Current State and Evolution of Russians Publication for Computer Science Flow

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Abstract. This article describes some aspects of Russian computer science publications flow analyzes. This analyzes holds by bibliometric methods for Web of Science data base Russian publications flow.

The analyzes done shows the increasing of Russian flow for 2010 to 2019, outstripping the world this thermostatics publications flow. For this reason, Russia rises from 34 to 15 position in this scientific area world publication rating. But that is not enough for the national project «Science» goal achievement, which is fifth position in this classification,

The list of document types was determined for further analyzes. This list concludes two main types: journals articles and conferences proceeding papers and, additionally, a little quantity of some other types documents. Further analyzes holds for two main types separately. All journals have been additionally dissipated to WoS journals quartiles.

The Citation of published Documents was same way separately calculated for every from two main document types. Calculations shows, that the journals articles citing is in times more that Conference proceedings papers citing. This fact demonstrates clearly the very less interest for the scientific society to proceeding conference papers then to journal articles.

"Quality Coefficient", according the Russian Science Ministry Methodic, have been calculated for two main document type sets. Such calculation shows that this coefficient is much more for journals articles set, than for conference proceedings set despite of much less quantity of documents in the journals article set. It underlines the special attention which must be paid in future to this problem.

Keywords[1]: informatics, Wed of Science, world publication's flow, publication's set, journals article, conference proceedings, bibliometric analyzes

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1 Introduction

The use of bibliometric methods for assessing scientific activity from the very beginning to the present time is a subject of discussion both, in fact, in the scientific environment, and in the environment of science management. Recently, however, these methods have found more and more widespread use in the work of scientific foundations and governing bodies and financing of science in different countries of the world. The experience of using such methods in some countries is considered, for example, in the publication of the director of the State Public Scientific Technological Library of the Siberian Branch of the Russian Academy of Sciences (SPSTL SB RAS) A.E. Guskov et al. [1]; as well as in the work of sociologists M.A. Yurevich and D.S. Erkina [2].

Since 2009, such methods have also been used by the science management bodies of our country to assess scientific activity in Russia. The evolution of their implementation in Russian science is traced in sufficient detail in the above-mentioned article [1] as well as in the publication of the Library for Natural Sciences staff V.A. Tsvetkova and Yu.V. Mokhnacheva [3]. According to the general opinion of specialists in the field of bibliometry themselves [1, 3, 4], bibliometric methods, if used correctly by competent specialists, to a certain extent, reflect objective real-world trends in the development of domestic and world science. In general, most experts come to the conclusion that (despite all the discussion) no other method of objective evaluation of scientific publications, independent of the preferences of experts and editorial boards of journals, has yet been found.

Anyway, the national project "Science" adopted at the state level, which largely determines the activities of Russian scientific institutions at the moment, requires the Russian Federation to join the top five countries in the world by 2024 in terms of the number of scientific articles in priority areas of science for it [5]. This country position is estimated mainly by the flow of Russian publications in the sources included in the Web of Science (WoS) and Scopus databases. At the same time, in the reports of scientific organizations (according to the latest version of the methodology for calculating the "Complex score of publication performance", approved by the Deputy Minister of Science and Higher Education RF S.V. Lyulin 25.08.2020), publications reflected in the WoS database are taken into account with the highest indicators, then (with significantly lower coefficients) – publications reflected in the Scopus database, and then – all the others.

The reporting indicators take into account publications in a significant part of Russian scientific journals to a very small extent (with the exception of those included in the WoS and Scopus databases, as well as in the list of High Attestation Commission-HAC journals). In particular, the database "Russian Science Citation Index" (RSCI) is excluded from the accounting of publications, which, despite all its shortcomings, records a significant part of Russian-language scientific publications. Thus, the procedure established by the Ministry of Education and Science, in fact, does not take into account the bulk of publications in Russian scientific journals that are not included in the mentioned Data bases.

In connection with this approach, this article examines the situation with Russian publications on computer science (as an absolute priority for the RF field of science),

reflected in the DB WoS – the most "valuable" according to the mentioned methodology of the Ministry of Education and Science.

Since the WoS database is English-speaking, it is necessary to clarify the terminology first, the term "Computer Science" in Russian has several meanings. In this article, we will consider the direction of computer science, which in English and, accordingly, in DB WoS is defined by the term "computer science".

2 Russian publications on the topic "computer science" in the WoS database

Thematically, DB WoS is divided into more than 200 thematic sections, called "Subject Categories". It should be noted that in this DB, the subject category is assigned to the journal as a whole, and not to each specific article. The same journal, due to its thematic orientation, can belong to two or more subject categories.

In this DB, the subject of "computer science" includes seven subject categories:

Table 1. Subject categories of Computer Science.

Subject Category
Computer Science Interdisciplinary Applications
Computer Science Theory Methods
Computer Science Information Systems
Computer Science Artificial Intelligence
Computer Science Software Engineering
Computer Science Cybernetics
Computer Science Hardware Architecture

As with almost all WoS subject categories, the total global flow of publications in these categories has increased significantly over the past ten years. These increases are reflected in Table 2.

Table 2. Global flow of publications-Computer Science.

Year	Number of publications	Increase compared to the previous one (%)
2010	118561	
2013	132458	12%
2015	186153	41%
2017	193928	4%
2019	190357	-2%

It follows from Table 2 that the most significant increase in publications on this topic occurred in the period 2013–2015, after which the number of publications approximately stabilized.

Over the past five years (2015–2019), 198 countries have contributed to this flow. In 2019 – 177 countries.

Then we will consider the contribution of Russian scientists to this part of the global flow of publications. Table 3 shows the flow of Russian publications on the subject of Computer Science for 2010–2019.

It should be clarified that each publication can have several co-authors (including from different countries), and on the other hand, the same author can specify how many affiliations. In this regard, a Russian publication is hereinafter understood as any publication in which at least one affinity of one author is Russian.

Table 3. Russian publication flow – Computer Science.

Year	Number of publications	Increase compared to the previous one (%)
2010	796	
2013	928	17%
2015	2213	138%
2017	3871	75%
2019	3521	-9%

According to Table 3, the maximum growth of Russian publications occurred (following global trends) in 2013–2015, but the rate of this growth was significantly higher than the global average. While the global flow increased 1.6-fold over the period 2010–2019, the Russian flow increased 4.4-fold over the same period, and this growth continued into 2015–2017. At the same time, and some decrease in the volume of publications in the period 2017–2019 in Russia was more significant than in the world as a whole.

In line with this growth rate, which outpaced the global average, Russia's share was increasing, and Russia was moving to an increasingly higher place among the countries participating in this stream.

Table 4. Changes in the position and share of Russia in the global flow of publications.

Year	Percentage of Russian publications in the global flow	Position
2010	0,70%	34
2013	0,70%	33
2015	1,20%	23
2016	1,60%	17
2017	2,00%	14
2018	1,83%	15
2019	1,82%	15

As a result, in ten years Russia moved up 19 places on the list of countries and almost tripled its share of the total flow, although this share (as well as the place on the list) had stabilized by 2017 and still remains quite small.

Next, let's focus on a more detailed analysis of 2019 publications, the last full year fully accounted for at this point in the DB WoS publication. The volume of publications and the shares of the first fifteen countries in the 2019 stream are presented in Table 5.

Table 5. Share of the first 15 countries in the global flow, 2019.

Country	Number of publications	Percentage in world flow
Peoples Resp. China	56046	29.932
USA	36237	19.353
India	12839	6.857
United Kingdom	11141	4.960
Germany	9245	4.937
Japan	7239	3.866
France	6904	3.687
Canada	6537	3.491
Italy	6084	3.249
South Korea	6038	3.225
Australia	5665	3.025
Spain	5583	2.982
Brazil	4099	2.189
Taiwan	3477	1.857
Russia	3456	1.822

Hereinafter, the flow of UK publications refers to the total flow of England, Scotland, Wales, and Northern Ireland counted separately in DB WoS.

Let us examine in more detail the composition of this year's Russian publications by incoming document type. The overwhelming majority of the considered array consists of two types of documents – articles in journals and publications in conference proceedings. At that, a small part (27 publications) of the conference proceedings was published as articles in journals, and the overwhelming majority – in separate collections of conference proceedings. In addition to these two sub-arrays in WoS there are also (in a very small volume) individual book chapters and reviews. A small number of editorials and amendments to articles are also present in the WoS DB, but these publications are not considered further, as they generally do not contain new scientific results.

Most other countries are also characterized by the overwhelming prevalence of the same two types of documents (articles in journals and conference proceedings), but the percentage ratio of these types in the Russian array differs markedly from the arrays of other countries.

Table 6. percentage distribution of the main types of documents.

Country	Percentage of articles from journals	Percentage of conference proceedings
Peoples Resp. China	63.2	36.2
USA	40	59.1
India	53.3	45
Brazil	46.4	51.7
Taiwan	53.7	45.7
Russia	23,8	73,2

For comparison the first three countries of the general list and two countries Brazil and Taiwan) neighboring with Russia in this list are taken.

It is easy to see that in the Russian array there is a significant predominance of publications from conference collections (73.2%), in contrast to most countries where these types of documents are present in close proportions. A certain exception is the array of USA publications, but even there this “skewness” is not so noticeable.

Next, let us consider in more detail the documents of the two main types mentioned above.

The 2019 array of Russian publications includes 823 articles from 209 journals. In DB WoS, one of the important bibliometric parameters of a journal is a quartile – the journal's belonging to one of the four groups of journals of a certain subject category, ranked by the decreasing citation rate of its publications (impact factor). In DB WoS terms, the quartile is an indicator of the scientific level of a journal. From this point of view, the 209 journals in which articles by Russian authors are published are distributed by quartiles (Q1 – the highest and further up to Q4) as follows.

Table 7. Distribution of journals by quartiles.

Quartile	Journals	Percentage	Articles	Percentage
Q1	59	28,20%	240	29,2%
Q2	49	23,40%	105	12,8%
Q3	26	12,40%	66	8,0%
Q4	29	13,90%	214	26,0%
Without quartile	46	22.00%	198	24.0%
Total	209	100%	823	100.0%

It should be noted that the distribution of articles by journals is very uneven. The first nineteen journals (among them seven journals of the highest (first quartile)), containing ten or more Russian publications each, yield a total of 450 articles (more than 50% of all publications). All 823 articles are submitted by 1,079 organizations (including organizations of all Russian and foreign co-authors). Among them, 17 organizations of the Russian Academy of Sciences (RAS) represent 234 articles (more than a quarter of the total number of articles).

The array under consideration also includes 2,531 publications from the proceedings of 338 scientific conferences. These publications (taking into account the organizations of all co-authors) are presented by participants from 1308 organizations. Among them there are 181 publications presented by 45 RAS organizations. Thus, in the array of journal publications the share of RAS publications is significantly higher than in the part of publications of conference proceedings.

A certain deviation towards the prevalence of conference proceedings over journal articles is observed not only for Russian publications in the field of Computer Science. In a previous paper [7], the author noted a similar situation in the field of Russian publications in the Physics section. This point was also noted in the works of other specialists. Thus, in [8] a group of authors from SPSTL SB RAS points to this feature as one of the strategies for increasing the representation of the country and its organizations in the world databases, but notes that “... such a strategy positively influences the quality of conferences and their proceedings, the development of international cooperation, but cannot be a reliable indicator of the level of scientific research”. The authors of [9] in

the journal Scientometrics also note that the question of whether this is a positive trend remains debatable.

At the same time, the authors of [9] draw attention to the low level of citation of such documents (especially outside Russia). The different level of citation of journal publications and publications of conference proceedings (which probably reflects less interest in them on the part of the scientific community) can be assessed on the basis of the array of Russian publications in the field of Computer Science that we are considering. The author determined (using DB WoS tools) the citation of the above mentioned 823 journal publications and 2,531 conference proceedings publications. The results are presented in Table 9.

Table 8: Citations (by types of documents).

Document array	Number of documents	Number of citations	Number of citations (without self-citation)	Average. citation
	2647	623	580	0,24
Citation of works of RAS Conferences	187	58	54	0,31
Citation of journals	821	1812	1753	2,21
Citation of RAS Journals	234	364	337	1,48

It follows from Table 8 that in this case, too, the average citation of journal articles is almost eight times higher than that of conference proceedings (for RAS publications, this figure is close to five), which confirms the assumption made earlier.

Finally, note that the above-mentioned methodology for calculating the "Comprehensive Publication Performance Index" [10], approved by the Ministry of Science RF, is based on the "article/journal quality ("scientific level") factor", which is based (for documents from DB WoS) on the same system of quartiles. When determining the publication quality according to this methodology, each document is assigned a correction factor according to the following rule:

Q1	20
Q2	10
Q3	5
Q4	2,5
Without Q	1

According to Table 7, 823 journal publications will give a total quality score of

$$240 \text{ X } 20 + 105 \text{ X } 10 + 66 \text{ X } 5 + 214 \text{ X } 2.5 + 198 = 13{,}093.$$

At the same time, 2,531 conference proceedings publications (publications without quartiles) will give a total quality index of only 2,351 (approximately five times less). That is, from this point of view, adopted by the Ministry of Education and Science, the presence of a relatively larger array of conference proceedings and the flow of publications is not too positive for the quality of the array.

3 Conclusion

Russian publications on the Computer Science DB WoS thematic increased its number during ten years at a rate outpacing the world average and moved up in the world flow by 19 positions during this period, but so far, they occupy 15th position only. This is still far enough from the position into the world top five, required by the national project "Science".

The flow of Russian publications. divided by types of documents, consists mainly from journals articles and conference proceedings, and conference proceedings number in 2019 publication flow approximately three times exceeds the number of journals articles.

These journals articles are mostly placed in sufficiently high (according to WoS criteria) scientific level journals.

The growth of the flow of conference materials does not always contribute at the same time to the overall scientific quality increase for the array of Russian publications as a whole.

The number of publications increase at the expense of conference proceedings also does not quite correspond to the growth of the Russian publication array quality as a whole, calculated according to the criteria approved by the Ministry of Science RF.

Based the last two points, scientific organizations should probably pay a special attention to its document types composition, when forming their publication flow.

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