

Evaluation of scientific performance according to citation indexes in Serbia

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Abstract

Science Citation Index was present in Serbia from 1979, when University Library in Belgrade bought it. Serbian scientists consulted it at the Library, but it was not the official resource for the evaluation of scientific performance until 1996, when it was mentioned as a criterion in the Bylaw on the election for professors and researchers. In 2001 it became a criterion for financing researchers by the Ministry of Science. In 2008 bylaw it is defined that citations should be collected from the ISI Web of Science and from Serbian Citation Index, and that academic staff must have articles published in journals on the JCR list. University Library is entitled by the Ministry of Science to issue certificates about the number of citations for individual scientists or institutions in the process of accreditation by the National Board.

From 2003 to 2008, Library had 1487 requests. Total number of citations (self-citations excluded), was 83 033. On average there were 57.18 citations per request, but the distribution of citations per request is very uneven. Half of the authors had 10 or less citations and 372 authors were not cited. Only 10% of authors had more than 150 citations, with the maximum of 2 769. Library of Matica srpska in Novi Sad also searches citations upon request from 1988, when they got the citation indexes. They had 2474 requests, with 25 374 citations – 10.26 citations per request.

Key words: Scientific performance, Serbia, citation indexes, University Library, Library of Matica srpska

Introduction

ISI Citation Indexes are present in Serbia from 1979, when Ministry of Science bought it in paper form for the University Library "Svetozar Markovic" in Belgrade. In 1988, Regional Ministry of Science for Vojvodina bought it for the Library of Matica srpska in Novi Sad. Those libraries put the publications in free access at their referral centers. When the CD-ROM edition appeared, the acquisition for those libraries continued, and when database Web of Science became available, we got the access for the period 1996 onwards. The access to the Web of Science is available to all institutions connected to the academic computer network of Serbia.

Serbian scientists consulted citation indexes at first only at the information centers of our libraries. It was used as additional information about the scientific performance of Serbian researchers, mostly for elections for professor's posts at the universities or for membership elections for the Serbian Academy of Sciences and Arts. Number of citations was not the official criterion for the evaluation of scientific performance until 1996, when it was first mentioned in the Bylaw on the election for professors and researchers¹. In 2001 it became a criterion for financing researchers by the Ministry of Science. In 2008 Bylaw it is defined that citations should be collected from the ISI Web of Science and from Serbian Citation Index, and that academic staff must have articles published in journals on the JCR list². The numbers of points that determine their scientific competence are dependent on the number of papers published in those journals and with the rank of the journals in their subject category. From 2008 at the universities of Nis³ and Novi Sad⁴ it is a necessary condition for professors in natural sciences and medicine to have at least 10 citations. For other universities the data about citations are recommended to be presented, but they are not obligatory.

Citation certificate

University Library "Svetozar Markovic"⁵ and Library of Matica srpska⁶ are entitled by the Republic Ministry of Science for Serbia and Regional Ministry of Science for the autonomous region of Vojvodina to issue certificates about the number of citations for individual scientists or institutions from ISI Thompson (now Thompson Reuters) citation indexes, for accreditation of individuals and research institutions by the National authorities. Citations from books and other citation databases (Scopus, Google Scholar, SCIndeks) authors collect themselves and present them to authorities. Librarians search citation indexes for the period 1945 to present, according to the complete bibliographies that authors submit and collect all citations from them. Users get CD-s with collected data and the certificate about the number of citations (self-citations excluded)

Results

Between years 2003 and 2008 University Library had 1487 requests for bibliographies of cited works and certificates from individuals and institutions and found 83033

citations of works included in those bibliographies. Before 2003 our users did not need library certificate about the number of citations found, so we did not keep those data on the library server and we have not the precise statistics⁷.

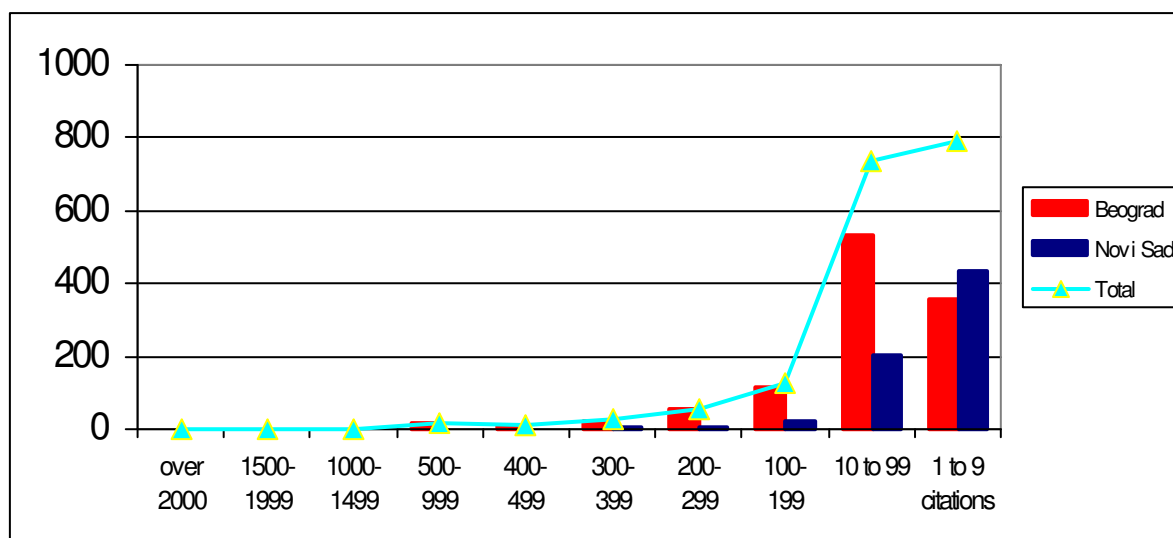
In the Library of Matica srpska in Novi Sad , the main library of the Province of Vojvodina, a research concerning citedness of researchers from Vojvodina was conducted in 2006⁸. The research was done using the electronic database of the workers collected by the Provincial Secretariat for Science Technological Development which also financed the project. Papers of 2,326 scientific workers from all scientific fields were searched, and 2004 was the last year. Bibliography consisted of 131.997 bibliographic entities. The majority of papers were not cited according to the ISI Thompson Citation Indexes. The summary results showed that there were 21.116 citations, and out of them 5.839 were self-citations. The majority of cited authors were from the University of Novi Sad, from Faculty for Natural Sciences, Faculty for Technology, Medical Faculty, Faculty for Agriculture and Faculty for Technical Sciences, Novi Sad. Total 2326 requests, 670 authors cited and 1656 uncited, total 15.277 citations. A research about citedness of 148 PhD doctors employed in the Institute of Nuclear Sciences Vinca was also conducted in 2003, and the result was 10.097 citations, most for papers in natural sciences⁹. There were also individual requests for citation analysis, but those data are not kept on the library server, so we do not have the precise statistics.

Majority of authors whose bibliographies were used for search of citations had only a few citations. The overall picture shows that on average authors from Vojvodina are cited less then authors that authors that requested data about their citedness from the University Library in Belgrade. The data are displayed on the next table, showing that 32% of authors that requested data from University Library in Belgrade and 65% of authors from Vojvodina had less then 10 citations. At the University Library in Belgrade the number of authors with 0 citations was 372 (25%) of requests and at the Library of Matica srpska it was 1656 (71%). The reason is probably that Regional Ministry of Science requested data for all authors from Vojvodina, and only authors that expected some citations sent their requests to the University Library in Belgrade. The authors from other university centers (Nis and Kragujevac) requested data about their citedness mostly from the University Library in Belgrade.

The data about number of citations per request are displayed on the next table and their distribution is represented on the next picture.

Number of citations per author	Number of authors Belgrade	% of cited authors	Number of authors Novi Sad	% of cited authors
Over 2000	2	0,18%	-	0
1500-1999	1	0,09%	-	0
1000-1499	2	0,18%	-	0
500-999	17	1,52%	1	0,15
400-499	11	0,74%	-	0
300-399	24	2,15%	3	0,45
250-299	17	1,52%	1	0,15
200-249	36	3,23%	7	1,05
150-199	47	4,22%	6	0,90
100-149	71	6,37%	14	2,09
50-99	167	14,98%	45	6,73
40-49	64	5,74%	11	1,64
30-39	67	6,01%	28	4,19
20-29	95	8,52%	41	6,13
10-19	138	12,38%	79	11,81
5-9	129	11,57%	107	15,99
1-4	227	20,36%	327	48,88
0	372		1656	

Table 1: Number of citations per author's bibliography submitted to the libraries



Picture 1: Number of authors from Serbia with particular number of citations to their papers in SCI and WoS (self citations excluded)

We can make assumption that the majority of highly productive authors from Serbia did request the bibliography of their cited works in passed thirty years. In our records there is only one author with more than 3000 citations, with one paper in genetics that was published in 1974 and received until 15. April 2009 a total of 2297 citations. It is

possible that there are some older authors with similar number of citations, but the probability for that is not great.

From the next table from data published by Eugene Garfield¹⁰, creator of scientific indexes, that concerns the total number of papers with particular number of citations from 1900 to 2006, it is obvious that highly cited papers are very rare. For more than hundred years the citations were collected in the most prestigious journals, total of 38 million of published papers. The table shows that nearly half of them were never cited. More than 500 citations had only about 20000 papers, and more than 100 citations for the whole period had only about 478000 papers, only 0.05% of the total number of published papers. That is the fact that all the world ministries should have in mind when they define the criteria for scientific excellence. And most important to mention, the number of citations vary intensively between disciplines, so the number of citations as a condition for evaluation should be always closely correlated with the discipline. Some analyses show that one citation from computer science or mathematics is on average equivalent to 10 citations from biochemistry or genetics.

According to our data only one paper of an author from Serbia (in genetics, published in 1974) is cited more than 2000 times. Number of citations for Milutin Milankovic (1879-1958), the founder of the astronomical theory of climate and the scientist from Serbia that has the greatest reception in the scientific community, is only about 1000, and yet the most important world price for geophysics is named upon him, and his name became part of scientific terminology (Milankovitch cycles), often mentioned in papers without explicit citing of his papers¹¹.

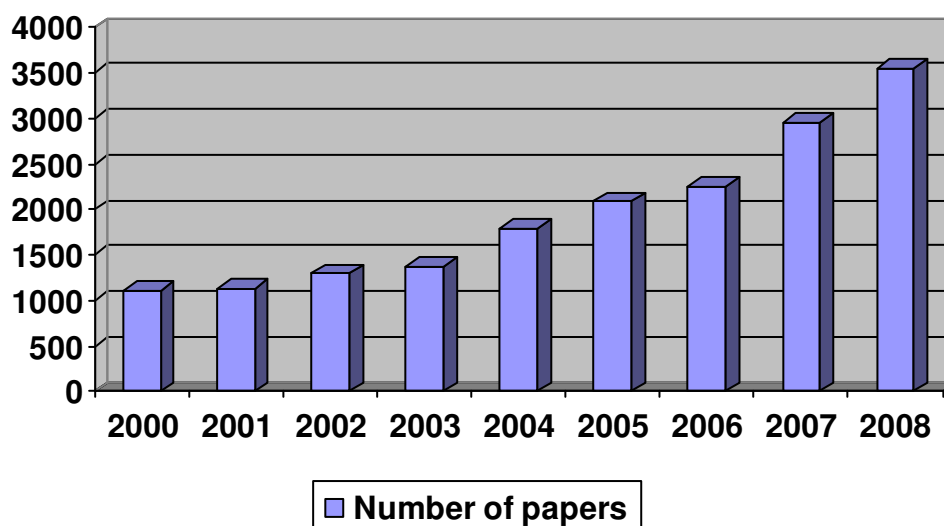
Number of papers with particular number of citations	Number of papers	% of the total number of papers in WoS	% of the total number of cited papers in WoS
More than 10.000 citations	61	0%	0,0033%
2000-10.000 citations	1.115	0,003%	0,0061%
1000-2000 citations	3.887	0,01%	0,0213%
500-1000 citations	16.322	0,04%	0,0896%
100-500 citations	456.910	1,2%	2,5071%
50-100 citations	953.064	2,5%	5,2296%
10-50 citations	6.340.127	16,6%	34,7889%
2-9 citations	8.823.494	23,1%	48,4154%
1 citation	3.343.789	8,8%	18,3477%
0 citations	18.224.550	47,8%	100%
Total number of papers	38.163.319	100%	

Table 2: Distribution of citation frequency of papers in Science Citation Index 1900-2006

Insisting on publishing in journals on JCR list did have results. Number of scientific papers in Web of Science with at least one author from Serbia shows constant growth in the new millennium. Articles from natural sciences contribute with around 50%, medicine about 30% and technical sciences about 10% of the total number of papers. Most important is the fact that the number of papers included in Web of Science grows much faster than it is the world average. The number of papers whose at least one author is from Serbia increased in the new millennium every year on average nearly 20%. That is well above world average of 4%, and even more than the “rising star” – China, who had growth of 17% between 1981 and 2007.

We suppose that besides the pressure from authorities, the availability of citation indexes, other databases and access to electronic editions of journals and books had also an important role in these results¹². In year 2001 the Consortium for coordinated acquisition was established by six most important research libraries, and Ministry of science started to finance acquisition of access right for resources that were available on academic computer network. Consortium started with the access to 3000 electronic journals, and in 2008 it had access to 35000 e-journals and 35000 e-books.

On the next picture it is displayed how the number of papers with at least one author from Serbia that is included in the Web of Science database grew in the new millennium.



Picture 2: Number of papers with at least one author from Serbia in Web of Science

The number of Serbian journals included in Web of Science also grew from 2005 to 2009 from 4 to 15, and some more journals from different fields are in the process of testing¹³. All those factors influence the cited ness of Serbian authors. The majority of authors that managed to publish in journals on the JCR list are from natural sciences,

mathematics, medicine and technical sciences. For social sciences and humanities cited ness in Serbian Citation Index¹⁴, established in November 2008, will be used.

Conclusion

Even though number of citations is not a perfect measure for evaluation of scientific excellence, its usage is widely spread all over the world¹⁵¹⁶. Serbian government and university authorities are using those data in the process of evaluation, and it is obvious that it had influence on establishment of closer ties between Serbian and world science. University Library "Svetozar Markovic" and Library of Matica srpska established specialized services to help both authors and authorities to get precise information about cited ness. The unfair practice to judge scientists only according to Impact Factor of journal he/she published, without gathering information of real cited ness of their works never was the praxis in Serbia, because our service was established as soon as the first requests of citation data appeared.

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