New map of the research published in *Profesional de la Información* (2006-2023)

Pablo Guerrero-Castillo; **María-Victoria Nuño-Moral**; **Vicente P. Guerrero-Bote**; **Félix De-Moya-Anegón**

Nota: Este artículo se puede leer en español en:
https://revista.profesionaldelainformacion.com/index.php/EPI/article/view/87540

Recommended citation:

Guerrero-Castillo, Pablo; **Nuño-Moral, María-Victoria**; **Guerrero-Bote, Vicente P.**; **De-Moya-Anegón, Félix** (2023). "New map of the research published in *Profesional de la Información* (2006-2023)". *Profesional de la información*, v. 32, n. 7, e320708.

https://doi.org/10.3145/epi.2023.dic.08

Manuscript received on September 18th 2023
Accepted on October 29th 2023

Pablo Guerrero-Castillo
https://orcid.org/0009-0000-9495-6553

Universidad de Extremadura
Facultad de Ciencias de la Documentación y la Comunicación
06071 Badajoz, Spain
pablogc@unex.es

María-Victoria Nuño-Moral
https://orcid.org/0000-0002-5447-4813

Universidad de Extremadura
Facultad de Ciencias de la Documentación y la Comunicación
06071 Badajoz, Spain
mvnunmor@unex.es

Vicente P. Guerrero-Bote ✉
https://orcid.org/0000-0003-4821-9768

Universidad de Extremadura
Facultad de Ciencias de la Documentación y la Comunicación
06071 Badajoz, Spain
guerrero@unex.es

Félix De-Moya-Anegón
https://orcid.org/0000-0002-0255-8628

SCImago Research Group
18220 Granada, Spain
felix.moya@scimago.es

Abstract

In 2006, *Profesional de la Información* (*EPI*) began to be indexed by international scientific literature databases and is currently one of the leading Spanish journals in Library & Information Science and in Communication. Research fields can be characterized and analysed based on the patterns of keywords used in the publications. One of the most used techniques for this is co-word analysis. This technique is used in the present study to examine the structure of the research published in *EPI*. The journal's two-fold spirit in Library & Information Science and in Communication is revealed, comprising six main thematic areas. Since no poor behaviour is seen in any of these areas, it can be concluded that, in becoming part of *WoS* and *Scopus*, *EPI* has entered a virtuous cycle that has led it to successfully expand its thematic scope, and to attain levels of impact and excellence superior to those of its origins.

Keywords

Scientometrics; Co-word analysis; Knowledge maps; Thematic analysis; Scientific journals; Library & Information Science; Communication; *Scopus*; *Profesional de la Información*.

1. Introduction

Profesional de la Información (*https://www.profesionaldelainformacion.com*) is a scientific journal also known as *EPI*. Its original title, dating back to 1992, was *Information World en Español* (*IWE*), a newsletter that published news and reports. In 1998, its title was changed to *El Profesional de la Información* and, in response to the demand of most of its subscribers, it began to publish peer-reviewed articles. Its indexing in the *Institute for Scientific Information* (*ISI*)'s *Social Sciences Citation Index* database (*Web of Science*) and in *Elsevier*'s *Scopus* began in 2006. In 2020, the editors decided to eliminate the article "El" (masculine article) to avoid what could appear to be gender discrimination. In 2023, *EPI* ceased its subscriber model to become a 100% open access journal. Despite the existence of other scientific journals in Spain in the field of Library and Information Science, *EPI* has played a prominent role ever since its creation. It has become the

Spanish publication with the greatest impact in this field, and has expanded its scope to the area of Communication.
In scientometrics, information from large scientific literature databases is used to analyse research quantitatively and qualitatively, and to examine it thematically. As **Neff** & **Corley** (2009) state, research fields can be characterized and analysed based on the keyword patterns used in their publications. One of the techniques most used in thematic analysis is co-word analysis (**Callon** *et al.*, 1986; 1991). In co-word networks, the nodes are keywords and the links are weighted based on the documents in which the pair of keywords forming the link occur together. These networks are subjected to procedures designed to detect the most closely related groups of keywords, thus revealing the thematic structure of the research (**Romo-Fernández**; **Guerrero-Bote**; **De-Moya-Anegón**, 2013; **Blázquez-Ruiz**; **Guerrero-Bote**; **De-Moya-Anegón**, 2016; 2017; **Olmeda-Gómez**; **Ovalle-Perandones**; **Perianes-Rodríguez**, 2017; **Faraji** *et al.*, 2022). Co-word analysis is sometimes used to study the thematic structure of scientific journals (**Romo-Fernández**; **Guerrero-Bote**; **De-Moya-Anegón**, 2013; **López-Robles** *et al.*, 2019), of research in specific periods (**Herrera-Viedma** *et al.*, 2020), and of such fields as Food Science (**Romo-Fernández**; **Guerrero-Bote**; **De-Moya-Anegón**, 2016; 2017), Library and Information Science in Spain (**Olmeda-Gómez**; **Ovalle-Perandones**; **Perianes-Rodríguez**, 2017), Intellectual capital (**Faraji** *et al.*, 2022), Communication in Spain (**Segado-Boj**; **Gómez-García**; **Díaz-Campo**, 2022), Entrepreneurship (**Lechuga-Sancho**; **Martínez-Fierro**; **Ramos-Rodríguez** 2023), and data-driven scientific research (**Velasco-López** *et al.*, 2023).

Studies of co-word networks are known as co-word analyses. However, not all co-word analyses use the same method. Some, such as those that use the *SciMAT* program (**López-Robles** *et al.*, 2019; **Herrera-Viedma** *et al.*, 2020; **Segado-Boj**; **Gómez-García**; **Díaz-Campo**, 2022; **Velasco-López** *et al.*, 2023; **Lechuga-Sancho**; **Martínez-Fierro**; **Ramos-Rodríguez**, 2023) are based on the strategic diagrams defined by **Callon** *et al.* (1986; 1991). Others use more visual methods based on clustering or community detection algorithms, together with layout algorithms that allow the co-word network to be viewed and navigated (**Romo-Fernández**; **Guerrero-Bote**; **De-Moya-Anegón**, 2013; **Blázquez-Ruiz**; **Guerrero-Bote**; **De-Moya-Anegón**, 2016; 2017; **Olmeda-Gómez**; **Ovalle-Perandones**; **Perianes-Rodríguez**, 2017; **Faraji** *et al.*, 2022).

In the past, it was the senior researchers who knew the intellectual structure of a discipline, usually that of their own field of study. But this structure was neither formal nor included in any support. Instead, it was a subjective structure that the researcher had formed mentally as a result of the deep knowledge they had of their discipline. It thus suffered from conservatism, bias, and subjectivity (**Bornmann**, 2011; **Irvine** *et al.*, 1985). Carrying out this type of research therefore involves a more objective revelation of the structure of scientific fields which can be readily assimilated by both novel and senior researchers.

The principal objective of the present study was to establish the intellectual structure of the journal *EPI* based on the analysis of the keywords present in those papers it has published which are collected in international scientific literature databases. This led to such specific research questions as:

- How has the journal evolved since being included in the international databases?
- How many sub-areas make up the main structure of *EPI*?
- How do they relate to each other?
- Which topics are the most central and which the most specialized?
- What is the scientific impact of each topic and how has it evolved?
- What are the keyword burst periods?

2. Method and data

The records corresponding to the articles published by *Profesional de la Información* were downloaded from both *WoS* and *Scopus* on 21 September 2023.

As can be seen in Figure 1, the production in *WoS* and in *Scopus* is coincident, with the former totaling 1,774 documents and the latter 1,809. Because of this slightly greater completeness of data, we chose to use that of *Scopus*. Of these *Scopus* documents, the vast majority were articles (1,663) and the rest reviews (111). The original language was Spanish in 1,305 documents (72%) and English in 479 (26.5%).

The Author Keywords were extracted, giving in total 6,864 keywords, with a total of 15,806 occurrences. Not all the records had Author Keywords –only 1,774. The extracted keywords were unified by first applying

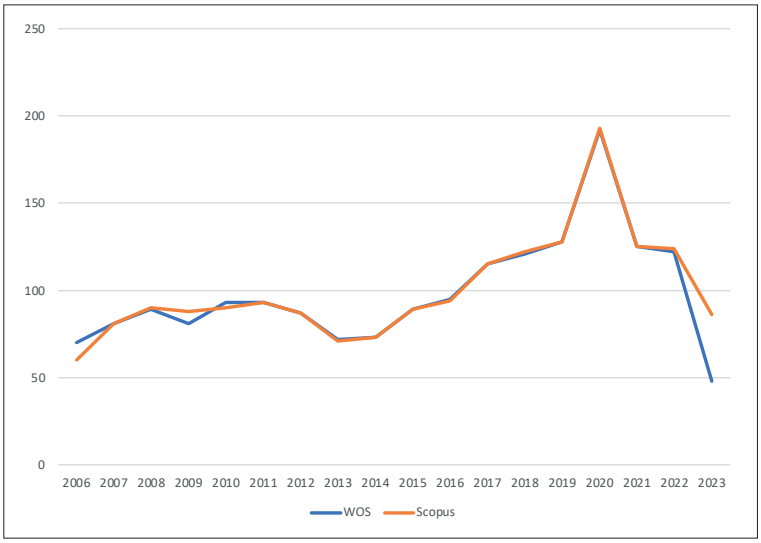

Figure 1. Scientific production published in *Profesional de la Información* as registered in *WoS* and *Scopus*.

Porter's stemming algorithm (1980) which reduced them to the root, and then, in order not to be left with just the root, choosing the commonest form. This unification left a total of 6,277 keywords. Since this number is difficult to cover and introduces excessive noise from keywords which occur in just a few documents (**Romo-Fernández**; **Guerrero-Bote**; **De-Moya-Anegón**, 2013; **Blázquez-Ruiz**; **Guerrero-Bote**; **De-Moya-Anegón**, 2016; 2017), in order to get a manageable number of keywords we selected those that appeared in more than 8 documents. This left a total of 279 keywords appearing in 1,616 documents, which represented 89% of the total documents and 92.7% of the keyword-containing documents. Figure 2 shows the evolution of this percentage during the period studied. As can be seen, the journal has good representation, with only a small gap in the first part of the period.

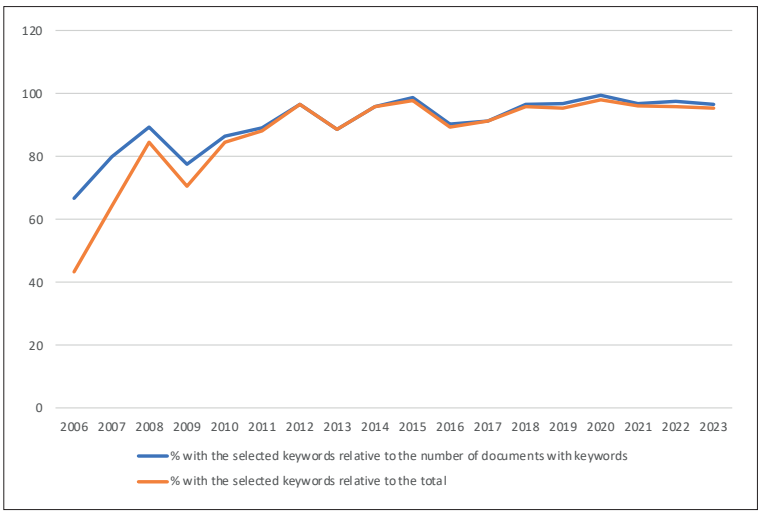

Figure 2. Percentage representation of the 279 keywords that appear in more than 8 documents relative to the total number of articles and to those that have keywords.

If the links between keywords were weighted by the number of co-occurrences, the keywords with the most occurrences would also be those with the links of greatest weight. To avoid this, the links between the keywords were normalized. The idea is to give greater weight to links between keywords that appear together more than expected, i.e., weight each link with the ratio between the proportion of the co-occurrences it represents and the probability that the two keywords co-occur according to their number of appearances.

The occurrences of each keyword were given a weight, firstly, by dividing by the number of keywords in the article because co-occurrence in an article that has many keywords is not the same as in one that has few. The average number of keywords per paper was 9 with a standard deviation of 3.67, meaning that there was considerable variation. In this way, each co-occurrence was weighted by the product of the weights of each keyword which, since it was the same document, is the inverse of the square of the number of keywords that occur in the document. And secondly, by dividing the sum of the weights of the co-occurrences by the sum of the weights of the co-occurrences in which each keyword participates separately, and then multiplying by twice the total sum of the network's co-occurrence weights. In this way, the weight of each link represents the ratio between the proportion of the co-occurrence weights it represents and the probability that the two keywords co-occur.

To make the co-word map and grouping, we used the *SCImago Graphica* tool (**Hassan-Montero** *et al.*, 2022). This uses **Clauset** (2004)'s community identification algorithm and the LinLog algorithm (**Noack**, 2007) to generate the layout. The latter uses an energy model which generates layouts that are strongly coherent with the communities identified (**Noack**, 2009). Although these communities are often called clusters, the concept is different since communities are not groupings of similar objects that are formed by evaluating their characteristics. Instead, they are usually formed by removing the links that participate in more geodesics, thus forming groups of frequently co-occurring words.

We used the burst algorithm developed by **Jon Kleinberg** (2003) which detects when certain terms become fashionable in a discourse and then fade away. We applied it to both the keywords and the communities. The algorithm generates a table with the bursty periods of the most frequent words, indicating the length, the strength, and the time interval in which the burst occurs.

To show the evolution of the journal itself and of the different communities, the following indicators were used:

- Ndoc: Number of documents published in scientific journals included in the *Scopus* database.
- %Int: Percentage of documents in whose byline appear authors from different countries.
- Normalized Impact (NI): Average normalized citation received by each document, understanding this to be the ratio between the citations received by the document and the average citations of the documents of the same type, year, and category (**Rehn**; **Kronman**, 2008).
- %Excellence: Percentage of documents that are among the 10% most cited of the same year, type, and category (**Bornmann** *et al.*, 2012).
- %Excellence1: Percentage of documents that are among the 1% most cited of the same year, type, and category.
- Authors: Average number of authors that appear in the byline of the articles.
- %ARC: Annual percentage rate of change calculated from the slope of the regression line, dividing it by the average of the indicator in the period and multiplying by 100. This indicator is designed to show the average evolution of other indicators in a period.

As the data for the year 2023 are incomplete, they were not taken into account for the calculation of the %ARC. Furthermore, for the citation-based indicators (NI and the %Exc indicators), the 2022 data were not taken into account as they are still not sufficiently stable.

3. Results

The only parameter in **Clauset**'s (2004) community identification algorithm is the number of communities. After trying several possibilities, we chose the value 6. On increasing this number by 1, the algorithm splits one of the previous communities into two, and so on successively. To generate a second level, we established 27 communities. Of the 27 communities, 8 contained a single keyword which was included in its neighbouring community. The community structure obtained in this way is presented in Table 1. Each community has been manually labeled. Since these communities are generated through co-occurrence links, they are keywords that co-occur frequently. While in many cases they are semantically related, in others it is hard to see beforehand any relationship that makes them frequently co-occur.

Table 1. Two-level community structure obtained with the parameters 6 and 27. In parentheses, the number of documents in which they occur.

C 1 Informetrics
C 1.1 Bibliometrics-Scientometrics
Bibliometrics (50), Transparency (39), Research evaluation (23), Bibliometric indicators (22), Citation analysis (18), Accountability (16), Wikipedia (13), Scientific output (13), Scientometrics (13), Science communication (10), Google Scholar (9), Research projects (9)
C 1.2 Altmetrics
Open access (52), Innovation (50), Universities (47), Indicators (38), Trends (31), Altmetrics (25), Impact (20), Metrics (18), Citations (18), Patents (11)
C 1.3 Scholarly Communication
Spain (217), Scholarly communication (37), Scientific production (24), Web of Science (23), Metadata (20), Rankings (20), Scopus (19), Review article (17), Information science (14), Interviews (14), Review (12), Communication research (9), China (9)
C 2 Health Social media
Social media (204), Content analysis (42), Health information (35), Health communication (20), Engagement (17), TikTok (9)
C 3 Social Networks
C 3.1 Entertainment networks
Social networks (192), Television (62), Facebook (50), Public libraries (45), YouTube (28), Instagram (27), Marketing (24), Audiovisual documentation (17), Users (11), Public opinion (11), Personalization (11), Social networking sites (10), Infotainment (9), Citizen participation (9)
C 3.2 Political networks
Twitter (131), Political communication (95), Academic libraries (46), Elections (28), Latin America (25), Political information (12), Populism (12), WhatsApp (12), Agenda-setting (9)
C 4 Communication
C 4.1 Data & automation
Audiences (58), Open data (34), News (25), Artificial intelligence (22), Gender (21), Mobile devices (19), Europe (16), Open government (15), Software (15), Video (15), Smartphones (15), Algorithms (15), Women (13), Automation (11), Programming (11), Apps (10), Public sphere (10), Democracy (10), AI (10), Applications (9), Gender gap (9), Stereotypes (9), TV (9)
C 4.2 Journalism
Journalism (131), Media (100), Internet (87), Digital journalism (57), Digital media (53), Journalists (38), Online media (31), Online journalism (30), Business models (28), Cybermedia (26), Digital press (25), Electoral campaigns (18), Usability (17), Political parties (17), Multimedia (17), Convergence (16), Influencers (16), Information architecture (15), Cyberjournalism (15), Digital newspapers (15), Online newspapers (15), Audiovisual (14), Methodology (13), Professionals (13), E-learning (12), Social web (12), User experience (11), New media (11), Colombia (11), Content (11), Policies (11), Crisis (11), Digital libraries (10), Cinema (10), Library cooperation (9), Networking (9), History (9), Polarization (9)
C 4.3 Disinformation
Disinformation (47), Fake news (40), Surveys (31), Mass media (25), Press (21), Fact-checking (19), Credibility (18), Post-truth (15), Trust (13), Catalonia (13), Hoaxes (12), Misinformation (11)
C 4.4 Corporate communication
Corporate communication (37), Organizational communication (35), Public relations (35), Interactivity (31), Companies (14), Standards (13), Management (12), Corporate social responsibility (12), Reputation (12), Internal communication (11), CSR (10), Organizations (10), Recommendations (9), Storytelling (9)
C 5 Information
C 5.1 Information Research
Research (62), Scientific journals (30), Evaluation (29), Social sciences (16), Quality (14), Websites (13), Visibility (11)
C 5.2 Information Stores
Newspapers (52), Libraries (46), Digitization (35), Branding (18), Documentation (17), Archives (17), Transmedia (13), Photography (12), Geolocation (9), El País (9)
C 5.3 Information Management
University libraries (33), Evolution (26), Privacy (23), Radio (23), Digital communication (22), Information sources (21), Knowledge management (20), Information professionals (19), Podcasting (19), Information management (18), Strategies (17), Content management (15), Information technologies (14), Document management (14), Museums (14), Audio communication (13), Platforms (12), Science (11), Publications (11), Literature review (11), Peer review (10), Classifications (10), Immersive journalism (10), Data journalism (9), Sustainability (9), Analysis (9)

C 5.4 Information Systems
Web 2.0 (66), Information retrieval (23), Semantic web (23), Library and information science (23), Web (23), Information visualization (22), Social network analysis (19), Profession (19), Websites (17), Ontologies (15), Spanish universities (14), ICT (14), Collaboration (14), Blogs (13), Public information (13), Information systems (12), Network analysis (12), Intranets (11), Statistics (11), City councils (10), Competitive intelligence (9), E-government (9), Cloud computing (9), Data visualization (9), Information design (9)
C 5.5 Search Engines & Books
Google (18), Ebooks (17), Publishing (17), Book (16), SEO (14), Search engines (13), Reading (12)
C 5.6 Information Professionals
Communication (104), Professional profiles (30), Technology (30), Higher education (26), Librarians (25), Education (20), Information literacy (18), Health (17), Information scientists (9)
C 5.7 Information Subjects
Covid-19 (81), Pandemics (66), Coronavirus (60), Big data (36), Information (30), Databases (29), Repositories (25), Media literacy (22), Scientific communication (20), Public administration (19), Framing (18), Scientific publication (17), Future (16), Crisis communication (16), Data (15), Politics (15), Training (14), Digital humanities (13), Institutional communication (13), Audiovisual communication (12), Perception (12), Skills (12), Adolescents (12), SARS-CoV-2 (12), Library services (11), European Union (11), Hate speech (11), Feminism (11), Challenges (11), Research data (10), Open source (10), Machine learning (10), Children (10), Activism (10), Knowledge (9), Digital divide (9), Risk (9), Power (9), Health crisis (9)
C 6 Advertising
Advertising (52), Participation (36), Ethics (31), Self-regulation (12), Governance (12)

The structure comprises six first-level communities, two that are quite small labeled *C 6 Advertising* and *C 2 Health Social media*, two medium sized labeled *C 1 Informetrics* and *C 3 Social Networks*, and two larger ones labeled *C 4 Communication* and *C 5 Information*. At the second level, the large communities have been subdivided into 4 and 7 communities respectively, the medium ones into 3 and 2 respectively, and the small ones left undivided.

Figure 3 is a map of the co-words. They are coloured based on the second-level community to which they belong. We have coloured not just the nodes but also the minimum convex hull so that the area which each community covers can be seen. For those of second-level included in one of first-level, we have chosen different shades of the same colour.

One observes in the figure that on the left are the communities more related to communication, while on the right are those more related to *Library and Information Science* and social networks.

Within this structure, the informetrics communities are at the top right, and Social Networks at the bottom right. The communities included within *C 5 Information* are found in the central part, and act as mortar holding all the other communities together. Of these, the one that occupies the largest area is that labeled *C 5.7 Information Subjects*.

At centre right is the community labeled *C 2 Health Social media* next to Social Networks. This is explained by the weight in them of some social media such as *TikTok*. Just above is the one labeled *C 4.4 Corporate communication*, which can be explained by the importance of Social Media in corporate communication.

The upper right appears dominated by the community labeled *C 4.2 Journalism.* From the centre downwards there begins to appear the one labeled *C 4.1 Data & automation,* and in the lower central area the one labeled *C 4.3 Disinformation*, curiously by the side of Social Networks.

At bottom right, relatively isolated, is *C 6 Advertising*.

Figure 4 shows an enlarged view of the upper right corner where the Informetrics communities are found. The largest node is Spain, which was one of the nodes isolated in the second level. Furthermore, Spain is the geographical domain that has been most studied in the informetrics studies published in *EPI*.

Figure 5 shows an enlarged view of the lower right corner. The node corresponding to Social Media is seen to be the largest of the C 2 community, and that of Social Networks the largest of the C 3 community.

Figure 6 shows an enlarged view of the lower left corner. The community labeled as *C 4.3 Disinformation* can be seen in full as well as its interaction with terms of other communities such as Artificial Intelligence or Democracy.

Figure 7 shows an enlarged view of the upper left corner of the co-word map. The first part contains words also related to Informetrics. In the central part, there already start to appear the largest nodes, nodes which are Journalism related.

Table 2 presents scientometric indicators of the journal and its communities. As indicators, we chose the number of documents, the normalized citation, the percentage of international collaboration, the percentage of excellence (papers included in the top 10% most cited in their categories, document types, and year), the percentage of excellence 01 (articles included in the top 1% most cited of their categories, document types, and year), and the average number of authors.

The first row of the table includes the data of the entire journal, a total of 1809 documents registered in *Scopus*, with an annual growth rate of more than 4.5%. The normalized impact is greater than the mean (1), and also its growth rate during the period is more than 10%, indicative of the journal's good evolution. The case is similar with the excellence parameters. The percentage of excellence (top 10% most cited) is very close to 30%, almost three times more than the mean, with a close to 15% growth during the period, and the same is the case with the percentage of excellence 01.

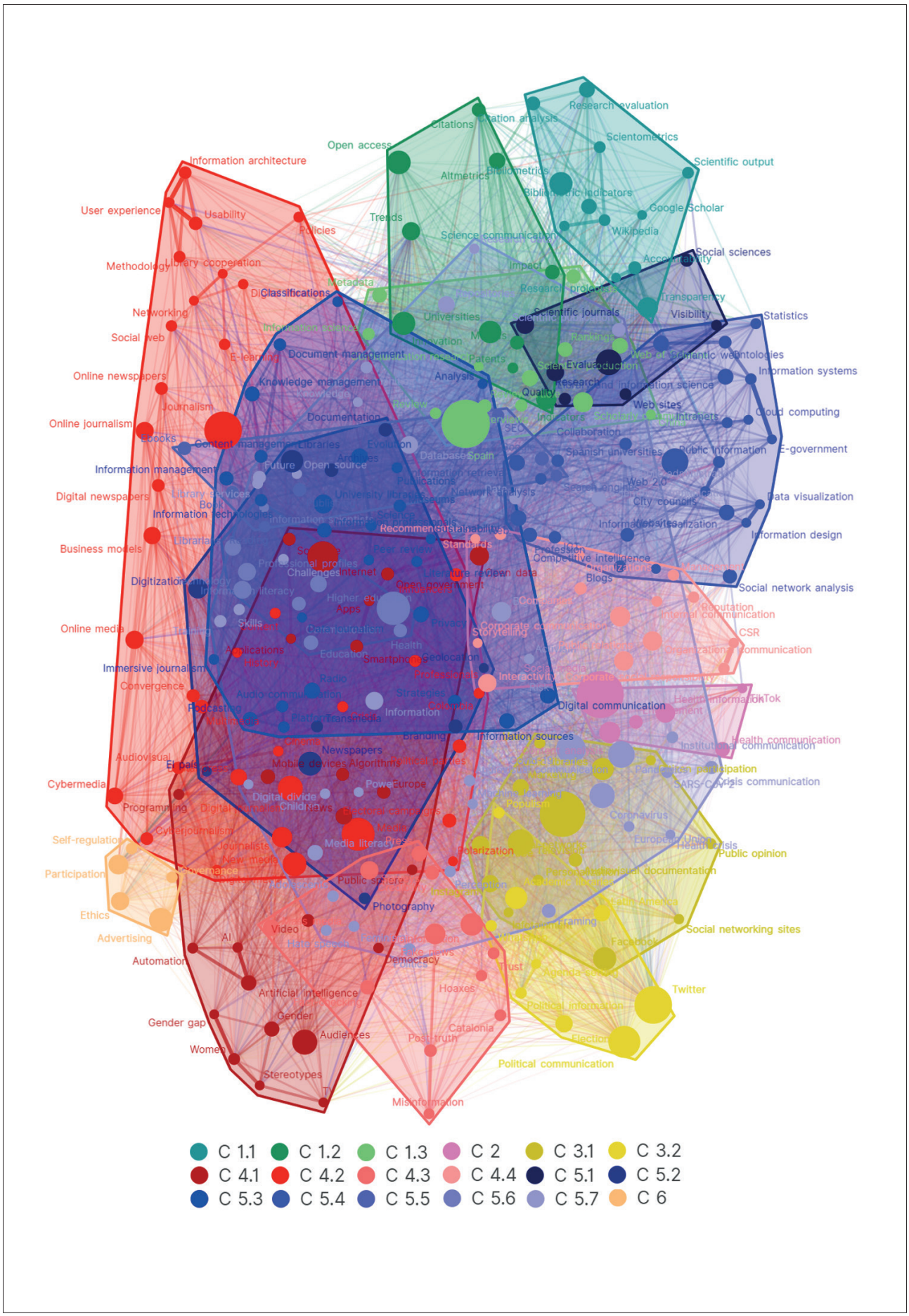

Figure 3. General view of the co-word map with shading for the zone corresponding to each community.

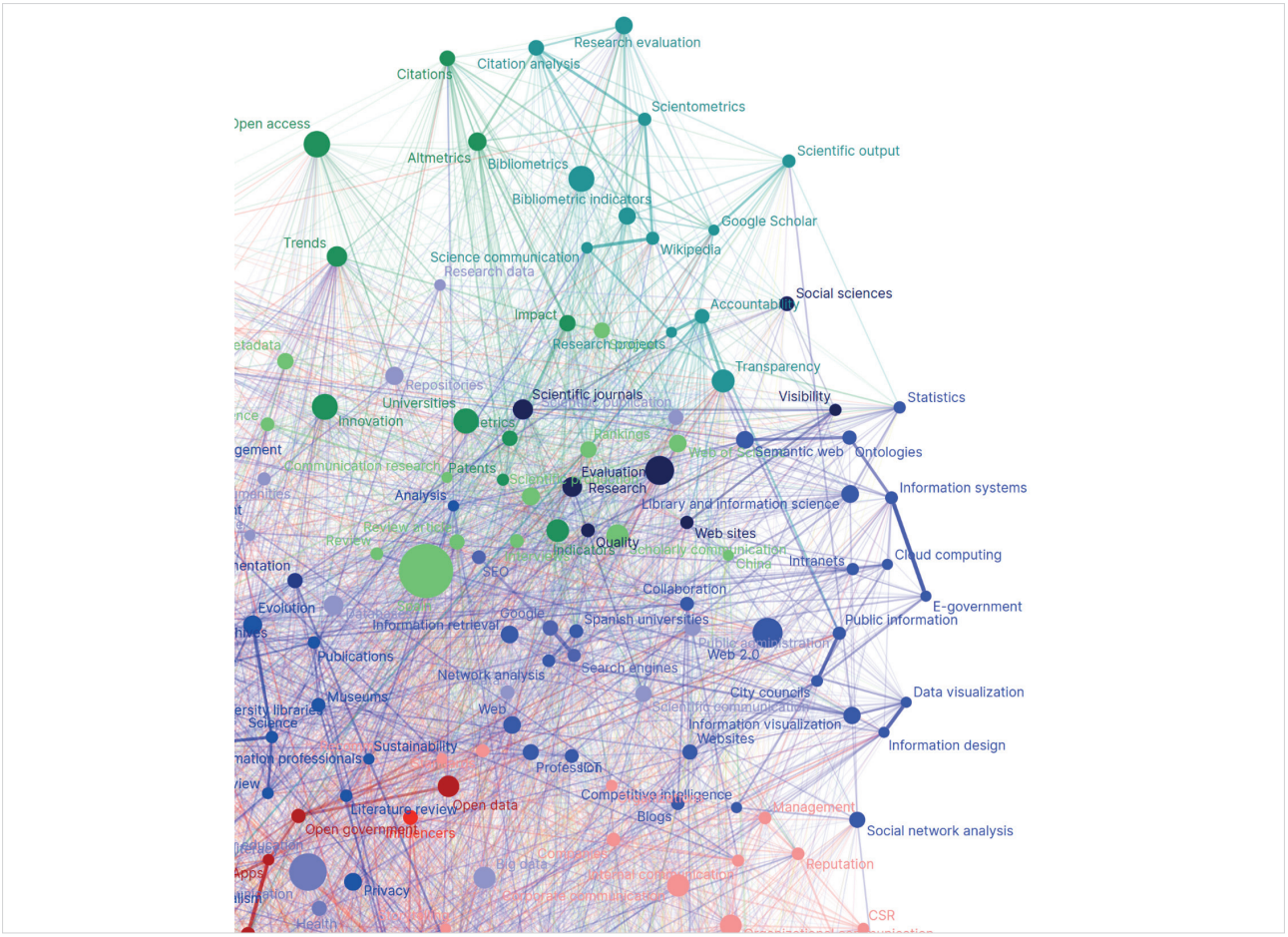

Figure 4. Zoom-in on the upper right corner of the co-word map.

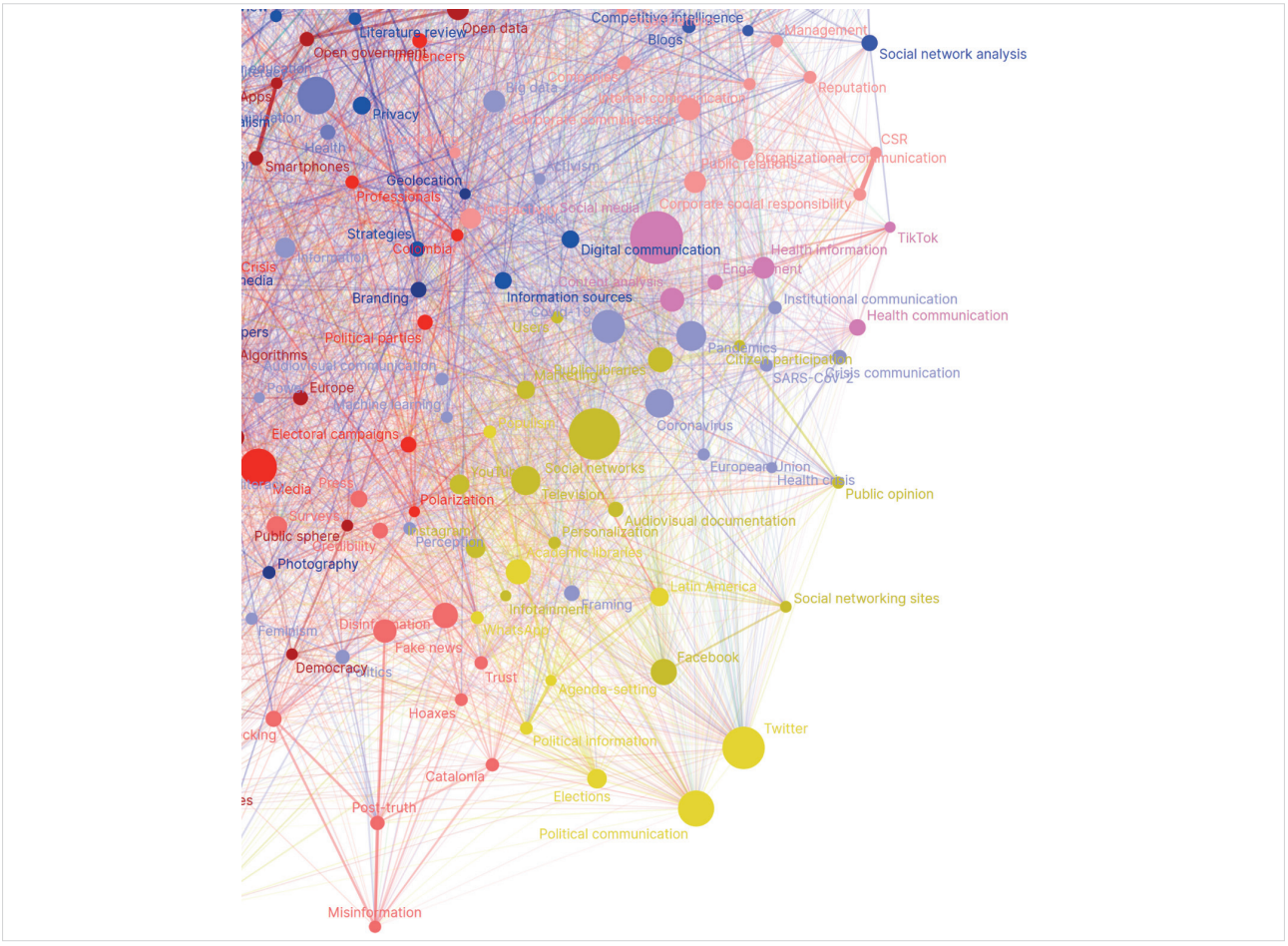

Figure 5. Zoom-in on the lower right corner of the co-word map.

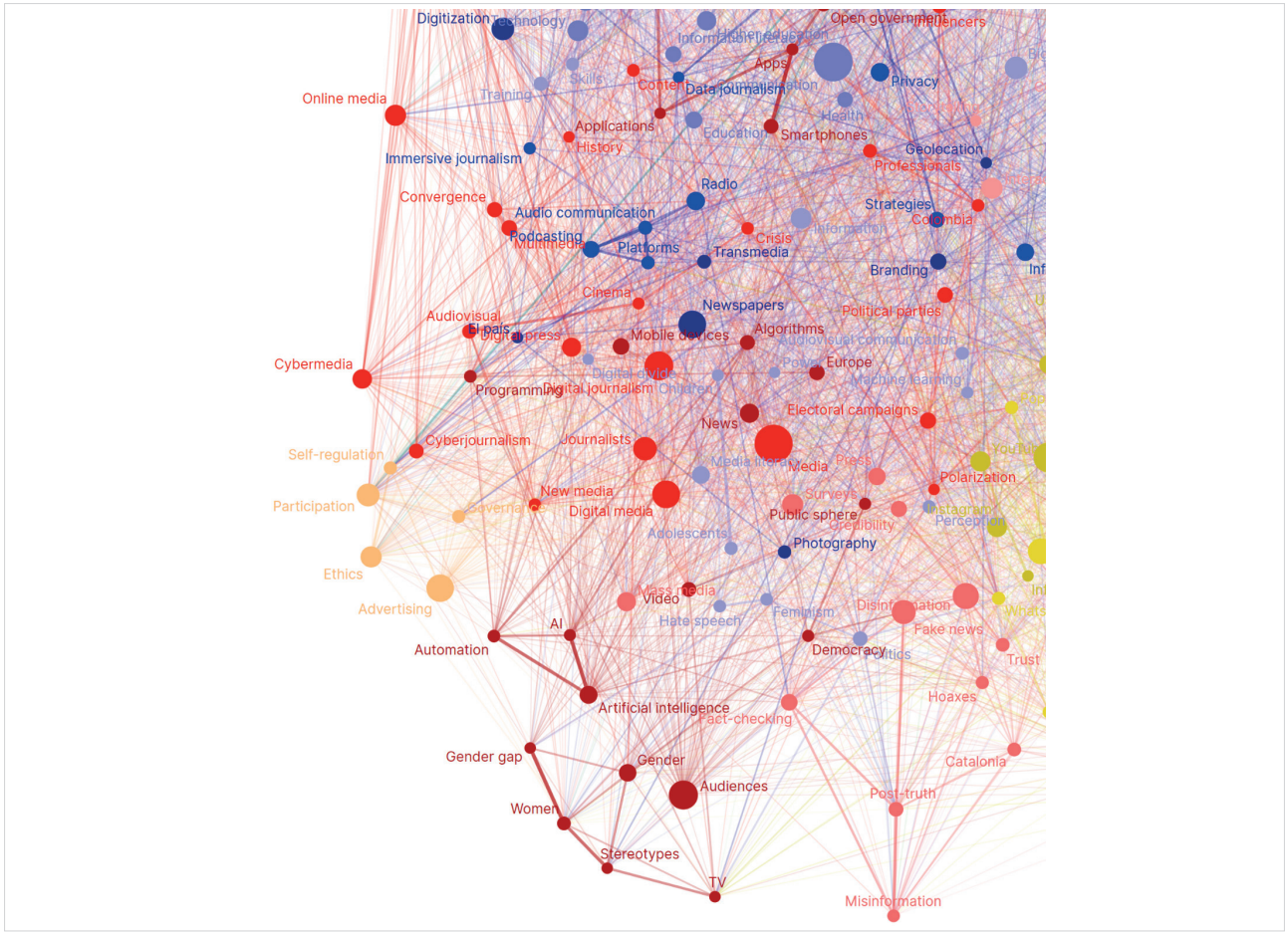

Figure 6. Zoom-in on the lower left corner of the co-word map.

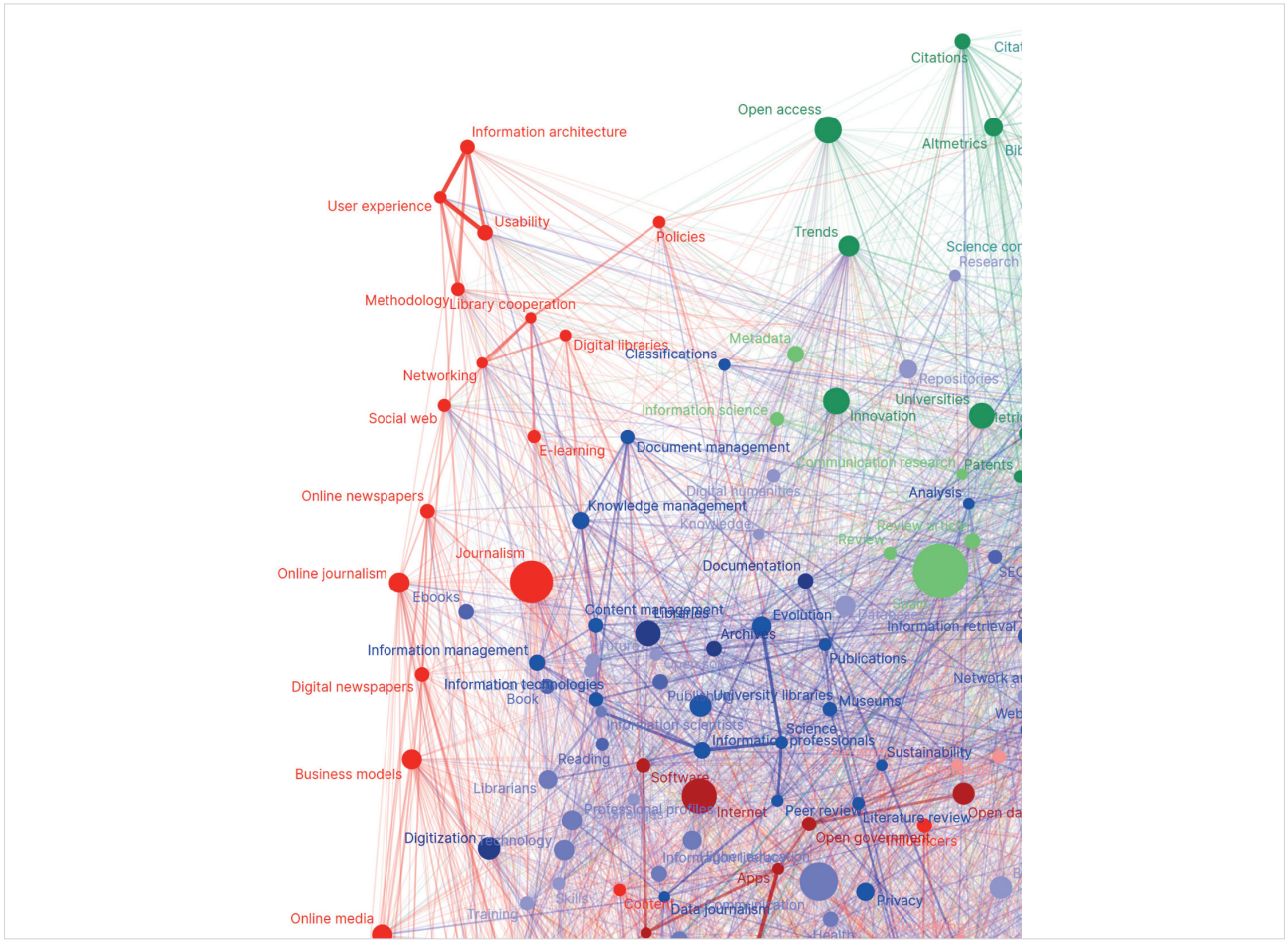

Figure 7. Zoom-in on the upper left corner of the co-word map.

Close to 10% of the studies involve collaborations, and there was considerable growth in this parameter during the period –around 8% per annum. The co-authorship index is 2.20, and also grew during the period, although more discreetly.

Table 2. Scientometric Indicators of the journal and communities, with number of documents, normalized impact, percentage of international collaboration, percentage of excellence, percentage of excellence 01, number of authors, and their respective annual rates of change.

	Ndoc	%ARC	NI	%ARC	%Int	%ARC	% Exc.	%ARC	%Exc1	%ARC	Authors	%ARC
Profesional de la Información	**1809**	**4.51**	**1.23**	**13.83**	**9.12**	**8.27**	**29.43**	**14.11**	**3.25**	**18.65**	**2.20**	**2.08**
C 1 Informetrics	**593**	**9.91**	**1.70**	**11.06**	**12.31**	**10.01**	**37.11**	**10.08**	**4.39**	**16.97**	**2.33**	**1.79**
C 1.1 Bibliometrics-Scientometrics	162	10.32	2.64	11.18	14.20	8.81	39.31	4.76	6.90	16.34	2.40	-0.96
C 1.2 Altmetrics	252	9.12	1.30	8.97	13.89	15.46	37.89	10.79	4.41	12.27	2.32	2.87
C 1.3 Scholarly Communication	358	11.36	1.62	11.68	12.85	8.32	40.66	11.96	4.52	22.90	2.41	1.45
C 2 Health Social media	**269**	**20.24**	**2.47**	**15.14**	**10.41**	**9.22**	**56.20**	**11.19**	**8.26**	**18.74**	**2.22**	**2.07**
C 3 Social Networks	**505**	**12.55**	**1.69**	**13.51**	**10.30**	**2.92**	**44.28**	**16.91**	**4.87**	**17.15**	**2.25**	**0.87**
C 3.1 Entertaiment networks	375	11.88	1.39	12.09	8.27	0.44	42.53	16.38	3.16	18.60	2.17	0.57
C 3.2 Political networks	264	14.89	2.21	12.27	12.88	-0.84	55.14	13.91	8.64	13.10	2.32	-1.14
C 4 Communication	**865**	**11.35**	**1.66**	**14.47**	**8.79**	**4.44**	**39.45**	**13.23**	**4.34**	**17.95**	**2.20**	**1.86**
C 4.1 Data & automation	332	13.81	2.03	15.00	8.43	9.34	42.16	10.14	3.59	19.20	2.19	3.24
C 4.2 Journalism	511	10.31	1.50	13.47	8.22	7.06	39.62	13.77	3.77	15.43	2.17	1.92
C 4.3 Disinformation	160	18.22	2.88	20.14	8.13	-12.65	54.29	19.24	10.71	23.24	2.21	1.62
C 4.4 Corporate communication	151	13.71	1.25	14.79	9.27	7.47	37.93	16.39	4.14	28.04	2.19	-0.23
C 5 Information	**1143**	**6.36**	**1.38**	**13.78**	**8.75**	**11.45**	**30.46**	**14.58**	**3.52**	**20.49**	**2.24**	**1.02**
C 5.1 Information Research	150	6.32	0.96	8.56	12.67	16.51	27.66	8.72	0.71	29.17	2.57	1.07
C 5.2Information Stores	191	5.41	1.66	19.05	6.28	16.04	21.86	15.33	2.73	20.43	1.92	2.23
C 5.3 Information Management	326	7.03	1.22	12.15	7.98	13.91	27.97	17.43	3.54	17.53	2.14	2.26
C 5.4 Information Systems	330	-0.04	1.03	9.00	9.39	12.85	26.56	13.63	1.56	10.56	2.34	0.86
C 5.5 Search Engines & Books	83	3.54	0.67	9.16	7.23	8.90	25.00	14.46	0.00	0.00	2.28	-0.78
C 5.6 Information Professionals	228	11.35	1.25	12.75	10.53	9.37	35.68	16.14	3.29	22.57	2.20	2.16
C 5.7 Information Subjects	444	12.40	1.95	13.49	7.88	11.10	40.69	14.81	7.20	20.92	2.17	2.10
C 6 Advertising	**124**	**14.57**	**1.09**	**11.76**	**8.87**	**18.49**	**38.84**	**17.83**	**2.48**	25.77	2.37	3.22

Observing the evolution of the first-level communities, one sees that they are all growing, although those that are growing most are the two smallest, especially *C 2 Health Social media* which has grown by about 20%. Of the second-level communities, those of *C 4.3 Disinformation* (18%) and *C 3.2 Political networks* (15%) are also growing notably.

In terms of impact, the *C 2 Health Social media* community stands out with more than twice the average impact. There also stand out *C 1 Informetrics* (1.7%), *C 3 Social Networks* (1.69%), and *C 4 Communication* (1.66%). In terms of evolution, *C 2 Health Social media* and *C 4 Communication* are the most noteworthy, with growth of more than 14%. Of the second-level communities, *C 4.3 Disinformation* stands out with an impact of 2.88% and an annual growth rate of more than 20%, and *C 1.1 Bibliometrics-Scientometrics* with an impact of 2.64%. Only *C 5.1 Information Research* (0.96%) and *C 5.5 Search Engines & Books* (0.67%) are below the mean.

In percentage of excellence, *C 2 Health Social media* and *C 3 Social Networks* stand out, having more than 40% of articles within the top 10% most cited. In the evolution of this indicator, *C 6 Advertising* and *C 3 Social Networks* stand out with increases of around 17% per annum. In the second level, there stand out *C 3.2 Political networks* (55%) and *C 4.3 Disinformation* (54%).

In the percentage of excellence 01, *C 2 Health Social media* clearly stands out, with more than 8% of its articles in the top 1% of the discipline. Among those of the second level, *C 4.3 Disinformation* (10.7%) and *C 3.2 Political networks* (8.64%) stand out.

Regarding international collaboration, *C 1 Informetrics* stands out with more than 12%, but all reach more than 8%. Of the increase in this period, *C 6 Advertising* stands out with an annual increase of

Table 3. Keywords from articles with a greater average normalized impact.

Id	Keyword	Ndoc	Ac. Weight	NI	C I2
172	Scientometrics	13	1.47	13.49	C 1.1
148	Software	15	1.44	10.27	C 4.1
262	Health crisis	9	0.66	9.16	C 5.7
214	Misinformation	11	1.00	7.98	C 4.3
235	Democracy	10	0.88	7.15	C 4.1
247	Analysis	9	0.74	6.37	C 5.3
238	Machine learning	10	1.05	6.10	C 5.7
31	Fake news	40	3.50	5.94	C 4.3
15	Coronavirus	60	4.93	5.73	C 5.7
10	Covid-19	81	6.44	4.97	C 5.7
22	Bibliometrics	50	6.17	4.78	C 1.1
223	Statistics	11	1.06	4.70	C 5.4
96	Fact-checking	19	1.64	4.63	C 4.3
107	Credibility	18	1.88	4.62	C 4.3

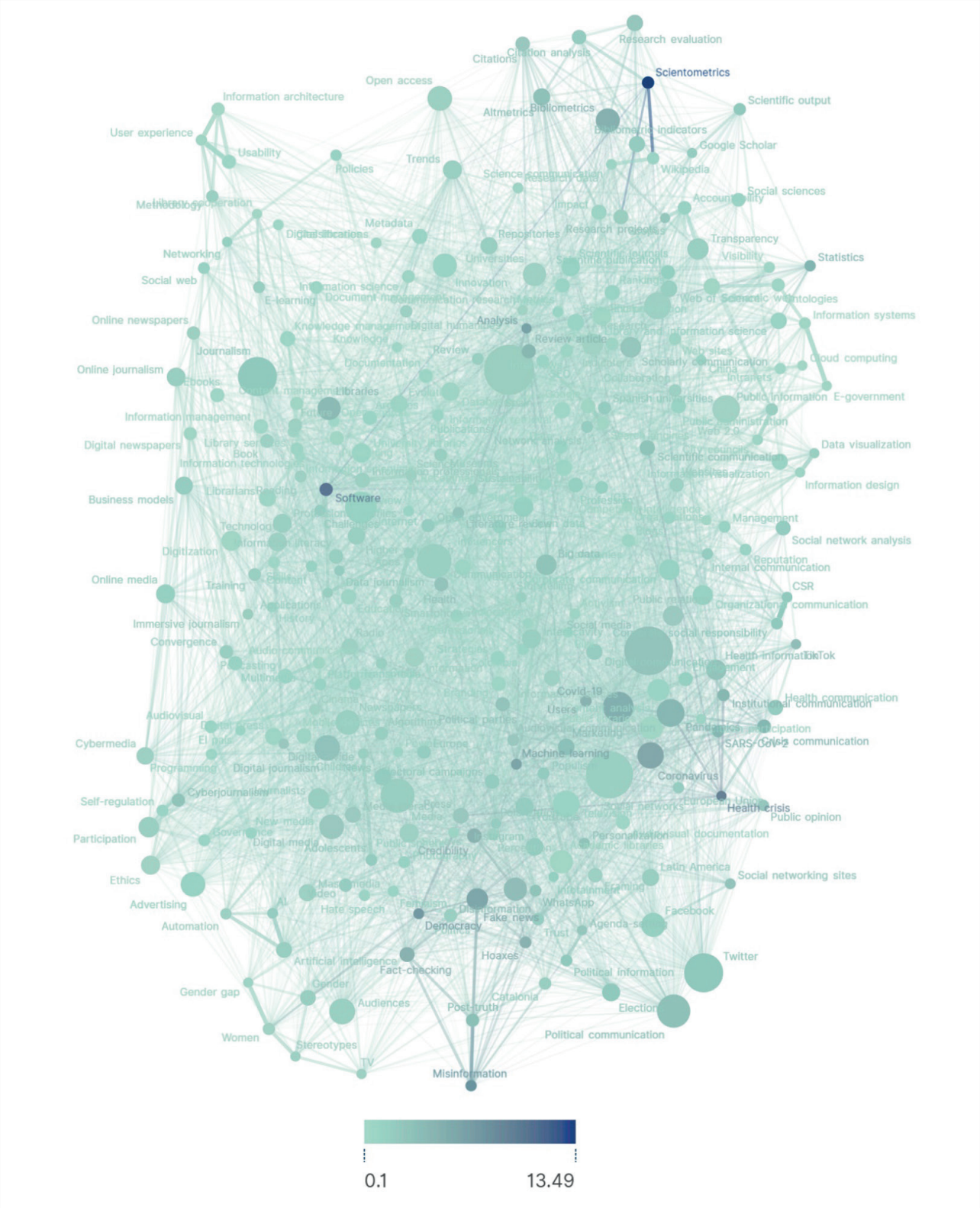

Figure 8. Map of co-words coloured on the basis of the normalized citation of the articles that include the corresponding keywords.

more than 18%. Of the second level, *C 1.1 Bibliometrics-Scientometrics* (14.2%) and *C 1.2 Altmetrics* (13.89%) stand out.

In the authorship index, there stand out *C 6 Advertising* (2.37%) and *C 1 Informetrics* (2.33%) with more than 2.30%. The former grew the most during the period. Of the second level, *C 5.1 Information Research* stands out with a co-authorship index of 2.57%.

Figure 8 is the same as the previous co-word map, but this time each node is coloured based on the impact of the documents in which the corresponding word occurs. Table 3 lists the keywords from articles with a greater average normalized impact. The number of documents (Ndoc), the weight they accumulate (Ac. Weight), the second level community (C l2), and the order by size are given.

The keyword from articles with a greater average normalized impact is Scientometrics, with a normalized impact greater than 13. It is followed by Software (10.27), Health crisis (9.16), Misinformation (7.98), and Democracy (7.14). All of these keywords occur in a small number of articles (fewer than 15). The keywords with more than 40 documents and a high impact are Fake news (5.94), Coronavirus (5.73), Covid-19 (4.97), and Bibliometrics (4.78).

Table 4 lists the most notable keyword burst periods. Included are all those that exceed a strength of 5. They are ordered by community, with which the distribution can be seen not to be balanced but instead very uneven. Most of the bursty periods noted correspond to keywords included in *C 5 Information*.

Table 4. Keyword bursty periods, ordered by level-2 community.

Word	Length	Strength	Start	End	C l2
Indicators	1	10.53	2018	2018	C 1.2
Open access	1	6.42	2012	2012	C 1.2
Metadata	9	5.40	2006	2014	C 1.3
Health information	2	6.11	2019	2020	C 2
Public libraries	11	6.23	2006	2016	C 3.1
Audiovisual documentation	6	5.67	2009	2014	C 3.1
Political communication	4	14.03	2017	2020	C 3.2
Academic libraries	5	6.44	2012	2016	C 3.2
Internet	7	7.58	2006	2012	C 4.1
Audiences	2	5.29	2015	2016	C 4.1
Artificial intelligence	4	5.29	2021		C 4.1
Online journalism	8	7.00	2010	2017	C 4.2
Information architecture	8	6.07	2007	2014	C 4.2
Social web	8	5.08	2008	2015	C 4.2
Disinformation	6	7.87	2019		C 4.3
Surveys	5	5.83	2014	2018	C 4.3
Post-truth	2	5.75	2018	2019	C 4.3
Fake news	1	5.01	2019	2019	C 4.3
Organizational communication	1	8.31	2019	2019	C 4.4
Public relations	2	7.51	2019	2020	C 4.4
Corporate communication	2	6.28	2019	2020	C 4.4
Libraries	7	8.27	2009	2015	C 5.2
Digitization	8	6.07	2007	2014	C 5.2
Documentation	4	5.37	2010	2013	C 5.2
Audio communication	3	7.74	2022		C 5.3
Information management	9	7.29	2006	2014	C 5.3
Podcasting	3	7.15	2022		C 5.3
Knowledge management	11	7.09	2006	2016	C 5.3
Document management	7	5.74	2006	2012	C 5.3
Content management	9	5.26	2006	2014	C 5.3
Museums	4	5.02	2011	2014	C 5.3
Web 2.0	6	23.95	2007	2012	C 5.4
Semantic web	9	7.94	2007	2015	C 5.4
Information retrieval	8	6.21	2007	2014	C 5.4
Ontologies	5	5.54	2007	2011	C 5.4
Intranets	6	5.32	2006	2011	C 5.4
Information design	2	5.05	2017	2018	C 5.4
Covid-19	5	23.75	2020		C 5.7
Pandemics	5	20.62	2020		C 5.7
Coronavirus	2	20.37	2020	2021	C 5.7
Repositories	7	8.78	2007	2013	C 5.7
Big data	3	7.59	2016	2018	C 5.7
Databases	11	6.81	2006	2016	C 5.7
Crisis communication	1	5.76	2020	2020	C 5.7
Ethics	1	6.47	2017	2017	C 6

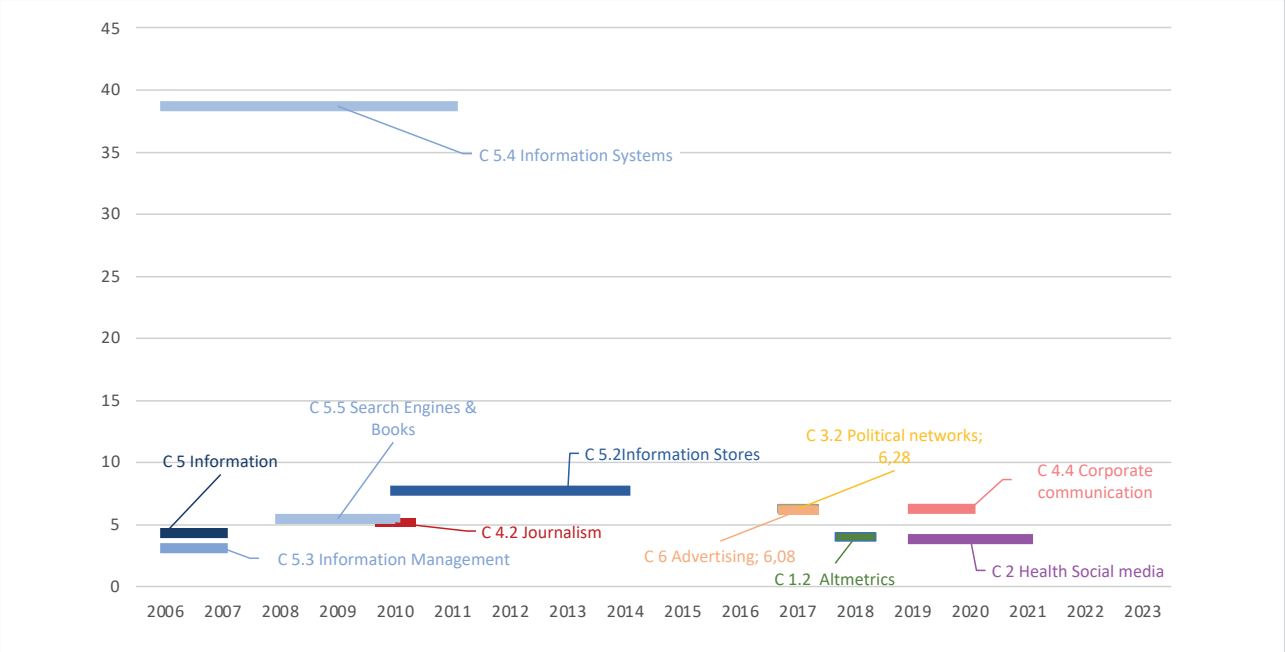

Figure 9. The communities' bursty periods.

The most notable burst period is that corresponding to the keyword *Web 2.0*, with a strength of almost 24 and a period that began in 2007 and ended in 2012.

The next three keywords, *Covid-19*, *Pandemics*, and *Coronavirus*, could well have been unified, all of them having a strength greater than 20 and having started in 2020. The periods relating to the first two have yet to be taken as concluded.

There are only two keywords with strength between 10 and 20. With 14.03, there is that corresponding to *Political communication* which lasted for the 4 years from 2017 to 2020, and in second place, with 10.53, that corresponding to *Indicators* which lasted only one year, 2018.

Table 5. The communities' bursty periods.

Community	Length	Strength	Start	End
C 1.2 Altmetrics	1	3.97	2018	2018
C 2 Health Social media	3	3.85	2019	2021
C 3.2 Political networks	1	6.28	2017	2017
C 4.2 Journalism	1	5.14	2010	2010
C 4.4 Corporate communication	2	6.23	2019	2020
C 5 Information	2	4.34	2006	2007
C 5 Information	1	3.15	2011	2011
C 5.2 Information Stores	5	7.69	2010	2014
C 5.3 Information Management	2	3.13	2006	2007
C 5.3 Information Management	3	5.28	2011	2013
C 5.4 Information Systems	6	38.68	2006	2011
C 5.5 Search Engines & Books	3	5.42	2008	2010
C 6 Advertising	1	6.08	2017	2017

Figure 9 and Table 5 present the bursty periods of the different communities, both first level and second level. The period of the *C 5.4 Information Systems* community stands out above all for its strength, which is more than four-fold that of the next. This period occurred between 2006 and 2011, and one can see from Table 2 that the said community does not increase during the production period.

The only first-level community (with second-level communities) that has separate bursts is *C 5 Information* which had two brief bursts of moderate intensity in 2006 and 2011.

There also stands out the digitalization fostered burst from 2010 to 2014 of the community denominated *C 5.2 Information Stores*. Also recognizable are the burst of the community denominated *C 3.2 Political networks* with the end of bipartisanship in Spain, that of *C 2 Health Social media* with the pandemic, and that of *C 1.2 Altmetrics*.

4. Conclusions

Since 2006, the journal under study has had its articles indexed in the major scientific literature databases. During this period, the journal has progressed considerably in both the quantity and the quality of what it has published. The number of published articles has increased, as have its international collaboration and average normalized impact.

The journal's content can be represented by the authors' keywords since more than 98% of the works contain keywords. Indeed, the 279 most used keywords are sufficient to represent its content since they are present in more than 92% of the keyword-containing works.

Co-word analysis identified 6 top-level thematic areas in the journal. Four of these first-level communities subdivide into 16 more communities.

The journal can be said to combine content of Library and Information Science with content of high technology which is where it comes from, together with other content of Audiovisual Communication. This gives rise to one front of Communication, another of Information, and two smaller ones of Informetrics and Social Networks.

While the Library and Information Science content occupies the central part of the map, serving as mortar that holds the rest of the areas together, it is the type with the slowest growth. Specifically, the area labeled *C 5.7 Information Subjects* is spread across much of the map. The other major central theme is *C 4 Communication* which is distributed over the left part of the map, also touching most of the other areas. It is smaller than the previous area because it was incorporated later, but it has a rapid growth rate.

The *C 2 Health Social media* and *C 3 Social Networks* areas are very close to each other and strongly related. The former obtains the greater impacts, although the latter's impact values are also good.

C 1 Informetrics is one of the most specialized areas and another of those which obtain the greatest average impacts.

C 6 Advertising is seen to be related to communication, although it is very specialized.

Different burst periods are observed, notable being that of *C 5.4 Information Systems* which can be regarded as the beginnings of the journal. The burst periods of the first part of the period correspond to areas included within *C 5 Information*. A burst of another area is not seen until 2010, specifically in *C 4.2 Journalism*. Also recognizable is the burst of the community denominated *C 3.2 Political networks* with the end of bipartisanship in Spain, or that of *C 2 Health Social media* with the pandemic, or of *C 1.2 Altmetrics*.

Periods of a keyword's boiling (when it has a sudden particular strength) are more recognizable and easier to detect. The most intense was that of *Web 2.0* from 2007 to 2012. Those corresponding to *Covid-19* keywords are also very intense. From 2017 to 2020 there is one of *Political communication* and in 2018 another of *Indicators*.

In 2006, *EPI* began to be indexed by international scientific literature databases, and entered a virtuous cycle that has led it to successfully expand its thematic scope, thus pushing it to levels of impact and excellence superior to those it originally had.

5. References

Blázquez-Ruiz, J.; **Guerrero-Bote, V. P.**; **De-Moya-Anegón, F.** (2016). New Scientometric-Based Knowledge Map of Food Science Research (2003 to 2014). *Comprehensive Reviews in Food Science and Food Safety*, 15(6), 1040-1055. *https://doi.org/10.1111/1541-4337.12223*

Blázquez-Ruiz, J.; **Guerrero-Bote, V. P.**; **De-Moya-Anegón, F.** (2017). Nuevo mapa conceptual de la investigación científica en ciencias de los alimentos basado en técnicas cienciométricas en España (2003-2014). *Ibersid: revista de sistemas de información y documentación*, 11(1), 13-31. *https://doi.org/10.54886/ibersid.v11i1.4403*

Bornmann, L. (2011). Scientific peer review. *Annual Review of Information Science and Technology*, 45(1), 197-245. *https://doi.org/10.1002/aris.2011.1440450112*

Bornmann, Lutz; **De-Moya-Anegón, Félix**; **Leydesdorff, Loet** (2012). "The new excellence indicator in the World Report of the SCImago Institutions Rankings 2011". *Journal of Informetrics*, v. 6, n. 2, pp. 333-335. *https://doi.org/10.1016/j.joi.2011.11.006*

Callon, M.; **Courtial, J.**; **Laville, F.** (1991). Co-word analysis as a tool for describing the network of interactions between basic and technological research: The case of polymer chemsitry. *Scientometrics*, 22, 155-205. *https://doi.org/10.1007/BF02019280*

Callon, M.; **Rip, A.**; **Law, J.** (eds.). (1986). *Mapping the dynamics of science and technology: Sociology of science in the real world*. Springer. *https://doi.org/10.1007/978-1-349-07408-2*

Clauset, A.; **Newman, M.**; **Moore, C.** (2004). Finding community structure in very large networks. *Physical Review E*, 70(6). *https://doi.org/10.1103/PhysRevE.70.066111*

Hassan-Montero, Y.; **De-Moya-Anegón, F.**; **Guerrero-Bote, V. P.** (2022). SCIMago Graphica: a new tool for exploring and visually communicating data. *Profesional de la Información*, 31(5), e310502. *https://doi.org/10.3145/epi.2022.sep.02*

Herrera-Viedma, E.; **López-Robles, J.-R.**; **Guallar, J.**; **Cobo, M.-J.** (2020). Global trends in coronavirus research at the time of Covid-19: A general bibliometric approach and content analysis using SciMAT. *Profesional de la Información*, 29(3). *https://doi.org/10.3145/epi.2020.may.22*

Irvine, J.; **Martin, B.**; **Peacock, T.**; **Turner, R.** (1985). Charting the decline of British science. *Nature*, 316, 587-590. *https://doi.org/10.1038/316587a0*

Kleinberg, J. (2003). Bursty and Hierarchical Structure in Streams. *Data Mining and Knowledge Discovery*, 7(4), 373-397. *https://doi.org/10.1023/A:1024940629314*

Lechuga-Sancho, M.-P.; **Martínez-Fierro, S.**; **Ramos-Rodríguez, A. R.** (2023). Thirty years of research on high-growth entrepreneurship: bibliometric overview of its H-Classics. *Profesional de la Información*, 32(3). *https://doi.org/10.3145/epi.2023.may.20*

López-Robles, J. R.; **Guallar, J.**; **Otegi-Olaso, J. R.**; **Gamboa-Rosales, N. K.** (2019). "El Profesional de la Información (EPI): bibliometric and thematic analysis (2006-2017)". *El Profesional de la Información*, v. 28, n. 4, e280417. *https://doi.org/10.3145/epi.2019.jul.17*

Noack, A. (2007). Energy models for graph clustering. *Journal of Graph Algorithms and Applications*, 11(2), 453-480. *https://doi.org/10.7155/jgaa.00154*

Noack, A. (2009). Modularity clustering is force-directed layout. *Physical Review E*, 79(2). *https://doi.org/10.1103/PhysRevE.79.026102*

Olmeda-Gómez, C.; **Ovalle-Perandones, M. A.**; **Perianes-Rodríguez, A.** (2017). Co-word analysis and thematic landscapes in Spanish information science literature, 1985-2014. *Scientometrics*, 113(1), 195-217. *https://doi.org/10.1007/s11192-017-2486-8*

Porter, M. F. (1980). An algorithm for suffix stripping. *Program*, 14(3), 130-137. *https://doi.org/10.1108/eb046814*

Rehn, Catharina; **Kronman, Ulf** (2008). *Bibliometric handbook for Karolinska Institutet*. Karolinska Institutet University Library. Version 1.05. *https://doi.org/10.13140/RG.2.1.1480.9447*

Romo-Fernández, L. M.; **Guerrero-Bote, V. P.**; **Moya-Anegón, F.** (2013). Co-word based thematic analysis of renewable energy (1990-2010). *Scientometrics*, 97(3), 743-765. *https://doi.org/10.1007/s11192-013-1009-5*

Segado-Boj, F.; **Gómez-García, S.**; **Díaz-Campo, J.** (2022). Intellectual and thematic structure of Communication research in Scopus (1980-2020). A comparative perspective among Spain, Europe, and Latin America. *Profesional de la Información*, 31(1). *https://doi.org/10.3145/epi.2022.ene.10*

Velasco-López, J. E.; **Carrasco, R.-A., Cobo, M. J.**; **Fernández-Avilés, G.** (2023). Data-driven scientific research based on public statistics: a bibliometric perspective. *Profesional de la Información*, 32(3). *https://doi.org/10.3145/epi.2023.may.14*