he second.[45]

According to Campbell, information became a scientific concept early in the twentieth century at the dawn of the era of electronic communication. Much like the definition of concept of energy in the nineteenth century, the concept of information was "made into a theory, bestowed with laws expressed in equations and generally striped of all ambiguity and mystery."[46]

The impact of the theory of information, not merely the concept, has been so great that according to Campbell its nature cannot grasped in terms of matter and energy, nor can its secrets by fathomed through:

[…] the lenses of chemistry and physics, despite the power and success of these disciplines in our century. Any explanation of the world that pretends to be com-

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43   See Campbell, *op. cit.*
44   This distinction is made by Moulines in paper previously cited.
45   Campbell, *op. cit.* p. 99.
46   *Ibid.*, p 15.

plete must contain a third component. The powerful theories of chemistry and physics must be complemented by a new arrival: the theory of information. Nature must be understood in terms of chemistry, energy and information.[47]

Early on, the theory of information addressed key concerns existing in diverse disciplines, expressed in questions such as: How are order and disorder possible; How are error and error control possible; What are the roles of chance and the realization of chance; What is incertitude and what are its limits?

Campbell is transparent when he states the following with regard to the theory of information:

Scientists still ask why the artifacts of nature are so improbable. Why is there is so much order, when giving into confusion and error, which prevail overwhelmingly in nature, would be more likely? This is still one of the overriding concerns of science, a question that is the near cousin of the philosophic query: Why is there something, instead of nothing? In his 1948 essay Shannon proved that contrary to expectation, "something," i.e., a message, can persist in the midst of "nothing," i.e., chaos or random noise.[48]

The theory of information is now 50 years-old and its impact has been so great it has become that premise theory used to sustain explanations in other social disciplines, such as pedagogy, communications science and Library Science. Currently, it is a vast field of study, attracting researchers largely from the fields of Library Science, Sociology and Linguistics to mentions only a few.

With regard to the second case, which would comprehend information as entirely fictional, it admits reiteration that such a use is associated with highly mathematical disciplines for which it is often asserted that there are concepts under which no real entities fall. According to Moulines, however, these are not purely mathematical terms, because:

[…] on the contrary, even though its referent is empty, there are associated "idealizations" or "approximations" to real entities: for example, real particles, real machines, real gases, or human beings of flesh and blood. Moreover, it would be a mistake to deem them superfluous terms. Many times (as in the example cited), the theory to which they belong, which is a good empirical theory, could not be formulated without them.[49]

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47 *Ibid.*, p 14.
48 *Ibid.*, p 17.
49 Moulines, *op. cit.,* p. 156

According to this explanation and on the basis of the analysis proffered up to now, both in Library Science and other disciplines, the concept of information is used as an idealization or approximation to real entities.

A good example of this is the distinct approaches of Bateson and Luhmann.[50] The former developed an interdisciplinary vision, entailing epistemology, linguistics and biology; and the latter worked from the field of sociology. Both of these thinkers made relevant contributions.

INFORMATION AND DIFFERENCE

Bateson poses the following question: What aggregate or increase in knowledge is derived from the combination of information from two sources?[51] He points out that he is interested in the varieties of information offered to the information gathering party regarding the surrounding world or as a part of that external world; that is, how knowledge is increased through the combination of information sources.[52]

Bateson earned world-wide recognition for having observed that information or the elemental unit of information is the difference that makes the difference.[53] It is important to stress that this definition of information is used by Luhmann to develop and explain his theory of systems in the field of Sociology.[54] As such, Bateson, indicates that in order to create a difference, at least two entities are needed. He goes onto explains that:

> To produce information, i.e., news about a difference, there should be two real or imaginary entities, so that the difference between them can be inherent to their mutual relationship; and the entire question must be such that news about their difference can represents themselves as a difference inherent in a certain information processing entity, such as a brain or, perhaps, a computer. [55]

Bateson observes that there is a deep unanswered question about the nature of these things, since "as a minimum of two," which between them generates the difference that becomes information because it is difference.

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50 See Gregory Bateson, *Espíritu y naturaleza,* p. 81 and Luhmann, *op. cit.*
51 Bateson, *op. cit.*, p. 80.
52 *Idem.*
53 Luciano Floridi states that MacCrimmon MacKay wrote the following: "Information is a distinction that makes the difference"; he also comments that Bateson restated the dictum somewhat less precisely, saying: "information –the elemental unit of information—is a difference that makes the difference." See Floridi*, Information: a very short introduction.*
54 Luhmann, *op. cit.,* p. 63.
55 Bateson, *op. cit.,* p. 81.

This is the focal point of his proposal and, although complex, each one of these taken alone is a non-entity or "a non-being no different from being and not different from non-being. Something inconceivable, a *Ding an sich*, the sound of one hand clapping."[56]

To fully illustrate the idea of increasing knowledge as a product of information, Bateson points out that any object, event or difference in the external world can be turned into a source of information, provided it is incorporated into a circuit with an appropriate network made from flexible material that can produce change. He expands on this idea, saying:

> Let's examine then, the broadest possible statement proposed by Korzybski: the map is not the territory. Seeing things from the broad perspective we now enjoy, the map for us is a kind of effect that gathers difference, organizing news about the differences in the "territory." Korzybski's map is a convenient map and has been useful to many people; but reduced to its simplest terms, his generalization asserts that the effect is not the cause.[57]

The aforementioned proposals sufficiently clarify how the increase in knowledge is produced from the information (the difference in the difference), and stresses the need to have a flexible network capable of producing change. In this way we have the concept of "information" as an idealization that represents the differences that matter in the plane of epistemology or cognition of subjects.

In addition to addressing the concept of information, i.e., the difference that makes the difference, Luhmann incorporates an explanatory context based on communication, in which the sense and function of information are articulated.

In this regard, Rodriguez M.[58] explains that the fundamental change introduced by Luhmann brings conceptual innovation to Sociology, because the previous view of Parsons, based on social action, was the dominant academic discourse in the twentieth century. He adds that this reconceptualization is important because only communication is always a social phenomenon, in contrast to action, which is generically individual and requires qualification as social phenomenon. Nonetheless:

> Communication does not consist of a transmission from person to person, as the theory of action insists, but rather involves a synthesis of three selections that occur in the presence of alter and ego, but which does not consist of their actions.

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56 *Idem.*
57 *Ibid.*, p. 123.
58 Niklas Luhmann, *Organización y decisión.*

Communication, therefore, is an emerging phenomenon characterizing the move from the individual psychological level to the social level in which individual are an essential to the environment.[59]

Likewise, Rodríguez stresses that for Luhmann there is a continuing job of selection associated with information. He summarizes his point as follows:

The three selections whose syntheses configure communication are:

a) Information selection: Alter must choose the information is wishes to share with Ego. Information is understood by Luhmann, in accord with the definition of Bateson, as the "difference that makes the difference." Because of this, information always surprises and it is only information at the moment it is received, in the instant that it "makes a difference" with what the Ego knew: not before, because it does not know it, not after because now it knows.

b) Selection in order to make the information selected known. Moreover, the words and gestures are also chosen to be used in its expression.

c) Selection of an understanding. Ego selects what it understands about what it has read or heard. It tries to elucidate the information conveyed as being made known and which it has received from Alter.[60]

Likewise, he explains that for communication, he is not particularly interested in the selections, but rather in their synthesis; and this is where it has social significance. Moreover, "it is only produced at the moment the Ego selects comprehension, which, naturally, includes incomprehension." [61]

In the next section, we shall review what Luhmann[62] has written about information and selection. He begins by clarifying that since the 1950s the use of the concept of information has grown, but without conceptual clarity. For example, when genetic information is mentioned, it is treating structure as information contents. He also explains that the relevant question about the concept of information is: What is the scale by which information can be selected? Consequently, one is faced by a two-fold concept:

1. Information is a concept aimed at that which has not yet been processed in the system.

2. It is separate from that which has already been created or deals with that which is being worked on permanently.

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59 *Ibid.*, p. 14
60 *Ibid.*, p. 15
61 *Idem.*
62 Luhmann, *Introduccion a la teoría de sistemas.*

Therefore, Luhmann explains that what is called information is the event that selects the states of the system. For this purpose, limiting structures are required to preselect the possibilities, in such a way that information presupposes structure, but in and of itself does not constitute a structure. It is rather, a matter of an event that actuates the use of the structures, since the events are elements that are fixed in time, occuring only one time and only in the minimum lapse of time needed for its appearance. Consequently:

> This passage of time identifies them; therefore, they cannot be repeated. Because of this, they serve as unifying elements of the process. This is shown by means of information. A piece of information whose surprising aspect is repeated is no longer information. It preserves its meaning in the repetition, but loses its value as information. The University, which is still there and endures, because it does not assess the value of information, because it does not change the state of the system, though structurally exhibits the same kind of selection. On another front, information is not lost, even though it has vanished as an event. The state of the system changed and thereby left a structural effect: the system reacts to these changed structures and changes along with it. Pieces of information, as such, are always information of a system.[63]

Luhmann also mentions the following characteristics associated to information:

a) For information to hold the value of the articulated function to the state of the system it must be an autopoietic system, that is, as a system that always works to transform its own state.
b) Information reduces the complexity insofar as it makes a selection known and, consequently, excludes possibilities. It can, nonetheless, increase complexity.
c) The information also possesses two features: on one hand, the quality of surprise and, on the other, if the surprise is presupposed in the expectation system.

Moreover, Luhmann asserts:

> Information is not an exteriorization of a unity, but rather the selection of a difference that moves the system to a change of state and, consequently, another difference is operating in it. Taking all of this together, it leads to the consideration that information is only possible within the system. Each system produces its information, since each system builds its own expectation and blueprints of order.[64]

63 *Ibid.*, p. 105
64 *Ibid.*, p. 106.

To summarize, Luhmann sees information as a state that arises from within a system and, for the reasons discussed, not outside of it.

An interesting example for analyzing problems of Library Science, specifically Bibliometrics, from the standpoint of Luhmann, is posed by Vélez,[65] whose study includes the following conceptual framework based on communication and information as difference, although it also includes the expression information with meaning.

Vélez starts from this premise: a communication event is the appearance of a distinction in the form of a brand; in the second place, stating that the brand (as the distinctive of information) is possible because there are brands with which it links, thereby making communication possible: "for example, in a conversation, the recurring themes, even though new to the interlocutors participating of the conversation, are persuaded by the experience with the information involved, its modes of expression and understanding."[66]

As a third point, Vélez explains how for science the brands possess a special feature that informs the scientific communication. In this case, a scientific paper is identified as a communication event. This event presents the specific brands which provide form and have been standardized. The indexing systems have allowed standardization of identification brands of a scientific text. Some of these are the following:

> The paper is published in a peer-reviewed journal enjoying the global prestige of indexes such as of SSCI, SCI and Scopus.
> The paper must have a proper, formal structure, as required by journals that wish to be indexed. Title, key words, abstracts (in several languages), up-to-date citations, clarity in the specialization and a discourse which in general terms follows the scheme of stating the problem and positing theories, methodologies, discussion and conclusions.[67]

According to Velez, the brands are expressed through words and the inclusion of these words in the presence of others plus the repetition or variation of the combinations of these, thereby making the meaning of the text possible. As such, scientific communication acquires a meaning through this repetition, which in diverse combinations indicate, for example: prestigious authors frequently appearing in diverse papers; distinct combinations of terms that have success for a certain time within diverse fields; and the formation of specialization, arising from the recurring association of distinct

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65 G. Vélez Cuartas, "Las redes de sentido como modelo para la conservación de la ciencia: Luhmann desde un punto de vista estructural".
66 *Ibid.*, p. 106.
67 *Idem.*

terms in combinations in the texts of the bibliographical citations in diverse scientific fields.[68]

The concept of the idealization of information or approximation to real entities is summed up by Floridi,[69] who defines information on the basis of data. Information as data, however, has a set of attributes that must be itemized, especially because this definition has been used frequently in Library Science and associated fields.

Floridi begins by pointing out that the General Definition of Information (GDI) posits information as being composed of data + meaning. He adds that this definition is often used in fields that handle data and information as material entities or as real referents. The definition consists of three parts, whose logical organization is as follows:

Table 1. The General Definition of Information (GDI)

GDI) σ is an instance of information, understood as semantic content, if and only if:
GDI.1) σ consists of n data, for n > 1;
GDI.2) the data are well formed;
GDI.3) the well-formed data are meaningful.[70]

Information and data

In this way information is comprised of data and meaning, which implies a circuit that spans diverse actors and components: a) the organization of the data; b) the rules (syntax) governing the chosen system and c) valid conventional meanings within the chosen system.

Because of the emphasis on the term data, Floridi proposals from the following definition:[71]:

68 *Ibid.*, p. 232.
69 Floridi, *op. cit.*
70 *Ibid.*, p. 21.
    General Definition of Information (GDI)
    GDI) σ is information, understood as a semantic content, if and only if:
        GD 11) σ is comprised of *n* data, where *n* > 1:
        GD 12) the data are well structured;
        GD 13) the *well-structured* data are meaningful.
71 Datum=$_{def}$ "*x* is distinct from *y*, where *x* and *y* are two non-interpreted variables and the relationship of "being distinct" and the domain are left open to future interpretations."

Dd) datum $=_{def.}$ x being distinct from y, where x and y are two un-interpreted variables and the relation of 'being distinct', as well as the domain, are left open to further interpretation.[72]

In this regard, Floridi asserts that this definition can be applied in three ways:

1. Data can be bereft of uniformity in the real world.
2. Data can lack uniformity (their perception) between two physical states of a system or signals.
3. Data can lack uniformity between two symbols.[73]

Likewise, Floridi propose the following typology:

Primary data. Data stored in data based are linked, i.e., they are data in an information management system.
Secondary data. These are contrary to primary data, when the latter are absent.
Metadata. These are indications about the nature of other data, usually about primary data.
Operational data. Data associated with operation of a data system as a whole and its performance.
Derived data. These can be extracted from other data, provided they are used as indirect sources in pattern searches, clues or evidence that make inferences about data in and of themselves.[74]

A review of these definitions, which merely add some degree of depth, does not reveal any significant differences. For example, with regard to informatics we have the following:

Formalized representation of objects, proper for communication or automatic processing or by persons. It is the information that has been processed by a computer program (digital data) or by analogue signals (analogue data).[75]

On another front, the Encyclopedia of Information Technology states that the terms is often used to refer to any type of information, whether a single element or set, and which can be processed by a computer. The classification proposed is as follows:

72 Floridi, *op. cit.* p 23.
73 *Ibid.*, p 24.
74 *Ibid.*, p. 29.
75 *Informática*: *Glosario de términos y siglas, s.v. dato.*

1. Input and output data: A program solves a certain class of problems and the input data determines how to process certain problems. The output data are the solutions to the problems.

2. Active and passive data. The active data are programmed instructions. Passive data are the objects of said processing activities.
3. Numeric and alphanumeric data. The former are digits and some special characters, such as the signs + and -; while the latter included numerals, letters and symbols. [76]

In the previous two cases, the definition is based on data processing. In contrast, the International Encyclopedia of Information and Library Science states that in addition to the aforementioned meanings, the general term "datum" is used for information that is encoded quantitatively or numerically, and its plural is also often used colloquially in a sense that is nearly synonymous with "information"; for example, in the phrase "bibliographical data" as interchangeable with "bibliographic information."[77]

The General Definition of Information, which entails data + meaning, and in accord with the nature of data proposed by Floridi, information is a kind of coin whose two sides are inseparable and which are constantly referring one to the other. Consequently, it is important to examine Floridi's thoughts on information as semantic content.

In this regard, Floridi asserts that when data are well structured and meaningful, this situation results in semantic content. Information, understood as semantic content, comes in two varieties: instructional and factual. The former transmits requirements by means of certain actions, while the latter represents an event in and of itself. Moreover, information as semantic content is declarative or factual, and the latter can be qualified as true or false. The definition proposed is as follows: p qualifies as factual semantic information, provided always p is well-structured, meaningful and the data are true.[78]

Therefore, the factual semantic content is the most common avenue for understanding information. Consequently, Floridi concludes that veridical semantic content is a necessary condition of scientific or academic knowledge.

In line with the concept of information as idealization or approximation to real entities, and in accord with the review of Floridi's concept of the se-

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76 *Encyclopedia of Information Technology, s.v. data.*
77 *Encyclopedia of Information and Library Science*, 2nd ed., *s.v. data.*
78 Floridi, *op. cit.,* p. 50.

mantic content of information, an examination of how the concept of information is treated in cognition theory should be addressed, since cognition theory is largely concerned with the construction of meaning. In this regard, Muñoz[79] calls attention to what Bruner expressed decades earlier about the repercussions of information theory in Psychology.

INFORMATION AND COGNITION

The displacement process was such that Bruner summed it up as follows: "Something that happened early on was the shift in the emphasis from "signified H" to "information, from the construction of meaning to the processing of information."[80] In light of Muñoz's observation and Bruner's asseveration,[81] the loss of meaning and the reductionism inherent in the new concept was something that:

> [...] increasingly undermined not only the possibility of building meanings, but also, more fundamentally, the capacity for treating the semantic component in the notion of information. Even without denying this point, but rather reducing it to a simple condition of the occurrence of information, information is encoded in certain semantic and intentional conditions in order to enter into functional positions that can produce behaviors. Research in semantic cognition trended increasingly toward positions in which the mental factor had to be eliminated because it was deemed superfluous and unnecessary for such ends. Researchers required only the examination of syntactic processes that build chains of symbols, while in other cases they deemed information as a result of non-significant levels of processing.[82]

The fundamental concern was to promote cognition theory in the field of information in order to explain the operation of semantic components and its interaction with the intellectual work of cognition and the respective semantic increase. In accord with Bruner, Bogdan's answer,[83] and as a sort of introduction to his synthesis of cognitive information, Munoz points out the following:

1. In accord with computational theory, information is that which allows one to decide between two alternatives. As such, a message con-

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79 Carlos Muñoz Gutiérrez, *Modelos narrativos de la mente.*
80 *Ibid.*, p. 1.
81 Jerome Bruner, *Actos de significado: más allá de la revolución cognoscitiva.*
82 Muñoz Gutiérrez, *op. cit.,* p. 1.
83 Radu J. Bogdan, "Actitudes mentales y psicología del sentido común (contra la eliminación)".

tains more information insofar as it allows us to eliminate the largest number of equally probable alternatives."[84]

2. The contribution based on discrimination depends not only on the quantity of information received, but also on that already possessed.[85]

3. Information is described as a structure of codification imposed by an organism on an input coming from and external source.

Likewise, Muñoz stresses that in Bogdan's view information exhibits two features thanks to which it is possible to build propositional attitudes. The first of these has to do with the internal aspect of the information and consists of symbolic encoding that can be understood by the organism or system in such a way that it enjoys a concrete state. He adds:

This internal encoding of information (the representation), insofar as it configures the state of the system, is what is causally efficient in the cognition process. We also find an internal, intentional dimension of the information represented, or in the structure of data, concepts, significations, prototypes or patterns, all stored in memory or otherwise existing as rules or procedures.[86]

The second feature, which Bogdan calls the external aspect of information, describes the relationships between internal codification, representation and objects. Representations are the states of the world and remit to external objects. Representations are true and, therefore, possess conditions of truth.[87]

Moreover, Bogdan has analyzed the problem of the function of "mental information" tied to mental attitudes, of which he says:

Mental attitudes must be associated with the way in which information animates and moves cognition and behavior existing in each. As we have already seen, it is not semantic information per se which animates and moves. We believe and wish because we must work, and to work we must register information that associates action with our current cognitive state. In other words, we treat information attending to the belief and wish, because that information must serve our current action and cognition.[88]

84 Muñoz Gutiérrez, *op. cit.,* p. 1.
85 *Idem.*
86 *Ibid.*, p. 2.
87 *Idem.*
88 Bogdan, *op. cit.*, p. 103.

According to Bogdan, semantic information is not sufficient to explain the field of cognition and the mind. Muñoz summarizes Bogdan's definition of information as the notion of mental information that is *pragmatic in nature and functionally efficient for cognition and behavior* (author's italics). He adds that "To the input information and its semantic form, this mental information also adds an incremental feature that affects the pragmatic sphere and is responsible for cognition and behavior."[89] Since the incremental information function is relevant, Bogdan, in the paraphrase supplied by Muñoz, states that such inputs are individualized at the time the interaction with the system takes place, emphasizing, moreover, two factors: in the first place, the topic, which defines the field of interest and frames the boundaries of potential increase, while also allowing articulation of previous increases in order to ensure continuity and relevance; and the second factor is entailed in the categorical articulation, which allows the format of the information increase to be set.[90]

Individualization of incremental information is for Bogdan, again as per Muñoz, analyzed in the following way:

> *[1] Roberto emptied the bottle of wine*
> (i) The incremental information content can be analyzed by relativizing the following parameter:
> (ii) Topic: To that which is addressed (and event at home)
> (iii) Given information: That which is known (Roberto dis something with the bottle of wine).
> (iv) Incertitude: Identification of the action (What did Roberto do to the bottle of wine?).
> (v) Projections: a class of relevant alternatives (he emptied it, he played with it, he broke it, etc.
> (vi) Inference: value for the new information (he emptied it).
> (vii) Categorical articulation: Agent-Action-Object.
> (viii) Integration: new information (he emptied it) is the given information (Roberto did something with the bottle), which produces terminal information (Roberto emptied the bottle of wine).[91]

Along these lines, the pragmatics of cognition and behavior are supported in this model of intellectual work, which includes fixing the mental information and entails interaction with an objective representation, "and

89 Muñoz Gutiérrez, *op. cit.,* p. 3.
90 *Idem*.
91 *Ibid.*, p. 4.

affixing new information to knowledge, attending to that which is already known, expected and desired."[92]

Thus, we have it that information in the context of cognition assumes diverse denominations in accord with the function it fulfills (input, increase, terminal), and its pragmatic nature is indispensable for mental attitudes, human action and cognition.

On another front, several mental architecture theories have been proposed, which include the term information. These theories are far superior to the computer processing information model, which has little capacity for explaining overall system of mechanisms required to exhibit flexible, intelligent behavior.[93]

The limitations of the information processing model are most obvious when one examines the architecture that brings together the features, properties, processing mode and limitations of real cognitive systems that, according to Ezquerro, include:

1. Flexible behavior as a function of environment;
2. Exhibition of adaptive conduct (rational, goal oriented);
3. Operation in real time;
4. Operation in a rich, complex and detailed environment;
   a. Awareness of an immense quantity of changing details;
   b. Use of a vast amount of knowledge;
   c. Control of a motor system with many degrees of freedom;
5. Use of symbols and abstractions:
6. Use of natural and artificial languages;
7. Learning from context and experience:
8. Acquisition of capacities in the course of development;
9. Living autonomously within a social milieu; and
10. Exhibition of self-awareness and sense of ego.[94]

A mental architecture capable of explaining a cognitive system is vital to the discipline of Library Science, because it opens up great challenges for understanding and interacting from the basis of incremental information (in Bogdan's terms), and for fixing new information in cognitive systems.

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92 *Idem.*
93 See Jesus Ezquerro, "Teorías de la arquitectura de lo mental", and Bruner, *op. cit.*
94 Ezquerro, *op. cit.,* p. 109.

Information and library science

In the field of Library Science, the term information is indispensable and has been in wide use for several decades, as information science has carried out applied research in libraries and information units. Moreover, there has been wide development of programs to register graphics, control systems and organizational management.

In the United States, it should be remembered, Information Science officially replaced Documentation at the end of the 1960s, and according to Lilley and Trice:

> The architects of information science in the United States wanted to be sure that it would no longer be mistaken either for the microfilm-oriented discipline that documentation had become or for the document–oriented discipline that was library science. This new discipline would be free of real or imagined appendages.[95]

The researchers cited herein also stress that in many parts of the world Documentation and Library Science co-exist and are often included in professional journals. Such is the case in Great Britain; however, in the United States these associations have not joined up, nor do they publish in the same professional journals or appear in the same indexes.[96] At the same time, according to Lilley and Trice, Information Science has advocated for an identity separate from Library Science and has driven many changes in traditional vocabulary. For their part, most librarians do not want to be overwhelmed by those who are in favor of advanced technology.

Information Science also used terminology notably different from that used in Library Science or Documentation; for example, information retrieval, descriptor or terms, relevance, precision, exhaustiveness (recall), Boolean logic, abstracts and indexation.

According to the historical narrative provided by the researchers cited, one observes that the term information is introduced conceptually as a conceptual innovation, even though not necessarily a welcome one, into a disciplinary field that was especially fertile such as Library Science.

The advent of Information Science could be interpreted as going beyond the phenomenological study focused on the book or document toward a sub-

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95   "The founders of Information Science in The United States wanted to ensure that were not confused with a discipline oriented to microfilm, such as was the case of documentation, or another focused on documents, such as Library Science. The new discipline would be free of real or imaginary appendages." Dorothy B. Lilley and Ronald W. Trice, *A History of Information Science 1945 -1985*, p. 3.

96   *Idem.*

stantial or abstract level represented by information and the cycle of information, both concepts that surpass by far the immediate physical referents in such a way that the concept of document possessed greater capacity to be included than the term book. Similarly, the term information becomes an abstract concept with unlimited possibilities to be included in a wide variety of material referents, such as books, magazines, files, etc.

Researchers such as Rubin have stated that Information Science vastly enriched the vocabulary and theory of Library Science. It even helped improve the understanding of the work of libraries and information units in society. The classic definition of Information Science is as follows:

> […] the science that investigates the propieties and behavior of information, the forces governing the flow of information, and the means of processing information for optimum accesibility and usability. The processes incluye the origination, dissemination, collection, organization, storage, retrival, interpretation, and use of information. The field is derived from or related to mathematics, logic, linguistics, psicology, computer tecnology, operation research, the graphic arts, comunication, library science, management, and some other fields.[97]

By virtue of the adoption over several decades of terminology from Science of Information, Library Science has made use of the term information to refer also to data or knowledge, while the material supports have lost importance. In light of Rubin's assertions in this regard, we can see further evidence of this trend; for example, he states that the term "datum" is used as a synonym for information, even though its main feature is to build constituent blocks of information and knowledge, i.e., it is the material from which information is assembled. It is represented by numerals, letters or symbols; however, data does not carry meaning, or rather, none has been assigned it.

As for the term information, he states that the definition is complex, but he makes it clear that for Library Science information means addition of data, organization or classification with meaning, which in turn implies some type of processing or comprehension.[98]

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97 "The science that examines the properties and behavior of information, the forces that govern the information cycle and the meaning of information processing for optimal accessibility and usability. The process includes the creation, dissemination, gathering, organization, storage, retrieval, interpretation and uses of information. The field is derived from or associated with mathematics, logic, linguistics, psychology, computer science, operational research, graphic arts communication science, library science, management and several other fields." Richard E. Rubin, *Foundations of Information Science*, p. 31.

98 *Ibid*, p. 54.

On another front, Saracevic[99] believes that the evolution of Information Science has lent clarity to the understanding the term, not on the basis of information per se, but rather through the solution to problems associated with communication of knowledge --or otherwise entailing individual issues or as part of information needs-- and grasping of the same by human beings, whose contexts, obviously, are social and institutional.

Since the 1970s, researchers as recognized as Shera have promoted new concepts to substitute one of the foundational concepts of Library Science, i.e., the "book." In this regard, Shera states that a book is merely a synonym for graphic record.[100] This bent toward abstraction is relevant because the term record shall later acquire a meaning, like the term information, that is indispensable in the literature and explanatory model of Library Science, as is corroborated by Saracevic.

It is worth pondering why Shera associated the terms cited above, and the reason he gives has to do with the fact that the library is a secondary communication organism, specifically of graphic media, which at the same time is part of the overarching social process of communication. In this light, the library in society becomes a mediator between man and his graphic records. In this context, the objective of the library is to collect, preserve and make available the records of human experience. Consequently, the human experience is recorded in large degree through graphic representation. For Shera, the work of the Library Science discipline makes sense insofar as it serves culture.[101]

On another front, within the academic tradition of Library Science and owing to the new context of information technology, many transcendental conceptual changes have occurred. It could be worthwhile to review the summary proffered by Rodriguez Garcia of this change.[102] He states that the fundamental change occurs in the direction from bibliographic entities to information entities, including the new information entities. In terms of the first of these entities, he states that they are the central unit of the bibliographic universe, which is comprised of a set of versions that can be described and represented in a bibliographic record. As such, these units represent a portion of the interdependent bibliographic universe. According to Rodríguez García,[103] the bibliographic conceptual model includes seven entities: documents, works, superworks, editions, authors, topics and other entities.

99 Tefko Saracevic, "Information science: Origin, evolution and relations."
100 Jesse Shera, *Los fundamentos de la educación en bibliotecología*, p. 91.
101 *Ibid*, p. 190.
102 Ariel Alejandro Rodríguez García, *Las nuevas entidades de información analizadas desde la perspectiva de la organización de la información.*
103 *Ibid.*, p. 7.

With regard to information entities, it is notable that the advent of the internet and computer devices lies at the origin of these entities.Some researchers have proposed substituting the terms bibliographic entities with the concept of entities loaded with digitized information, also known as information packages. These entities are an extension of bibliographic entities; however, they are also new formats with a powerful capacity to store information.

For their part, the new information entities should be understood as resources derived from technological applications whose nature is more interactive and dynamic, with the ability to combine entities that belong to other resources. Moreover, they are characterized by being fragmented; and thanks to this it is possible to access and use the information they contain.[104] The terms associated with the new information entities are as follows: informative objects or sources of information; electronic resources, digital journals, documents or digital documents and digital information objects. In light of this array of terms, Rodríguez García adds that the new entity…

> […] has been created on a digital support and medium; i.e., as an intangible object; as such it cannot be touched like a book, making its environment and constitution largely electronic. For this reason it is considered a digital object. This object and the digital information in general are based on the diverse states found in the binary code, the main medium allowing representation of numbers, text, images, sounds and instructions, whose existence is possible thanks to the short- and long-term file storage capacity of the computer.[105]

The current discussion of the objects of study of Library Science shows that the concept of information, born of Shannon's theory of information, and the context of information technologies have reconfigured standardized models of Library Science and its capacity to represent and organize the universe of records containing socially valuable information.

Finally, it is worth considering that in the new patterns of cataloging known as RDA (Recourses, Description and Access),[106] the emphasis is placed on the term resource, which at the same time is associated to manifestation or item, i.e., individual entities, aggregates and components, as well as entities both tangible and intangible.[107] As is well known, cataloguing standards have allowed the description and access to resources; however, the great challenge is to redesign these for the digital world.

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104 *Ibid.*, p. 20.
105 *Ibid.*, p. 15.
106 See: http://www.loc.gov/catdit/cspo/RDA/rda.html
107 See: RDA Glossary definition of the term *resource*.

In synthesis, one can say that the movement has been from bibliographic entity to information entities and, at this time, has culminated with the resources of the digital world, whose fundamental referent is information technologies. This assertion does not ignore the forms of observing the society as a system, a network society or knowledge society; and explaining human cognition on the basis of interaction with information.

Conclusions

The dimensions of the concept of information are multiple, and each one of these facets has exerted influence on several fronts and, one way or another, on the discipline of Library Science. This can be explained because the concept of information is essential in diverse theories, i.e., information science, sociology and cognitive approaches. And although its use is largely fictional or meta-scientific, its use and usefulness within a theory is undeniably prodigious.

From its origins in the theory of information, this term allowed, as in the case of Library Science, introduction of analysis entailing higher levels of abstraction or substance. Consequently, it unfolded as a conceptual progress, contributing explanatory models that enrich the markedly normative perspectives that for decades have prevailed in the discipline. Nonetheless, we have reached the point of reducing or subsuming the fundamental entities of Library Science into term information, a progression driven in no small degree by technologies used in information processing. Fortunately, this subsuming has begun to dissipate.

It should be stressed that the diverse dimensions or conceptions that have accompanied the term information and the attending social study of technologies have made clear the need to carry out interdisciplinary research, thanks to which new problems relevant to Library Science can be approached. These areas include the organization of information resources and services and cognitive gaps, human development and justice, as well as cultural identity and globalization.

Methodologically, the accurate theoretical identification of how the conception of information is used becomes apparent, since its indiscriminate use has led to extremes of overvaluation, banality or it has been constrained to the field of electronic communication. In all events, it is clear that for the discipline of Library Science, the theoretical and applicative impacts of this weighty term have been underway for several decades. And even though this term is not likely to be used in the future in any narrower way, it is important to be careful with regard to its pretended explanatory or descriptive scope;

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because it is increasingly used in the reconfiguration of Library Science research and the social environments in which it is uttered.

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BOOK REVIEWS

by Luis-Alberto Fuentes-Gatica

The coordinator of this edition provides a brief introduction to research on users of information in diverse communities, calling attention to how the NEIN model is applied, which will surely be of interest to researchers in this field.

The studies gathered in this tome apply the NEIN model and help shed light on the needs and behaviors of the individuals attempting to satisfy their information needs in a community. The structure of the collection attends to what is stipulated in a research compilation.

Calva González asserts the importance of this type of study of users in diverse communities in order to discover their information needs and observe how the NEIN model can help them. The research presented attempts to expand the field of action to other social communities, such as those associated with industry and indigenous groups. The NEIN model simply requires the existence of information needs in order

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to prove its virtues and bring to light such demands.

The introduction is followed by a paper written by Sueli Angélica Do Amaral of the University of Brasilia titled: "The phenomenon of information needs and marketing information studies"; which addresses varied Library Science topics, such as the context of the information society and others, as it attempts to stress the importance of the role of librarians, without ignoring the problem of the business side of information and marketing in a complex society. The researcher emphasizes the role played here by users, who are the basic factor in the library and the reason the librarian exists.

The second paper in the book, by Isabel Villaseñor Rodríguez of the Complutense University of Madrid is: "The phenomenon of the need for information in Spain"; attempts to provide an overview of research and practice associated with the NEIN model and proposes to continue this line of research. The researcher provides an overview of literature published in Spain in the field of Library Science and Documentation, and then discusses the topic of Library Science and Documentation education at the university level. Thereafter, she offers her conclusions and recommendations, where she discusses the scant interest of researchers in the area of information needs, which nonetheless has proven to be very important in the study of users and communities receiving information services.

In the third chapter, José Tomás Palacios Medellín of the UNAM addresses the information behaviors and needs of winemakers in the Mexican states of Aguascalientes, Zacatecas and Durango, arguing that information is a social product required to understand the field of winemaking, its resources and their information sources, showing us their needs, behaviors and the satisfaction obtained, and thereafter explaining the research parameters. He gives an account of the information needs of the community and identifies personal characteristics, the form in which these are manifested and the relationship with information resources and with the identification of the sources used. Palacios discusses the typology of the winemakers and identifies the patterns of their behavior, and thereafter discusses the importance of the environment in which they work. He concludes with a discussion of how he approached these communities and how his inquiry might improve information services provided to these users.

In the fourth Chapter, César Augusto Ramírez Velázquez of the UNAM presents a paper titled "Information, communication and satisfying information needs of the Amuzga community as it undergoes identity change"; which introduces the reader to information needs and how these are determined by each individual within the community until the satisfaction stage is achieved.

The researcher states that his paper is part of a larger research endeav-

or of indigenous communities and their general needs. He goes on to discuss the nature of information in this community. He points to the loss of information and identity in the Amuzga community as relevant traits, something these human communities have experienced and is patently evident in the communication media that enter into contact with their language and culture. The researcher's conclusions provides an overview of the many modifications produced in these communities that occurring as a result of their manner of living and type of information needs. The researcher then argues that research in information must be interdisciplinary in nature.

In the fifth chapter, Martha Sabelli of the University of the Republic of Uruguay offers her paper "Examination of the information behavior of vulnerable children and adolescents: toward information inclusiveness in Uruguay." She asserts that academia is very important in university life and that it must be integrated in an interdisciplinary way. Moreover, the university must be integrated with society in order to generate proposals that involve the government or otherwise bring it to the table. To describe vulnerable children and adolescents is to address a difficult issue in Uruguay. The use of information resources is a very complex phenomenon which begs further analysis and interpretation. A salient part of this research is the section on research subject-object and the function of mediators, who are

none other than public and private sector services that work in the research area and operate as bridges reaching out to vulnerable young people and adolescents, contributing to processes favoring the construction of these communities.

The researcher moves on to discuss the program to promote *Information and inclusion of women, vulnerable children and adolescents*, providing an overview of 167 documents produced by local and national organizations and services, and other institutions that support education and social development, concluding that the supply of information and services targeted at women in the area under study constitute information demands for women and are, at the same time, both barrier and facilitator to achieving the information access they need, while revealing their behaviors associated with information and communication technology.

Sabelli concludes by asserting that accurate, true information (that is to say: a demand satisfied by an information need) constitutes a basic good for achieving personal realization, the development of identity, peaceful co-existence and a dignified quality life of as a citizen.

Chapter Six is contributed by Angélica Guevara under the title "Secondary level teachers as users of information: a development project." The researchers states that there are no studies referring to the information needs of secondary level educa-

tors. She posits her hypothesis and describes the analytical unit to define the object of study, as well as her methods, technique and research instrument.

The next chapter is contributed by Antonia Santos Rosas of the UNAM who presents "Analysis of user satisfaction of the Geographic Information Systems developed in Mexico. Research Project"; which opens by stating that man has developed the activity of preserving and organizing information using systems that allow professionals and researchers to seek and locate the information they require, and has also sought to find the variables involved in the process of user satisfaction. The researcher asks about the profiles of users of the geographic information system and the variables that are entailed in satisfaction of information needs, whether this exists or not and whether there is a correlation between satisfaction of needs of these users and the way in which information they seek is organized, stored and accessed.

The researcher also discusses the specific general objectives of her project and the hypotheses and assumptions she proposes to test and, finally, the method to be used.

The eighth and final chapter is contributed by Juan Antonio Gómez García of the National University of Distance Education of Madrid under the title "The right to information to satisfy information needs, with special reference to its constitutional regime in Mexico." This paper asserts that the human being has the existential need for information as an anthropological precondition, since man exists within an information rich environment and his basic condition as a rational entity implies he will make use of this information. With regard to current context of the information society, the researcher discusses the relevance of the phenomenon of information in our current time; where the basic right to information is now viewed as a pre-condition to democracy. The theory of basic rights is contained in the information and offers two alternative rights arguments to this end. These arguments appeal to subjective rights in order to assert that the constitutional right is a key touchstone to support the theoretical facet of the right to information. Gómez García concludes that rights also exert influence in information to arrive at satisfaction of needs, whether for an individual or a community.

As a whole, the studies included in this edition, some already in their final phases and other still underway, contribute to the development of NEIN as a research tool. Moreover, the researchers hope to spur more studies of users in light of these of elements and encourage researchers and grad students to join this line of inquiry.

MARTÍNEZ COMECHE, JUAN ANTONIO, JUAN CARLOS MAR-COS RECIO y JUAN MIGUEL SÁNCHEZ VIGIL (editores), *Actas del VIII Seminario Hispano-Mexicano de Biblioteconomía y Documentación: Información y Documentación: investigación y futuro en red [Official minutes of the Eighth Hispano-Mexican Seminar on Librarianship and Documentation: Information and Documentation research and future online]*; Madrid, España: Universidad Complutense de Madrid, Departamento de Biblioteconomía y Documentación, 2011.

por Amado Vilchis-López

Each Hispanic-Mexican Librarianship and Documentation Seminar seeks to enrich and elucidate contemporary academic issues, and especially to promote individual and collective, institutional and inter-institutional, national or international work in the communities where information professionals work.

The eighth annual seminar held in Complutense University of Madrid with an emphasis on information and documentation, collectively proposes to address the topic of "Research and Future on the Internet." This topic is discussed in the opening conference and thirty-five papers organized under four headings: Reading; Communications Media; Library Science/Technology and Education/Users. These papers are presented by forty-six experts belonging to diverse participating institutions: Universidad Complutense de Madrid, Univer-

sidad Nacional Autónoma de México, Universidad de Extremadura, Universidad Autónoma de San Luis Potosí and la Universidad Autónoma de Chihuahua.

The seminar addresses online research and the future, stating that "[…] now more than ever libraries, and information and documentation centers are at a crossroads entailing how to face the future that guarantees sustainability of their collections […]", and asks itself:

> We are doing our job well? Do we have the proper tools? Are we facing a reality which because it's known we don't know how to approach it? Is information the most important raw material for humanity? Should libraries and documentation centers continue thinking in terms of printed materials? Should they become entirely digital? To what degree does society contribute to the operation of our libraries and documentation centers?

In the opening paper, José López Yepes discusses the essence, space and the Library Science-Documentation craft, stressing that "[…] the essence of our discipline, the raw material, the focus of all Library Science-Documentation action […] and I see the Library Science-documentation field as a set of tasks, activities, etc., carried out by documentation institutions within the context of the information society […] in this factory of knowledge that is the academic or professional milieu, each and every one of us works in a certain area on the basis of a given concern

and specialization." One of the urgent concerns is "[…] to incorporate an added value to contents that allows these to be used as authentic, reliable sources on which to base new contents […]", and in this way "[…] immediately facilitate the power of information, turning it into contemporary news that is true and useful."

The first section, Reading, is represented by thirteen contributors in six conferences, which provide answers to the initial questions. As such, "[…] the role of reading and writing is potentiated in the university, not only as tools for work, but also as vehicles for integral promotion of the university […]," and serves to create a model that provides hard, processed and analyzed data to support the improvement of regional culture.

According to the statistics, the state of reading is grim and not particularly encouraging; however, "[…] public libraries must design their reading programs in order to attract as many users as possible […]"; in such a way that:

> […] through facilitation of information resources, the librarian strives to understand the user's perception of the reading programs offered by their library, while attempting to present the library as an inviting place to read and socialize.

The cultural heritage entailed in material and immaterial artifacts (i.e., monuments, and oral and musical traditions, respectively), offers a *sui ge-*

neris context of reading and writing as immaterial manifestations of culture, while extracting from these material the *genius loci* or "soul of the place." In this sense, we can appreciate

> […]narrations and choreographs as distinctive elements of the idiomatic tourism based on two elemental tools: the language and the culture, which attempt to create elements not only of reading, but also multimodal artifacts that lead to new narratives through photography, video and digital narratives.

The importance of "[…] the management and integration of files as entities constituting an important source of information depends on awareness and diffusion […]." As such, it is important not only to make these materials visible online, but also to allow access and digital consulting well before definitive and required reading *in situ*.

The establishment of a documentation center to study the online issues, such as reading, writing and diverse practices of written culture is predicated on that fact that today "[…] everything is information and that which is not communicated does not exist; and that which does not inform is condemned to the rigor of nothingness." The idea is to bring together

> […] all of the existing university research on reading in a single collection, and in this way the center shall serve not only as a simple online information shelf, but also as a mediator between universities, faculties, etc.,

supplying them with all of the knowledge needed to carry forward their research work and a filter between the entities and the all of the vast material published in the field.

The digital culture "[…] is transforming the ways in which we inform and are informed, and reality and interpersonal relationships. This digital culture has its foundation in written culture." In this digital environment "[…] adolescents play, learn, entertain themselves, are informed, build social networks and, through these activities, they establish friendships and groups for different purposes "[…], as such it is important that libraries inform about and strengthen this culture in such a way that is remains incorporated and achieves "[…] development of abilities that produce web agents rather than cybernauts or consumers without the ability of discerning, deciding and creating."

The second section, Communications Media, consists of eight contributors offering six papers that emphasize that "[…]the information society has propitiated the existence and proliferation of files, including audiovisual files, which are important because they contain the testimony of recent centuries of humanity […]"; making public and private access to them a matter of transcendental importance, through the implementation of proper methods of organization and systemization, while weighing their historical, social and

cultural value, which added to the advantages of the internet shall facilitate access and consultation, which "[…] uses the internet as a communication channel to empower their transmission and dissemination."

Photography "[…] has always been a pioneer in fixing images […]" as a document. Because of this, it "[…] constitutes a documentary heritage with regard to society's historical memory, and as such photography deserves specific treatment, classification, organization and description, allowing […]" errorless retrieval as a function of context and temporality. To this end the ISAD (G) Standard is used in conjunction with enriching new technologies, so that

> […] photography fulfills its documentary function of confirming facts and events, because photography is born and develops to provide answers to a series of needs.

The postcard was designed as "[…] a communication and dissemination medium to inform about cultures, cities, monuments […]"; however, it is not afforded a specific treatment, because the gathering of such materials has come about on the basis of catalogue, rather than any system of organization and classification, even when their origin is perfectly defined (1869) and the topicality is provided in "[…] countless military, tourism, advertising, political and critical references […]." The proposal for organization of postcards consists of

fourteen elements and their analysis is executed on the basis of Standard UNE50103:1990.

An interesting review analyzes the impact of catechism stamps in Mexico as effective communication media along two fundamental lines: the knowledge of indigenous culture and the translation of doctrine into vernacular languages, a very important historical event in the Old World. This motivated the celebration of several councils called for the purpose of homogenizing doctrine, which centuries later would find in the Second Vatican Council its complete materialization, but to its credit it preserves the pillars on which it was founded. In this tenor the researchers address the topic of general interest regarding the measures for the protection of bibliographic heritage, that "[…] secured historical protection because of their cultural importance, and on this basis the documentary security in Library Science and information centers is determined and essentially exists because of the need to safeguard the collection with greater warranties for their accessibility and consultation." In addition to bulls and other protection laws, currently there are more sophisticated systems, such as bar codes, electro-magnetic devices, radiofrequency transponders, and biometrics.

Finally, the new ecology of the documents in the knowledge society establishes that for "[…] the creation of wealth we are increasingly dependent on the exchange of data, infor-

mation and knowledge, and another form to prepare, edit and write the information is required that addresses two issues: images and the new textual features, agility and dynamics." The key to current information is in the spectator/information generator, which "[…] this is the new ecology of media: more information counted by everyone." In this context we see the *Infoscopos* project, which is posited as the "[…] main objective of the study of change in the media in the first decade of the twenty-first century, and […]"; more specifically, the analysis of the information sources and the model of documentation.

The Library Science/Technology brings together fifteen contributors reading twelve papers and places a special emphasis on a descriptive model of information policy, which "[…] has been used as a model for promulgation of the Federal Transparency and Access to Public Government Information Act of Mexico […]". Said model is based on twelve stages, highlighting their usefulness in contextualizing and meeting the actors, and for understanding the problem and the circumstance. This outline provides the framework for the topic: "[…] social access vertices of knowledge, technology, communication, control, assets and participation […]," and diverse questions are raised, in light of the availability of information and includes the social world that refers to "[…] a way of organizing that has four elements: voluntary identification,

partial involvement, multiple identity and mediated interaction […]." This is the world where the library can realize its social characteristics.

This research also stresses the importance of the binomial information and creativity, pointing out that "[…] the discovery of information and the emergence of new ideas fuel creative intellectual activities […], allowing creativity to catch up with Library Science and Documentation. This connection occurs on the basis of the desire to create new knowledge, and exerts itself especially on the behavior artists who employ a broad array of information sources base in a given information system." The question arises from this point of "[…] why new catalogues must adapt to the new technological; standard and guidelines of Web 2.0 […]." In principle, the answer arises from the way in which catalogues have evolved in successive versions from the early 1980s to 2000, entailing radical changes in digital environments, and the stress on "[…] access over achieving the unity of a friendly interface environment allowing users to exploit more fully the data displayed, which has the potential of creating new ways of communication […]" between users and services.

In the light of these antecedents, it is manifest that "[…] Library Science knowledge is constantly in movement and transforming as it seeks to respond to the challenges that recorded information offers in each context, and "[…], it is in the field of Library

Science where […] the humanities and science coexist like in no other […] ," and "[…] the human condition leaves behind information about itself in each historical era in the form of documents that survive the ravages of time thanks to files, libraries and other information units." This shows that Library Science plays a strategic role in society and is "[…] the link that puts the public into contact with the information and knowledge created by researchers."

Since, "[…] the accelerated technological changes that affect the modalities of production, storage, organization, dissemination, retrieval, access and use of information […] has led to questions about the very nature of Library Science itself and the need to identify new essential elements […]"; where the objective is to arrive at a "[…] consensus within the scientific community of Library Science with regard to the object of study and the conceptual apparatus of the same, "[…] in order to achieve "[…] unity in diversity."

Along these same lines, it is important "[…] to know, document and assess the evolution of the bibliographic organization in terms of subjects cataloguing, "[…] a job that was carried out in the UNAM and about which, after doing the corresponding bibliographic analysis, especially with regard to the use of subject heading lists, one can conclude that:

> […] practically no tools have been created with the subjects to be assig-

ned to documentary contents and that the lists are translations of LC lists. As such, modern terminology proposes the conversion of terminology rather than simple translation, in the opinion that index systems should be created on the basis of one's own culture.

This leads to the consideration of the establishment of new competencies for librarians who need to keep abreast of ICT in such a way that they can meet the information needs of users, and in this way aid users in their development by satisfying their demands within the library environment. In this sense, "[…] one of the most important online information transmission and re-dissemination media is the syndicated content channels, […] "which the ReSync program is designed to solve […] by facilitating research of this object of study, while introducing concrete operations and functions for treating syndication channels and their contents." Along this same line, wiki and peer-to-peer (p2p) systems constitute two emerging paradigms for collaborative production and information exchange, which in the context of the network society have driven

> […] new modalities in our lifestyles, and manner of sharing, working, learning, interrelating and getting information […]. From the social and cultural perspective, the wiki model is primarily an alternative medium which is emancipatory and libertarian […], while the P2P phenomenon depends on relationships distributed across networks.

The conclusion to this section is comprised of the project to develop the digital observatory of digital academic-scientific publications erected in response to the "[…] vast amount of information that remains unknown or otherwise never consulted […]," which drives "[…] the attempt to create a virtual space for consulting the output of the institutions of higher education at the national level." In the context of retrieval of digital files, it is also important to consider the terminological phenomenon, since it is identified on the internet, such as social networks=online communities, Facebook, Tuenti, Twitter, seen from a non-Library Science perspective: "[…] the social theories help us understand how interaction between users of the internet occur and they search for and select information."

The fourth section, Education/Users, brings together nineteen contributions and eleven papers. One of these papers posits the Teaching Outreach Units as "[…] flexible instruments allowing thematic contents to be adapted to curricula as a solution to the problem of economic and social development […]," and concretely the case of a school-based library that worked as a learning resource center in a Tzotzil community.

In this tenor, information literacy is deemed "[…] a necessary condition for attaining the information and knowledge society […]," but with a vision to establishing national strategies that would be materialized through diverse government actions. It is relevant to determine "[…] whether these action constitute a plan, program, policy and/or national strategy for information literacy […]"; for which this must "[…] be seen as a phenomenon that involves all of the instances and institutions of the country […]." In this context we can consider the evaluation/ accreditation programs in higher education institutions, which spur the question: What is implied, especially in the field of Library Science, by submitting to an external evaluation and what are the concomitant challenges for educational institutions and authorities of the same?"

On this plane where information literacy projects become "[…] a sort of functional discipline more than a set of personal abilities, which should be seen in the light of their broad social relevance beyond the issues of librarians and the academy […]," and naturally interoperable with a wide array of complementary disciplines.

Another timely topic is the digital book, which from its beginnings has posed problems entailed in edition, supports and copyright. I stress that the study shows that "[…] all sectors save distribution agree that the central problem is piracy of digital contents […]," for which a law is needed to strengthen copyright protection and commercial exploitation.

We shall conclude this reflection with a note by Butler cited in Michael Gorman's book, *Our Enduring Values:*

"[…] the librarian has come to see his role as that of a secular priest, who administers the sacrament of cultural communion for the souls of individuals."

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Manuscript requirements
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- The conclusions must be the logical result of the arguments put forward.
- The paper should contain the basic elements of a research article.
- Bibliographic and/or electronic sources should be current, sufficient and pertinent to the topic under discussion.

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- You can send critical reviews of recently published books in the areas of Library Science, Archival, Documentation and Information Science, with a maximum of 10 pages. All reviews will alternate the editorial committee for review and undergo specialized copyediting.

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NORMAS PARA LA RECEPCIÓN DE ARTÍCULOS

Los artículos que se publiquen en la revista *Investigación Bibliotecológica: archivonomía, bibliotecología e información* deberán reunir las siguientes características:

Ser artículos de investigación
- Presentar un tema original y/o innovador.
- Tener enfoque novedoso a temas ya tratados.
- Llevar a cabo una aplicación metodológica nueva o distinta al tratar un tema.

Metodología
- La metodología utilizada debe ser consistente (implícita o explícita) y aplicarse adecuadamente al tema.
- Las conclusiones deben corresponder a la argumentación presentada y desprenderse de ésta de manera lógica y coherente.
- La estructura del trabajo debe contener los elementos mínimos que se requieren para un artículo.
- El uso y las fuentes bibliográficas y/o electrónicas deben ser actualizadas, suficientes y pertinentes al tema que se esté tratando.

De los dictámenes
- Sólo se aceptarán artículos que cumplan con los requisitos antes mencionados.
- La revista se apoyará en el arbitraje de expertos o especialistas. Este proceso será anónimo para ambas partes.
- Los dictámenes serán comunicados por escrito al autor y éste, en caso que le sea desfavorable, podrá solicitar por escrito el recurso de reconsideración, que incluya la argumentación pertinente en relación al trabajo presentado.

Reseñas
- Se pueden enviar reseñas críticas sobre libros de publicación reciente en las áreas de Bibliotecología, Archivología, Documentación o Ciencias de la Información, con una extensión máxima de 10 cuartillas. Todas las reseñas se turnarán al Comité Editorial para su revisión y se someterán a corrección de estilo especializada.

Presentación del material
- Se aceptan artículos en idiomas español, inglés, portugués y francés.
- Los trabajos enviados deberán ser relativos a la Bibliotecología, Archivonomía y Ciencias de la Información. Podrán publicarse colaboraciones sobre otras disciplinas siempre y cuando el artículo las vincule con las ya mencionadas y *no haya sido –o vaya a ser– publicado.*
- El envío de cualquier artículo a esta revista supone el compromiso del autor de *no someterlo a la consideración de otras publicaciones.*
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–La extensión mínima de los artículos es de 15 cuartillas (incluyendo anexos). Cada cuartilla consta de 28 renglones de aproximadamente 65 golpes cada uno.

–Los nombres propios, los títulos y subtítulos del trabajo deberán anotarse en mayúsculas y minúsculas.

–La primera vez que se emplee una sigla en los textos de los cuadros o gráficas irá acompañada de su equivalencia completa.

- Cada artículo deberá incluir:

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- Los artículos deberán acompañarse de un resumen en español e inglés de 100 a 200 palabras cada uno.
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- Las notas al pie de página y las fuentes de citas con referencias bibliográficas se presentarán a doble espacio, y además la bibliografía se indicará al final del texto.
- Las citas, notas bibliográficas y la bibliografía deberán contener todos los elementos que permitan la identificación de los documentos citados.
- Los trabajos deberán estar escritos de acuerdo con las reglas de la gramática y la sintaxis.
- Todos los artículos se someterán a corrección de estilo especializada.
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Os artigos que se publiquem na revista *Investigación Bibliotecnología: archivonomía, biblioteconomía e información* deverão reunir as seguintes características:

Que sejam artigos de investigação
• Apresentar um tema original e/ou inovador.
• Apresentar uma perspectiva nova a temas já conhecidos.
• Apresentar uma aplicação metodológica nova ou diferente sobre um tema.

Metodologia
• A metodologia utilizada deve ser consistente (implícita ou explícita), e aplicar-se adequadamente ao tema.
• As conclusões devem corresponder à argumentação apresentada e distinguir-se desta de forma lógica e coerente.
• A estrutura do trabalho deve conter os elementos mínimos que são requeridos para um artigo.
• O uso e as fontes bibliográficas e/ou electrónicas devem ser actualizadas, suficientes e pertinentes ao tema que se está a analisar.

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• Só se aceitarão artigos que cumpram com os requisitos antes mencionados.
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• Você pode enviar resenhas críticas de livros recentemente publicados nas áreas de Biblioteconomia, Arquivologia, Documentação e Ciência da Informação, com um máximo de 10 páginas.Todos os comentários serão suplentes da comissão editorial para revisão e submeter copyediting especializados.

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