GOOGLE SCHOLAR METRICS: AN UNRELIABLE TOOL FOR ASSESSING SCIENTIFIC JOURNALS

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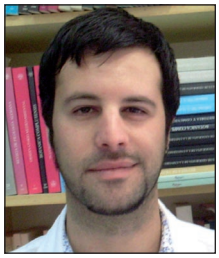

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Abstract

We introduce *Google Scholar Metrics* (*GSM*), a new bibliometric product of *Google* that aims at providing the H-index for scientific journals and other information sources. We conduct a critical review of *GSM* showing its main characteristics and possibilities as a tool for scientific evaluation. We discuss its coverage along with the inclusion of repositories, bibliographic control, and its options for browsing and searching. We conclude that, despite *Google Scholar*'s value as a source for scientific assessment, *GSM* is an immature product with many shortcomings, and therefore we advise against its use for evaluation purposes. However, the improvement of these shortcomings would place *GSM* as a serious competitor to the other existing products for evaluating scientific journals.

Keywords

Google, *Google* Scholar, *Google Scholar Metrics*, Scientific Journals, Repositories, H-Index, Bibliometric Indicators, Scientific Assessment.

Título: *Google Scholar Metrics*: una herramienta poco fiable para la evaluación de revistas científicas

Resumen

Se presenta *Google Scholar Metrics* (*GSM*), el nuevo producto bibliométrico de *Google*, que computa el índice h de revistas y otras fuentes de información científica. Se exponen las principales características de *GSM*, y se realiza una revisión crítica de sus posibilidades como herramienta para la evaluación de revistas científicas. Se estudia, entre otros aspectos, su cobertura, la inclusión de repositorios junto a las revistas científicas, el control bibliográfico de la información, y las posibilidades de consulta y visualización de resultados. Se concluye que, pese a las potencialidades de *Google Scholar* como fuente para la evaluación científica, *GSM* es un producto inmaduro y con múltiples limitaciones por lo que no se aconseja su uso con fines evaluativos. Igualmente se plantea que la mejora de sus prestaciones, posicionaría a *GSM* como una seria competencia para los productos de evaluación de revistas existentes en el mercado de la información científica.

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Palabras clave
Google, *Google Scholar*, *Google Scholar Metrics*, Revistas científicas, Repositorios, Índice H, Indicadores bibliométricos, Evaluación científica.

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1. Introduction[1]

Since its emergence in 2004, *Google Scholar* has attracted a huge interest in the scientific community (**Butler**, 2011). In addition to its usefulness to find academic materials, not only has its capability as a source of information been studied, but also its usefulness as a tool for evaluating research (**Jacsó**, 2005; 2008a; 2008b; 2009; 2011; 2012; **Harzing**; **Van der Wal**, 2008; **Torres-Salinas**; **Ruiz-Pérez**; **Delgado-López-Cózar**, 2009; **Aguillo**, 2012). In this sense, the wealth of *Scholar* as a source of information has not gone unnoticed by *Google*, which aims now to offer a product for evaluative purposes. Similar to *Thomson Reuters*' *Journal Citation Reports* (*JCR*) and their impact factor, or the *Elsevier* database *Scopus* and the *SJR* and *SNIP* indicators, *Google Scholar* has developed a number of bibliometric measures based on its content, which provide a proxy of journals' impact (along with other sources) according to their database. It seems logical for *Google* to dig deeper in this arena, as it has already managed to make both its main search engine and the specialized *Google Scholar* into indispensable tools for scientists (**Nicholas** *et al.*, 2010; **Jamali**; **Asadi**, 2010).

Google Scholar Metrics (*GSM*)[2] was established in April 2012 and its launching was announced in a brief note on their blog[3]. In this way, the company moves into the very heart of bibliometrics: the journals citation indexes. However, researchers had already speculated about this possibility after the release, a few months earlier, of *Google Scholar Citations* (**Cabezas-Clavijo**; **Torres-Salinas**, 2012), a tool that measures researchers' impact. With the implementation of *GSM*, *Google* enters into direct competition with the different products and indexes currently on the market.

In this paper we describe and critically review *Google*'s new product, going through its most significant features and pointing out their few strengths and many weaknesses. Among other aspects, we outline the scope and coverage of *GSM* for the most relevant Spanish journals for Social Sciences and Law and discuss the enormous impact that the surprising inclusion of some repositories generates in the final results. Finally, we discuss the possibilities of adopting this product for bibliometric purposes.

2. Description

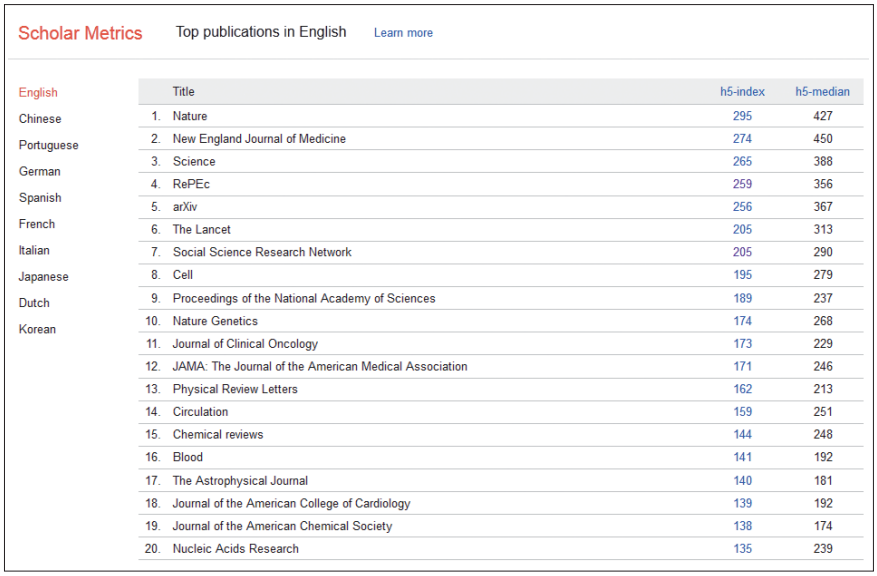
GSM is a free and open access bibliometric product which provides the h-index of a wide range of scientific journals and other information sources. For the first edition, the h-index is calculated from papers published in the last five years (2007-2011) and tracks the citations received until April 2012.

The h-index is an easy-to-calculate indicator, and –probably because of that– is hugely popular among the scientific community. Although mainly used to evaluate researchers, it may be used to assess any scientific agent such as a scientific journal (**Braun**; **Glänzel**; **Schubert**, 2006). A journal with an h-index of 12 (eg, *El profesional de la información*) means that this journal has published 12 papers with at least 12 citations each. Additionally, *Google* provides two more indicators for each journal. On the one hand, it shows the median number of citations obtained by the articles that contribute to the h-index. Therefore, two journals with the same h-index can obtain very different citation averages; this way *GSM* uses this indicator to rank publications with the same h-index value. On the other hand, it provides a list of items that contribute to its h-index.

The *GSM* interface can be consulted in two ways:

– Accessing the rankings by language (currently 10: English, Chinese, Portuguese, German, Spanish, French, Korean, Japanese, Dutch and Italian). It displays for every language a ranking of the top 100 journals according to their h-index.
– Using the search engine to search for words in the titles of journals. The search is not limited to the 100 main journals but to all those included in *GSM*. In this case, the query returns a maximum of 20 results.

In this regard it is noted that journals included in this product


Scholar Metrics Top publications in English Learn more

English
Chinese
Portuguese
German
Spanish
French
Italian
Japanese
Dutch
Korean

	Title	h5-index	h5-median
1.	Nature	295	427
2.	New England Journal of Medicine	274	450
3.	Science	265	388
4.	RePEc	259	356
5.	arXiv	256	367
6.	The Lancet	205	313
7.	Social Science Research Network	205	290
8.	Cell	195	279
9.	Proceedings of the National Academy of Sciences	189	237
10.	Nature Genetics	174	268
11.	Journal of Clinical Oncology	173	229
12.	JAMA: The Journal of the American Medical Association	171	246
13.	Physical Review Letters	162	213
14.	Circulation	159	251
15.	Chemical reviews	144	248
16.	Blood	141	192
17.	The Astrophysical Journal	140	181
18.	Journal of the American College of Cardiology	139	192
19.	Journal of the American Chemical Society	138	174
20.	Nucleic Acids Research	135	239

Figure 1. *Google Scholar Metrics* ranking for top publications in English

are not all of those indexed in *Google Scholar*. A selection has been made according to two criteria: only journals that have published at least 100 articles in the period 2007-2011 and those which have received at least one citation (i.e., excluding journals with h-index = 0). It should be noted that all journals' bibliometric indicators correspond with those calculated on April 1, 2012. It is therefore a static information system as it is not updated automatically as the journals get more citations. Although not announced, it is expected that *Google* will periodically update this data.

3. Analysis and evaluation of *GSM*

GSM shows an easy-to-use and simple interface similar to the rest of *Google* products; however, it lacks many functionalities as an evaluative tool. To *Google*'s traditional opacity we must add, regarding its coverage and scope, many errors in the technical processing of bibliographical data along with an incomprehensible amalgam of information sources listed in their rankings. In this section, we present a thorough analysis of the product pointing out its main weaknesses.

3.1. *Coverage*

There are two main aspects discussed in this subsection. Firstly, we discuss the decision of mixing scientific journals with other sources such as repositories in *GSM*. Secondly, we analyze the coverage of journals belonging to the Social Sciences and Law fields, two areas that may need more reliable assessment tools.

3.1.1. What information sources does it cover? Is it advisable to mix repositories and journals?

The first question we must answer regards the information sources covered by this product and, more specifically, the appropriateness of including different materials along with scientific journals (**Delgado-López-Cózar**, 2012). Thus, the ambiguous definition of which documents are to be measured in *GSM* is surprising. Despite the fact that the brief methodological note refers to scientific journals constantly[4], and that these constitute the vast majority of sources collected, *GSM* states that, in addition to journal articles, conference proceedings and preprints of "some manually selected sources" have also been included. This surprising decision leads to the indiscriminate mixture of sources as diverse as journals, repositories (*RePEc* or *arXiv*), databases (*Cochrane database of systematic reviews*), conference proceedings (*Proceedings of SPIE*, *AIP Conference proceedings*) and working papers (*NBER Working paper series*).

Although any expert knows of the valuable role repositories play in communicating and disseminating science, *GSM* engineers seem to ignore their nature, which should have prevented them from making any bibliometric comparison with scientific journals. It is unreasonable to compare repositories, which have a very broad subject coverage and are created to store and disseminate academic materials, with scientific journals, which are vehicles for publishing almost exclusively research in a very narrow subject area (discipline or specialty) after passing through a process of scientific evaluation. Usually, the level of peer review is in accordance with the journal's prestige and impact. The inclusion of repositories contradicts this axiom, as these only conduct a formal review of the documents stored and do not validate their scientific content. It is the publication in a peer reviewed journal which certifies the scientific nature of a work. Moreover, the fact that the indicator chosen by *Google* (the h-index) is highly dependent on the size of the output of each source, actually favours repositories, which store a much higher number of papers than most scientific journals.

No wonder, then, that three of the top 10 English publications (figure 1) are repositories (*RePEc*, *arXiv* and *Social Science Research Network*), probably including some of those "hand-selected sources". The obvious question is: why are these selected and not others? Repositories as *E-LIS*, or databases such as *CiteSeerX* or *ADS* (*Astrophysics Data System*) would have reached very high positions if they had been included. All in all, this decision is surprising and already indicates that, methodologically, *GSM* is a poor product.

Figure 2. Screenshot of "Market liquidity and funding liquidity" in the different sources where it is indexed.

A further analysis of the most cited papers in the four top repositories in the *GSM* rankings (*RePEc*, *SSRN*, *arXiv*, *NBER*), reveals that the overwhelming majority of these materials have also been published as journal articles (89%) and that many papers are simultaneously included in several repositories (**Delgado-López-Cózar**, 2012), as illustrated in figure 2. This means that the documents determining the impact of repositories are actually published in scientific journals, and only 5% can be considered as unique "repository documents".

3.1.2. What is the coverage for national journals in specific areas?

Since no master list of journals is provided by *GSM*, it is necessary to do some tests to check the coverage of certain areas of knowledge (**Cabezas-Clavijo**; **Delgado-Lopez-Cózar**, 2012b). As multidisciplinary information sources, *Web of Science* and *Scopus* databases show a good coverage for basic science journals; therefore, the areas where a new tool for the classification of journals makes more sense are Social Sciences and Humanities. Of course this assessment need makes perfect sense when evaluating national journals, which have not fully been included in the other databases. In this regard, and taking as an example the Spanish journals with the highest impact according to the *In-Recs* (Impact index of Spanish Journals in Social Sciences) and *In-Recj* (Impact index of Spanish Journals in Law) databases, the coverage rate for the different disciplines within these areas was calculated. The results show that *GSM* covers 69.8% of the high-impact Spanish journals in Social Sciences and 62.1% of the journals in Law.. This low coverage can be attributed mainly to the production thresholds established and, in the case of Law, to the exclusion of journals with an h-index = 0.

3.2. The bibliometric indicators: h-index and median of citations

Google bets it all on the h-index, which is the criterion to rank the journals. This is a well-known and accepted measure by the international community for the assessment of researchers' careers but it is not commonly applied to the evaluation of scientific journals (**Harzing**; **Van der Wal**, 2009; **Franceschet**, 2010; **Moussa**; **Touzani**, 2010; **Onyancha**, 2009; **Hodge**; **Lacasse**, 2011). However, it is a little disappointing that *Google* has not released its own metrics, such as those based on the algorithm used in the PageRank. In this case, *Google* seems to have chosen an indicator which happens to be very popular within the scientific community, but which presents major limitations. The main one is that it favours long research careers or, in this case, the most productive journals, since the maximum achievable potential of the h-index is limited by the total output of the agent under evaluation (**Costas**; **Bordons**, 2007). The fact that the h-index has little discriminatory power emphasizes the need for using additional indicators, in this case, the median number of citations of articles contributing to the h-index of a journal. It is more statistically significant to use the median than the average, as it represents more precisely the probability of citation of a particular journal. However, we must bear in mind that this indicator is calculated only with the papers contributing to the h-index. Returning to the case of *El profesional de la información* (h-index = 12), only these 12 articles contribute to the median, while the rest of the papers published by this journal are ignored. This means that for *El profesional de la información* –which published 442 papers between 2007 and 2011- only 2.7% of articles (figure 3) influence their impact indicators.

3.3. Analysis of the citation window

Google has chosen a five-year time frame for calculating the h-index. Actually, this period is even shorter, since it is unlikely that papers published in the last year of the citation window meet the citations threshold required to contribute to the journal's h-index. While this time frame is suitable for basic science journals with an international scope, it seems insufficient for the case of national journals, and especially for those in the fields of Social Sciences and Humanities. In these areas, it is advisable to employ longer periods of time in order to generate meaningful and discriminatory citation values. The h-index for a 10-year period shows significantly more discriminatory figures, as indicated for the case of Spanish journals in Social Sciences and Law (**Cabezas-Clavijo**; **Delgado-Lopez-Cózar**, 2012a). These differences in the h-index between time frames can be seen in the impact data collected by the *EC3* research group in 2011 (**Delgado-López-Cózar** *et al.*, 2012a, **Delgado-López-Cózar** *et al.*, 2012b) in comparison to those offered by *GSM*. Thus,

Title / Author	Cited by	Year
Conceptos de web 2.0 y biblioteca 2.0: origen, definiciones y retos para las bibliotecas actuales DM Arnal El Profesional de la Informacion 16 (2), 95-106	58	2007
El factor de impacto de las revistas científicas: limitaciones e indicadores alternativos R Aleixandre-Benavent, JC Valderrama-Zurián, G González-Alcaide El Profesional de la Informacion 16 (1), 4-11	53	2007
Las bibliotecas universitarias y Facebook: cómo y por qué estar presentes D Margaix-Arnal El Profesional de la Informacion 17 (6), 589-602	26	2008
Ciencia 2.0: catálogo de herramientas e implicaciones para la actividad investigadora Á Cabezas-Clavijo, D Torres-Salinas, E Delgado-López-Cózar El Profesional de la Informacion 18 (1), 72-80	25	2009
Animating the development of Social networks over time using a dynamic extension of multidimensional scaling L LEYDESDORFF, T SCHANK, A SCHARNHORST, W DE NOOY El Profesional de la información 17 (6), 611-626	24	2008
Repositorios de publicaciones digitales de libre acceso en Europa: análisis y valoración de la accesibilidad, posicionamiento web y calidad del código C Rovira, MC Marcos, L Codina El Profesional de la Informacion 16 (1), 24-38	20	2007
Introducción y estudio comparativo de los nuevos indicadores de citación sobre revistas científicas en Journal Citation Reports y Scopus D Torres-Salinas, E Jiménez-Contreras El Profesional de la Informacion 19 (2), 201-208	17	2010
SCImago journal & country rank: un nuevo portal, dos nuevos rankings G Scimago El Profesional de la Informacion 16 (6), 645-646	15	2007
La formación de usuarios en las bibliotecas universitarias españolas M Somoza-Fernández, E Abadal El Profesional de la Informacion 16 (4), 287-293	13	2007
Estudio de caso de servicio de préstamo de libros electrónicos J Clavero, M Codina, A Pérez, M Serrat-Brustenga El Profesional de la Informacion 18 (2), 237-242	13	2009
Normalización de la información: la aportación de IraLIS T Baiget, JM Rodríguez-Gairín, F Peset, I Subirats, A Ferrer-Sapena El Profesional de la Informacion 16 (6), 636-643	13	2007
Desarrollo profesional y opinión sobre la formación recibida de los titulados universitarios en información y documentación de las universidades públicas de Madrid (2000-2005) JA Moreiro-González, P Azcárate-Aguilar-Amat, MÁ Marzal-García-Quismondo, CM ... El Profesional de la Informacion 17 (3), 261-272	12	2008

Figure 3. Papers contributing to *El profesional de la información* h-index

the extension of the h-index range can bring out important differences between journals in the same specialty. Given the slow processes of production, dissemination and reception of scientific knowledge in these fields, it is better to use longer time periods in order to allow documents to reach their citations peak.

3.4. Bibliographic control

Two issues must be reviewed regarding the bibliographic control: on one hand, the lack of standardization in journals' titles; on the other hand, errors in the identification of authors, journals and other bibliographic data.

In order to calculate a journal's impact factor, one must undertake normalization tasks such as standardizing journal's title. The different naming variants of journal titles when cited call for normalizing and identifying these publications. However, *Google* already acknowledges this problem and has tried to deal with it. The company itself has found 959 ways to name the journal *PNAS* (*Proceedings of the National Academy of Sciences*) –a fact that shows that the same care has not been taken with other publications of lesser rank or reach-, which makes it inexcusable to make serious mistakes when identifying national flagship publications. It is not necessary to conduct a systematic search to detect dupli-

Primary Language	Journal Title (as shown in GSM)	H Index	Median	Language
English	BULLETIN-AMERICAN ASTRONOMICAL SOCIETY	26	45	English
	Bulletin of the American Astronomical Society	19	32	English
	The Journal of the American Dental Association	34	53	English
	The Journal of the American Dental Association (JADA)	1	3	Spanish
	International Journal of Minerals, Metallurgy and Materials	10	13	English
	International Journal of Minerals, Metallurgy, and Materials, Volume 18, Issue 1, pp. 115-120	2	6	English
French	Annales Françaises d'Anesthésie et de Réanimation	9	10	French
	Annales françaises d'anesthèsie et de rèanimation	9	14	English
	Archives de Pédiatrie	8	9	French-English
	Archives de pédiatrie: organe officiel de la Sociéte française de pédiatrie	10	14	English
	JOURNAL FRANCAIS D OPHTALMOLOGIE	11	14	English
	Journal Français d'Ophtalmologie	6	8	French-English
	Médecine tropicale	4	5	French
	Médecine tropicale: revue du Corps de santé colonial	6	8	English
	Revue de pneumologie clinique	4	5	English
	Revue de Pneumologie Clinique	4	4	French
German	Der Chirurg	10	14	English-German
	Der Chirurg; Zeitschrift fur alle Gebiete der operativen Medizen	11	15	English
	Operative Orthopädie und Traumatologie	9	12	English
	Operative Orthopädie und Traumatologie	7	9	English-German
Italian	GIORNALE ITALIANO DI DERMATOLOGIA E VENEREOLOGIA	5	7	English
	Giornale italiano di dermatologia e venereologia: organo ufficiale, Società italiana di dermatologia e sifilografia	7	12	English
Portuguese	Ciência, Cuidado e Saúde	11	16	Portuguese
	Ciência, cuidado e saúde	11	13	Portuguese
	Encontros Bibli: Revista Eletrônica de Biblioteconomia e Ciência da Informação	5	7	Portuguese
	Encontros Bibli: revista eletrônica de biblioteconomia e ciência da informação	3	27	Portuguese
	Revista Brasileira de Enfermagem	22	28	Portuguese
	Revista Brasileira de Enfermagem	8	10	English-Portuguese
	REVISTA BRASILEIRA DE CIÊNCIAS SOCIAIS	11	16	Portuguese
	Revista Brasileira de Ciências Sociais	9	13	Portuguese
	Revista CEFAC	17	22	Portuguese
	Revista CEFAC	8	11	Portuguese
	Revista Gaúcha de Enfermagem	11	16	Portuguese
	Revista Gaúcha de Enfermagem	10	15	Portuguese
	Texto & Contexto Enfermagem	21	27	Portuguese
	Texto & Contexto-Enfermagem	12	16	Portuguese

Table 1. Examples of duplicated journals according to the primary language of the journal, h-index, median and language of the papers' title contributing to the h-index.

Primary Language	Journal Title (as shown in GSM)	H Index	Median	Language
Spanish	Acta otorrinolaringologica espanola	1	2	English
	Acta Otorrinolaringológica Española	7	8	Spanish
	ACTA PEDIATRICA ESPANOLA	1	5	English
	Acta pediátrica española	5	8	Spanish
	Adicciones	6	12	English
	Adicciones: Revista de socidrogalcohol	13	17	Spanish
	Anales de Pediatría	13	22	Spanish
	Anales de pediatría (Barcelona, Spain: 2003)	8	10	English
	Atención Primaria	11	20	Spanish
	Atencion primaria/Sociedad Española de Medicina de Familia y Comunitaria	6	7	English-Spanish
	Biblioteca Universitaria	3	6	Spanish
	Biblioteca Universitaria	2	4	English-Spanish
	Cirugia espanola	4	4	Spanish
	Cirugía Española	10	12	Spanish
	Cirugía Española (English Edition)	6	7	English
	ENDOCRINOLOGIA Y NUTRICION	3	8	English
	Endocrinología y nutrición: órgano de la Sociedad Española de Endocrinología y Nutrición	6	7	English-Spanish
	Farmacia Hospitalaria	8	9	Spanish
	Farmacia Hospitalaria (English Edition)	4	4	English
	Medicina Clínica	15	25	Spanish
	Medicina clínica	12	17	English
	Nefrología (Madrid)	10	11	English
	Nefrología: publicación oficial de la Sociedad Española de Nefrología	14	18	Spanish
	Neurología (Barcelona, Spain)	7	13	English
	Neurología (English Edition)	5	9	English
	Neurología: Publicación oficial de la Sociedad Española de Neurología	9	14	Spanish
	PROGRESOS DE OBSTETRICIA Y GINECOLOGIA	2	5	English-Spanish
	Progresos de Obstetricia y Ginecología	5	31	Spanish
	REVISTA DE NEUROLOGIA	8	9	English
	Revista de neurologia	5	7	English
	Revista de neurología	14	17	Spanish
	Revista Española de Cirugía Ortopédica y Traumatología	3	3	Spanish
	Revista Española de Cirugía Ortopédica y Traumatología (English Edition)	1	2	English

Table 1 (continued).

cate journals in various languages such as English, Spanish, French, Italian, Portuguese or German. These mistakes were especially notable in the biomedical field, where they often use the abbreviated journal title rather than the full one. This lack of standardization is motivated not only by the abbreviated titles of journals, but also appears to be associated with journals edited in more than one language, which are not uniformly processed by *Google*. Table 1 shows some of the detected duplicated journals. Supplementary material regarding mistakes and omissions in *Google Scholar* can be found at

http://ec3.ugr.es/googlescholar.htm

It is also worth mentioning the lack of care regarding the formal presentation of the product. Thus, *GSM* has not managed to show journal titles evenly: some are presented with their full name (most of them), others with the abbreviation and some references are in uppercase while most of them aren't. Moreover, in some journals, volumes or numbers have been incorrectly included as part of the title, while in other cases there seem to be many problems when converting characters.

To these errors, we must add those already discussed regarding the identification of a paper's source. Along with classical errors (**Jacsó**, 2008a) such as including authors such as "Password", "Building", "Introduction" or "View", *GSM* showed the journal "Age (years)", first included in the list of Spanish-language ranking as the 99th with the highest h-index and excluded afterwards. Similarly, other errors in the standardization of journals were corrected after being identified in an initial note (**Cabezas-Clavijo**; **Delgado-López-Cózar**, 2012c). This illustrates *Google*'s goodwill to continually improve the product, but also warns against the consistency of data which may be modified without any previous comment, note or explanation.

Finally, another type of error detected is the incorrect identification of references. Thus, the professional affiliation or information such as DOI mistakenly replaces the title information or is shown as a part of it.

3.5. Search and visualization of results

If the data standardization problems negatively affect the validity and reliability of the results, the search capabilities directly challenge the interpretation of this data. Bibliometric data from a journal only make sense if you can compare them with the publications in the same *league*, that is, same discipline or scientific area. However, the possibilities offered by *Google* are scarce and inadequate. They are scarce as there are just two ways to access the information: browsing the hundred journals with the highest h-index per language or filtering through journal title. They are also inadequate as none of these methods are effective when evaluating journals in a given discipline.

The ability to browse only by languages is unprecedented in bibliometrics, and has little practical value. The logical thing would be to provide data per areas or scientific disciplines, as bibliometric indicators –such as the h-index- are highly dependent on the production and citation patterns of each scientific area and are not comparable between disciplines. Thus the only way to check a journal's impact in a given area is to search one by one and with no certainty of whether it is or not included, as *GSM* doesn't provide a master list with all the indexed sources. The standardization problems emerge again when performing a search. *Google* itself is aware of this weakness, as they encourage using the short or the alternative title of the journal when the user is unable to find it by searching for its full name.

The option to search by words in journal titles only displays up to 20 results, which turns out to be insufficient. This option supports word stemming only for titles of publications in English, so searching for the lexeme "cardiol", for instance, would retrieve the first 20 publications with the word *cardiology* in the title, but not others such as *cardiología*, indicating the strong language bias of *GSM*. In all languages but English the word to be found must be entered in its exact form. However, this also seems to be inconsistent.

Another shortcoming is that *GSM* only shows items that contribute to a journal's h-index (if an h-index equals 51, then those 51 items are listed). It also would be interesting to show items that are close to the h-index threshold, although it could also encourage unethical behaviours by editors, which could press researchers to cite such papers (**Delgado-López-Cózar**; **Robinson-García**; **Torres-Salinas**, 2012).

4. Final thoughts

Despite the above-mentioned limitations of *GSM*, we consider the arrival of *Google* in the field of bibliometrics to be very positive, as it will allow many researchers without access to traditional citation databases to look up their journals' impact. This will also stimulate competition between different evaluation products and may encourage the adoption of the h-index for the evaluation of journals, especially in Social Sciences and Humanities, areas with few adequate bibliometric indicators for assessing journals' impact.

Thus, *Google Scholar* lands in the research evaluation market, working on products that are in direct competition to *Elsevier*'s and *Thomson Reuters*' databases. However, given *Google*`s recent history when launching and subsequently withdrawing products that do not meet their expectations, we must be wary of a possible future scenario that could lead *Google* to close down the *GSM* project in a few months. In case of going ahead, its success will depend on the extent to which *GSM* weaknesses are addressed, as well as the capacity to integrate this product with *Google Scholar Citations*' personal profiles and *Google Scholar*'s results.

However, we have to be very critical at the moment. It is disappointing to see how *Google* has delivered a product that is so unambitious and full of mistakes. *Google* should be aware that producing professional bibliometric tools requires effort and infrastructure beyond algorithms and robots that automatically produce results. It also requires the involvement of specialists in the area in order to correctly configure this product. For now, it seems that *Google* considers that scientific evaluation by means of bibliometric tools is a field to "play" more than a niche market of potential profitability.

Thus, in this context, the main strengths of *Google Scholar Metrics* seem related to factors which are external to the product, such as free and open access, more than to the tool itself. Free access will certainly awaken the sympathy of research managers, who will certainly reflect upon the costs of the *Thomson Reuters* and *Elsevier* databases.

When speaking of *Google* products for research, we must distinguish well between the data source *Google Scholar* and the *Scholar Metrics* product. In this analysis we have focused on the product, not the source. However, we must warn that some of the limitations come directly from errors detected in the data source. In any case, it should be noted that *Google Scholar* as an information source for evaluation purposes shows a huge potential. Therefore, it may lead to generating bibliometric products at lower costs than the traditional assessment tools, without a significant decline in credibility, as evidenced by the new *Journal Scholar* tool (**Delgado-Lopez-Cózar** *et al.*, 2012c). However, *Scholar Metrics* is an immature product, which presents several shortcomings in its current configuration for evaluating scientific journals, making its use inadvisable for assessment purposes, especially for those involving national journals and the fields of Social Sciences and Humanities.

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6. Notes

1. This paper comprises the content of several *working papers* (*EC3 Working Papers 1-5*), published in April and May of 2012.

2. Google Scholar Metrics
http://scholar.google.com/citations?view_op=top_venues

3. Google Scholar Metrics for Publications
http://googlescholar.blogspot.com.es/2012/04/google-scholar-metrics-for-publications.html

4. *http://scholar.google.com/intl/en/scholar/metrics.html*

5. Supplementary material: *Mistakes and omissions detected in GSM.* Here we show screenshots of several mistakes and shortcomings reviewed in the paper *Google Scholar Metrics: an unreliable tool for assessing scientific journals*. Please beware that all screenshots were taken on 06/12/2012 and that the mistakes we point out here might have been corrected by *Google* at this time:
http://ec3.ugr.es/googlescholar.htm

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