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The sources used by bibliometrics-scientometrics as reflected in references

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The aim of this study was to examine the extent to which the field of bibliometrics and scientometrics makes use of sources outside the field. The research was carried out by examining the references of articles published in *Scientometrics* in the course of two calendar years, 1990, 2000. The results show that in 2000, 56.9% (and 47.3% in 1990) of the references originated from three fields: scientometrics and bibliometrics; library and information science; and the sociology, history and philosophy of science. When comparing the two periods, there is also a considerable increase in journal self-citation (i.e., references to the journal *Scientometrics*) and in the percentage of references to journals.

Introduction

The main purpose of the current study was to investigate how interdisciplinary is bibliometrics-scientometrics? In order to answer this question, we carried out a reference analysis of the leading journal in the field, the journal *Scientometrics*.

In many professional fields of study there is a considerable literature of self-examination, especially with regard to communication patterns between fields, use of literature, and the evolution of creative ideas. Even medicine has come to accept the principle of self-examination. *Van Raan* (1997) discussed the state-of-the-art of scientometrics, and emphasized the need to balance between applied and basic research in the field, and the importance of strengthening the relations of scientometrics with a broad spectrum of disciplines.

Several previous works analyzed publications in the area of library and information science. *Peritz* (1981) examined the references of research papers published in 39 core journals during five calendar years, and calculated the percentage of references outside the field. In another study, *Peritz* (1988) examined the literature for bibliometrics for the period 1960–1985, and classified the body of literature according to the field of the journal in which the article was published. *Al-Sabbagh* (1987) studied the interdisciplinarity of information science through a reference analysis of *JASIS*. The

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findings, based on a ten percent random sample of references appearing in *JASIS* articles between 1970 and 1985 show that the largest percentage of references come from information science, followed by computer science, library science and science-general. *Thompson* (1989), based on the references of articles in twenty library and information science journals in five selected years, studied the age of the references, the extent of self citation, and found that the list of most cited journals was almost exclusively from library and information science. *Cronin* and *Pearson* (1990), in a study based on citations found that information science exports techniques of information retrieval and bibliometrics. *Meyer* and *Spencer* (1996) analyzed citations to twenty-four library and information science journals over a twenty-year period. Their findings show that 86.6% of the citations come from library and information science, but other disciplines including computer science, medicine, psychology, the social sciences and general sciences also cite library and information science journals to some extent. *Rousseau* (1997) studied the references appearing in the papers of the first two ISSI Conferences and citations of the Proceedings. He tabulated the most frequently cited publications – the three most frequently cited publication were *JASIS*, *Scientometrics* and *J. Doc*. The list of most frequently citing journals and of the most cited papers from the Proceedings was also presented.

Other works examined interdisciplinarity and cross citations. *Narin* et al. (1972) studied cross citing among journals in mathematics, physics, chemistry, biochemistry and biology. Cross citation analysis was also used by *Neeley* (1981) to study interdisciplinarity among management and social science literatures. *Herubel* (1990) monitored interdisciplinarity in history by carrying out a reference analysis of three major history journals.

Egghe and *Rousseau* (1990, p. 220) state that the term self-citation has been used with different meanings. Most often it means either author self-citation (the citing paper has one or more authors in common with the cited work) or journal self-citation (references to articles published in the same journal in which the citing article appears). *Lawani* (1982) further classified author self-citation into synchronous and diachronous self-citation. In the current study, we only consider synchronous author self-citation. A reference is categorized as such, if the name of an author of the analyzed paper appears in the reference.

Both author and journal self-citations were studied before. *Snyder* and *Bonzi* (1998) studied patterns of author self-citation in six disciplines distributed equally among the physical sciences, social sciences and the humanities. *Rousseau* (1999) examined the rate of journal self-citations, and showed that they reach an earlier peak than external citation. *Fassoulaki* et al. (2000) studied journal self-citation rate of six anaesthesia

journals. Great differences were found between the journals, self-citation was between 4% and 57%. Significant correlation was found between journal self ciation and the impact factor of the journal. *Lipetz* (1999) looked at different aspects of *JASIS* authorship through five decades. One of his findings shows that the percentage of papers containing any journal self-citation increased more or less linearly over the time, from 24% in 1955 to 82% in 1995. The role of author self-citation is currently being discussed in the SIGMETRICS discussion list (n.d.).

The above-mentioned studies used either citation or reference analysis. *Price* (1970) distinguished between *references* and *citations*. These notions are further discussed by *Egghe* and *Rousseau* (1990, p. 204): "a reference is the acknowledgement one document gives to another, while a citation is the acknowledgement that one document receives from another". Our study analyzed the references of articles published in *Scientometrics*. *Glänzel* et al. (1999) used reference analysis as a means for subject classification of the articles based on the analysis of the subject categories of the reference literature.

The journal *Scientometrics* has been the "theme" of several previous bibliometric studies. To mention a few, *Schubert* and *Maczelka* (1993) studied the changes that occurred to the journal during the 1980's based on its reference patterns. Two periods, 1980–81 and 1990–91 were chosen. They calculated the age distribution of the references, the Price Index, the distribution of the cited publication, the distribution of cited authors, and tabulated the most frequently cited publications. *Wouters* and *Leydesdorff* (1994) analyzed the references of all articles and notes in the first 25 volumes of *Scientometrics*, and calculated, among other indicators, the number of references per article and the relative age of the cited literature (the Price Index). *Persson* (n.d.) maps the citation and reference patterns of *Scientometrics* based on volumes 1 to 44 of the journal. Very recently, *Schoepflin* and *Glänzel* (2001) calculated several bibliometric measures (the Price Index, percentage of references to serials, mean reference age and mean reference rate) for articles, letters and notes published in *Scientometrics* in 1980, 1989 and 1997.

Most of the previous studies of Scientometrics were either concerned with quantitative aspects (e.g.; the Price Index) or with citation and co-citation patterns. Our aim was to examine the extent to which the field of bibliometrics and scientometrics makes use of sources outside the field. The research was carried out by examining the references of papers published in *Scientometrics* in the course of two calendar years, 1990, 2000. Bibliometric studies of specific fields are often published in journals of the specific filed. Thus, in order to answer our research question, we have not only classified the publication source of the references, but also looked at the titles of the references.

Methodology

This study analyzed all the references of all the papers published in *Scientometrics* in 1990 and in 2000. The population of the study consisted of 169 papers and 2814 references. The reference data was retrieved from ISI's *Web of Science* (http://wos.isiglobalnet.com/) resulting in uniform format and journal abbreviations. The original lists of references were also used for the analysis.

The calendar years 1990 and 2000 were chosen, in order to find out, among other questions, whether there are differences in the use of literature from outside the field during the two time periods. The first ISSI Conference took place in 1987, and by 1990 the field developed rapidly.

The references were categorized according to six facets:

- author self-citation;
- journal self-citation;
- discipline of publication source;
- field self-citation;
- type of publication;
- year of publication.

Author and journal self-citation were already defined in the introduction.

The publication source is labeled as "cited work" in the ISI Web of Science database (the meaning of the field is not defined in the help files of the database nor in the ISI glossary). It is the title of the journal, the serial, the book (monographs, collections, handbooks, yearbooks, etc.), the proceedings, the electronic source (for stand-alone sources) or the thesis, the name of the database or of the bibliographic source, the patent number for patents. Additional possible values of this field are, for example, communication (for private communications), unpublished or in press (usually the title of the source in which the reference is to appear is also given).

The discipline of the publication source is the scientific area to which the journal or the publication source belongs. For journals we used to some extent, the ISI classification, complemented by *Ulrich's International Periodical Directory*, the 37th edition, 1999. For books, proceedings, reports and other non-journal sources, the classification was based on the name of the source. The following areas were defined:

- science policy, bibliometrics and scientometrics including citation studies;
- information and library science (not including scientometrics);
- sociology, history and philosophy of science;
- general (all sciences);

- science (mainly physics and chemistry);
- medicine, life sciences and agriculture;
- mathematics, statistics, computer science and engineering;
- humanities;
- social sciences (excluding statistics and management);
- management (not including science policy);
- law;
- interdisciplinary;
- bibliographic sources and information retrieval tools;
- popular sources (e.g. newspapers, press releases, personal web pages);
- other (cannot be defined).

Note, that our classification does not follow exactly the ISI subject classification. For the field of scientometrics and bibliometrics, we defined our own categories.

A given reference is categorized as field self-citation, if the publication belongs to the field of scientometrics and bibliometrics. Thus, first we had to define the major themes covered by the field:

- indicators (science and technology), forecasting and planning;
- research trends, research evaluation and funding;
- science policy;
- bibliometric laws and models;
- citation analysis including all aspects (e.g. obsolescence, ranking, mappings, coupling, etc.);
- patent analysis;
- reference analysis;
- coword analysis in context of performance;
- productivity (e.g. authors, journals, institutions);
- impact;
- peer review process;
- sociology of science;
- social contexts of research;
- characteristics and development of a scientific area;
- scholarly communication;
- scientific networks;
- technology flow;
- innovation;
- other themes relevant to the field.

Field self-citation was based on the title of the publications and on our previous knowledge. *Peritz* (1984) discussed and analyzed the non-informativeness of titles and recommended guidelines to prospective authors, specifying the kinds of titles required. Some of the titles were rather uninformative, and it was impossible to decide whether they belonged to the field or not. The same problems arose when categorizing the discipline of the publication source, when the publications were books or reports.

The following types of publications were defined:

- journals;
- books and manuals;
- collections or in collections;
- year books reports, guidelines, drafts and manuscripts;
- proceedings or in proceedings;
- dissertations and theses;
- internet and electronic sources;
- bibliographic sources, information retrieval tools and handbooks;
- other (including papers presented, personal communication, opening addresses, memorial lectures).

The reliability of the categorization was checked on a 20% sample coded by both authors. The intercoder reliability was very high.

Results and discussion

Using ISI's *Web of Science* (http://wos.isiglobalnet.com/), the list of all papers published in *Scientometrics* in the calendar years 1990 and 2000 were retrieved. The list for 1990 included volumes 18 (issues 1–2, 3–4 and 5–6), 19 (issues 1–2, 3–4 and 5–6); and the list for 2000 included volumes 47 (issues 1, 2 and 3), 48 (issues 1, 2 and 3), and 49 (issues 1, 2 and 3). The list contained 70 items for 1990 and 89 items for 2000, altogether 169 papers.

The document type, as labeled by ISI was not limited, thus our list includes articles, bibliographies, book reviews, biographical items, editorial matters and corrections. In the set for 1990, 60 (86% of the total for 1990) items in the list were labeled as articles, while for 2000, 83 (93% of the total for 2000) items were labeled as articles.

For each paper, the reference data was retrieved from ISI's *Web of Science* resulting in uniform format and journal abbreviations. For the analysis, especially for determining whether the specific reference should be classified as field self-citation, we consulted the original lists of references, as they appeared in the journal. During this process, we

discovered missing references from the ISI lists (34 additional references were discovered), and made occasional corrections. Altogether, 2814 references were identified, 1054 in 1990 and 1760 in 2000.

The mean number of references in 1990 was 15.1, while in 2000 the mean increased to 19.8. In 1990, 5 items had no references at all (these were labeled as article, editorial matter, and bibliography by ISI). The largest number of references in an item was 60. In 2000, only 4 items had no references at all (these were labeled as editorial matter, biographical item and bibliography by ISI). The largest number of references in an item was 75. Table 1 displays the summary of the distributions of the ages of the references.

Table 1. Summary of the distributions of the reference age

Time period	No. references in 1990	% references out of total for 1990 (1054)	No. references in 2000	% references out of 2000 (1760)
No date given	25	2.4%	50	2.8%
19th century	0	0.0%	2	0.1%
First half of 20th century	15	1.4%	16	0.9%
3rd quarter 20th century	141	13.4%	148	8.4%
Between 1975 and 1985	477	45.3%	259	14.7%
Between 1986 and 1990	396	37.6%	211	12.0%
Between 1990 and 1995			518	29.4%
Between 1996 and 2000			556	31.6%

References without dates are usually to personal communications, unpublished works, to works in press or to electronic sources, and occasional omissions. It is interesting to note, that the percentage of references in the last five years (1986 to 1990, for 1990; and 1996 to 2000 for 2000) decreased from 37.6% to 31.6%. Does this mean that scientometrics is getting "softer" (the "Price Index", (*Price*, 1970))? Both *Schubert* and *Maczelka* (1993) and *Shoepflin* and *Glänzel* (2001) found that the Price Index of scientometrics increased over time. They, as in the current work, based their data on single years. On the other hand, *Wouters* and *Leydesdorff* (1994) studied the first twenty five volumes of *Scientometrics*, observed some fluctuations in the Price Index over the years, but showed that the regression line is not significant, and concluded that the index displays neither rise or fall between 1978 and 1992. We also believe, that in order to draw conclusions about the "hardness" or "softness" of the field, its journal or journals should be studied over a continuous time period, and not isolated years. Special, dedicated issues, for example, have greater influence on the data for isolated years than for continuous periods.

Author self-citation

As mentioned in the introduction, several types of author self-citation can be defined (see *Lawani* (1982)). In this study, we measured synchronous author self-citation. A reference for a given item was labeled as author self-citation, if one of the authors of the reference matched one of the authors of the given item. Author self-citation was determined by consulting the list of references appearing at the end of the papers, since ISI only lists the first author for each reference. Sometimes, even in the reference lists, not all authors are recorded (using the et al. notation), thus the actual self-citation rate may be a bit higher than the numbers presented here.

Author self-citation was 13.4% for 1990 (141 references) and 13.9% (244 references) for 2000. Both in 1990 and in 2000, we identified five papers with at least 50% author self-citation rate. About 30% of the papers in both years had author self-citation rate of 20% or more.

Journal self-citation and the publication sources

In terms of author self-citation, no significant differences were observed between the two periods. Journal self-citation, (i.e., references to the journal *Scientometrics*), on the other hand, increased considerably, from 12.9% in 1990 (136 journal self-citations) to 20.1% (354 journal self-citations) in 2000. A possible explanation for this increase is that the journal *Scientometrics* is more and more becoming the central journal of the field. However, as in the case of the Price Index, caution must be exercised, and conclusions should be drawn only from examining the trends over a longer, continuous period of time. In this case, as in the case of author self-citations, some papers cite the journal more than the others. Seven items in 1990, and eight in 2000 had over 50% journal self-citation rate. 26% of the papers in 1990, and 48% of the papers in 2000 had journal self-citation rates above 20%.

Publication source is defined as the source of the reference, this field is labeled as "cited work" or "source title" in the ISI *Web of Science* database. We gave an operational definition of this term (as we found no "official" definition in the ISI sites) in the Methods section of this paper. For 1990, 563 publication sources were identified. This may be a slight overestimate, since occasionally ISI labels the same source differently. Table 2 displays the results, all sources cited five or more times are listed, the data for the other publications is summarized. For 2000, 844 sources were identified, the results for 2000 appear in Table 3.

Table 2. The distribution of the publication sources in 1990, in absolute numbers and in percentages

Rank	Publication source	Times cited	% out of total number of references (1054)
1	SCIENTOMETRICS	136	12.9%
2	J AM SOC INFORM SCI	21	2.0%
3-4	RES POLICY	19	1.8%
3-4	SOC STUD SCI	19	1.8%
5	CURR CONTENTS	18	1.7%
6	AM PSYCHOL	17	1.6%
7	EVALUATION FORSCHUNG	16	1.5%
8	CZECH J PHYS	14	1.3%
9	MESSUNG FORDERUNG FO	12	1.1%
10	HDB QUANTITATIVE STU	10	0.9%
11-13	AM SOCIOL REV	9	0.9%
11-13	NATURE	9	0.9%
11-13	SCIENCE	9	0.9%
14	J INFORM SCI	8	0.8%
15-18	AM J SOCIOL	7	0.7%
15-18	J DOC	7	0.7%
15-18	SOC SCI INFORM	7	0.7%
15-18	Z BETRIEBSWIRT	7	0.7%
19-20	INFORM PROCESS MANAG	6	0.6%
19-20	STAT YB	6	0.6%
21-24	EMPF WETTB DTSCH HOC	5	0.5%
21-24	HDB INT TRAD DEV STA	5	0.5%
21-24	J HIST BIOL	5	0.5%
21-24	MESSUNG FORSCHUNGSLE	5	0.5%
25-33	9 sources	4	3.4%
34-53	20 sources	3	5.7%
54-124	71 sources	2	13.5%
125-563	439 sources	1	41.7%

Table 3. The distribution of the publication sources in 2000, in absolute numbers and in percentages

Rank	Publication source	Times cited	% out of total number of references (1760)
1	SCIENTOMETRICS	352	20.0%
2	J AM SOC INFORM SCI	62	3.5%
3	RES POLICY	56	3.2%
4	SOC STUD SCI	24	1.4%
5	SCIENCE	21	1.2%
6	NATURE	20	1.1%
7	J DOC	16	0.9%
8	RES EVALUATION	16	0.9%

(to be continued on the next page)

Table 3. (cont.)

Rank	Publication source	Times cited	% out of total number of references (1760)
9	J INFORM SCI	14	0.8%
10-11	ASTROPHYS J	12	0.7%
10-11	SCI PUBL POLICY	12	0.7%
12	AM SOCIOL REV	11	0.6%
13	SCI TECHNOL HUM VAL	9	0.5%
14-18	COMMUNICATION	8	0.5%
14-18	INFORM PROCESS MANAG	8	0.5%
14-18	LANCET	8	0.5%
14-18	LITTLE SCI BIG SCI	8	0.5%
14-18	TECHNOL ANAL STRATEG	8	0.5%
19-20	AM ECON REV	7	0.4%
19-20	REV ESPANOLA DOCUMEN	7	0.4%
21-22	BRIT MED J	6	0.3%
21-22	MAPPING DYNAMICS SCI	6	0.3%
23-31	AM J SOCIOL	5	0.3%
23-31	CITATION INDEXING IT	5	0.3%
23-31	COMMUNICATION YB	5	0.3%
23-31	HDB QUANTITATIVE STU	5	0.3%
23-31	INTERCIENCIA	5	0.3%
23-31	J OPER RES SOC	5	0.3%
23-31	OPER RES	5	0.3%
23-31	P 7 C INT SOC SCIENT	5	0.3%
23-31	STRUCTURE SCI REVOLU	5	0.3%
32-48	17 sources	4	3.9%
49-82	34 sources	3	5.8%
83-174	92 sources	2	10.5%
175-844	670 sources	1	38.1%

The top four journals appear exactly in the same order for both years, and they represent the main aspects of the field: the field itself, its relation to information and library science, to planning and management and to the sociology of science. These four sources cover 18.5% of the references in 1990, and 28.1% of the references in 2000.

Type of publication

In the list of most frequently cited publications we see mostly journals, but also books, handbooks, yearbooks, collections, proceedings and reports. Table 4 displays the distributions according to publication type for 1990 and 2000.

Table 4. Distributions according to the publication type in absolute numbers and in percentages

Publication type	No. of publications referenced in 1990	% out of total (1054)	No. of publications referenced in 2000	% out of total (1760)
Journal	589	55.9%	1145	65.1%
Book or manual	160	15.2%	205	11.6%
Report, guidelines, draft or manuscript	100	9.5%	132	7.5%
Collection or in collection	89	8.4%	106	6.0%
Proceedings or in proceedings	14	1.3%	53	3.0%
Internet and electronic sources	0	0.0%	36	2.0%
Bibliographic source, information retrieval tool or handbook	39	3.7%	33	1.9%
Dissertation or thesis	11	1.0%	12	0.7%
Year book	21	2.0%	7	0.4%
Other (incl. papers presented, personal communication, opening address, memorial lecture)	31	2.9%	31	1.8%

Table 4 shows that the percentage of the references to journal articles increased considerably, while the percentage of the references to books, yearbooks and reports decreased. In 1990 there were no references to electronic sources, this category only appeared in 2000. It will be interesting to see whether the electronic sources are going to be referenced more extensively in the future.

Discipline of publication source

Next we classified the publication sources, according to the disciplines they belonged to. The categories are defined in the Methods section of the paper. For journals we based our classification on data derived from the ISI databases and on Ulrich. For other types of publications the classification was based on data from library catalogues and on our personal knowledge. The results are displayed in Table 5.

Table 5. Distributions of the references according to the discipline of the source, in absolute numbers and in percentages

Discipline of publication source	No. of sources in 1990	% out of total in 1990 (1054)	No. of sources in 2000	% out of total in 2000 (1760)
Science policy, bibliometrics and scientometrics including citation studies	334	31.7%	675	38.4%
Information and library science (not including scientometrics)	92	8.7%	202	11.5%
Sociology, history and philosophy of science	73	6.9%	124	7.0%
General (all sciences)	85	8.1%	128	7.3%
Science (mainly physics and chemistry)	48	4.6%	88	5.0%
Medicine, life sciences and agriculture	49	4.6%	132	7.5%
Mathematics, statistics, computer science and engineering	65	6.2%	65	3.7%
Humanities	12	1.1%	6	0.3%
Social sciences (excluding statistics and management)	224	21.3%	229	13.0%
Management (not including science policy)	28	2.7%	38	2.2%
Law	0	0.0%	4	0.2%
Interdisciplinary	8	0.8%	13	0.7%
Bibliographic sources and information retrieval tools	25	2.4%	34	1.9%
Popular sources (e.g. newspapers, press releases, personal web pages)	1	0.1%	6	0.3%
Other (cannot be defined)	10	0.9%	16	0.9%

Along with the increasing citation rate of the journal *Scientometrics*, we observe a general increase in sources belonging to the field of scientometrics and bibliometrics. This could either be the sign that the field is becoming more mature or self-sufficient or it may indicate that scientometricians base their research less and less on methods and studies conducted in other fields. Most of the references 2000 (56.9%), and nearly half of the references in 1990 (47.3%) are from the three fields, closely related to the subject-matter: scientometrics and bibliometrics itself; library and information science; and sociology and history of science. A substantial amount of references are to sources belonging to the social sciences (21.3% in 1990, and 13.0% in 2000). We see that the percentage of references to sources from the social sciences decreased considerably. On the other hand, the combined share of sciences-general; mathematics, computer science, statistics and engineering; science and medical sciences remained nearly the same (23.4% in 1990 versus 23.5% in 2000).

Field self-citation

The last issue we examined was field self-citation. About half of the references originate from sources, which are not related to scientometrics. It is quite possible that some of these references are to works, which belong to the field. As an example, consider (*Fassoulaki* et al., 2000) in the list of references in the current paper. The publication source of this reference is the *British Journal of Anaesthesia*, thus the publication source would be classified as belonging to medicine, life sciences and agriculture. The paper compares journal self-citation rates of six anaesthesia journals and discusses the implications of these rates. Thus the paper is clearly a bibliometric study, and would be defined as field self-citation. On the other hand, some of the references from the fields closely related to scientometrics are not classified as field self-citation. As an example, consider *Salton* and *McGill*'s book *Introduction to Modern Information Retrieval* (1983), which was classified as library and information science, but it clearly does not belong to the field of scientometrics and bibliometrics.

The topics the field deals with are defined in the Methods section of this paper. The decision on the classification of an item as field self-citation was based on the title of the source. Note that for reports and books the title of the work referred to and the publication source coincide; but for journal papers, collections and proceedings these are two separate entities.

In 1990, 593 out of the 1054 references (56.3%) were classified as field self citation, while in 2000, 1092 out of the 1760 references (62.0%) were field self-citations. This is a rather considerable increase, it may indicate that the field is becoming more and more self sufficient, and needs to rely less on theories and methods emanating from other scientific fields. In Table 6, we present the breakdown of the field self-citations according to the disciplines of the publication sources.

The results show that 66.1% of the field self-citations in 1990 and 75.6% in 2000, are from the three areas closely related to the field. Here too, we see a decrease in the percentage of references emanating from the social sciences, while the combined share of the sciences decreased only slightly (from 16.9% to 13.3%). A more detailed content analysis of the titles could reveal whether the references from outside the field and its related areas are to works describing methods and tools, which are also utilized in the field. Unfortunately, such an analysis was beyond the scope of the current work.

Table 6. The distributions of the field self-citations according to the disciplines of the publication sources, in absolute numbers and in percentages

Discipline of publication source	No. of sources in 1990	% out of total in 1990 (593)	No. of sources in 2000	% out of total in 2000 (1092)
Science policy, bibliometrics and scientometrics including citation studies	286	48.2%	621	56.9%
Information and library science (not including scientometrics)	58	9.8%	133	12.2%
Sociology, history and philosophy of science	48	8.1%	72	6.6%
General (all sciences)	50	8.4%	77	7.1%
Science (mainly physics and chemistry)	32	5.4%	18	1.6%
Medicine, life sciences and agriculture	7	1.2%	30	2.7%
Mathematics, statistics, computer science and engineering	11	1.9%	20	1.8%
Humanities	3	0.5%	2	0.2%
Social sciences (excluding statistics and management)	75	12.6%	80	7.3%
Management (not including science policy)	14	2.4%	22	2.0%
Interdisciplinary	4	0.7%	12	1.1%
Bibliographic sources and information retrieval tools	2	0.3%	2	0.2%
Popular sources (e.g. newspapers, press releases, personal web pages)	1	0.2%	1	0.1%
Other (cannot be defined)	2	0.3%	2	0.2%

Concluding remarks

Soul searching and self-examination of a scientific field or subfield have become very popular. Even in our field several such studies have been conducted over the years, each one of them looking at the field from a different perspective.

This study asked the question how outside looking is our field by analyzing 2814 references of 169 papers published in *Scientometrics* during the years 1990 and 2000. The results show that the field relies heavily on itself, on library and information science and on sociology, history and philosophy of science. There is an increase in journal self-citation, the list of core journals remaining stable for both periods. Author self-citation is around 20% for the years under study. The special issues devoted to national developments or to very specific topics have some influence on the results. For more conclusive results, studies of longer periods of time should be conducted.

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