

Application of Scientometrics in the University evaluation and research policy: foreign experience and Russian practice

Olga Moskaleva

Research Office
Saint-Petersburg State University
Saint-Petersburg, Russian Federation
e-mail: olga@science.pu.ru

Julia Dmitrieva

International Research & Technology Department
Saint-Petersburg State University
Saint-Petersburg, Russian Federation
e-mail: julia.dmitrieva@ir.pu.ru

Abstract— Research productivity defines University development and its activity. What are the best ways for its evaluation for every University? The University leaders should define how to consider application of the scientometrics derivatives and outputs for the University strategy policy. Both international and Russian ratings of most educational and research organization are based on the publication activity indicators. Saint-Petersburg State University may generally reflect the situation and trends in the Russian Federation.

Keywords—scientometrics, university evaluation, research policy, Saint-Petersburg State University

I. INTRODUCTION

One of the most verifiable and fair indicators of the research productivity, especially in fundamental research, is publication activity. It means that number of publications and its quality are included in all systems of evaluation for research capacities and productivity and also qualification of academic and research staff.

What is Scientometrics? As science we may find its birthday after paper by Derek J. de Solla Price “Networks of Scientific Papers” in *Science* dated in 1965. It was he who discovered such phenomena as “network of papers” and special relationship which is given by the citation of one paper by another in its footnotes or bibliography as well as practice of citation [1].

Since science is going on and develops, scientometric as its derivative has also evaluated.

Today we may consider scientometrics and its tools by different definitions or points of view. Generally one can find several practical implementations and several forms. All of them are connected with its practical meaning and target, based on analysis or effective guide for the University goal settings:

- university evaluation (reflected in such tools as World Rankings and Thomson Reuters and Elsevier products);
- research activity evaluation (Scopus and Web of Science);
- academic competitiveness and research productivity and research development power;
- conducting new research policy by researcher or by University or by State.

Nowadays there are different products both international and national that have implemented core principles and methods of scientometrics. In this article we try to consider mainly on its application, necessity and outputs first of all generally for the University policy and its research evaluation. Finally we present Saint-Petersburg State University (SPSU) research evaluation policy as case-study for Russian universities.

The main argument is how to evaluate or how to use these indicators in practice. Briefly we may conclude that among adequate indicators are:

- number of publications and citations in every database but for definite period of time;
- proportion of articles edited as result of international cooperation;
- correlation of indicators, year period and several databases.

How can we use publications for research analyses and building the strategic policy in the university? This article is devoted to the practical application of different scientometrics tools.

II. GENERAL ISSUES OF RESEARCH OUTPUTS OF SCIENTOMETRICS

General features of scientometrics for research evaluation and policy of the University:

- Number of published papers and papers with highest impact factor;
- H-index of every researcher or department;
- Changes in research trends in your institution;
- Competitiveness of your own institution in compare with counterparts;
- Analysis of home institution policy, based on its strengths and weaknesses or what we may and should improve;
- Average citation per paper in home institution or in several fields;
- main actors of cooperation and its trends;
- effectiveness of the strategic decision on research activity, made before;
- how and to what extent we can implement perspective trends of the most strong and research studies;

- choice of the concrete researchers to conduct joint studies or international projects;
- best way of diversification limited internal resources;
- search of potential partners and collaborators;
- correlation and diversification of the research portfolio and its focus;
- best way of the implementation of our renewed strategy in accordance with new activities in research.

What we may find through analytical instruments of Scientometrics for the evaluation of research policy:

- The competences in organization and their position in world trends
- Elucidation of certain competences and scientist, working in these fields. Detailed analysis of researchers, working out in the same field by research competency, collaboration networks, etc.

III. NATIONAL RESEARCH POLICY (RUSSIAN FEDERATION)

Both international and Russian ratings of most educational and research organization are based on the publication activity indicators. Raise of the number of publications is the single purpose indicator for the implementation of the national Development Programs, the activity of different research founds as Russian Foundation for Basic Research, Russian Foundation for Humanities.

Moreover in the Decree by the President of the Russian Federation adopted in 2012 named as “Measures for the realization of the national educational and research policy” the publication share of Russian scientists in the total number of publications in scientific papers, included in the Web of Science should be up to 2,44% till 2015 [2].

Nowadays the percent of Russian publication in compare with world is less. At the same time due to raise of the total publications in the world especially in such countries as Brazil, India and China, the Russian share fall dawn because the number of Russian publications hasn't been changed.

It means, that measures, aimed at the improvement of the quality and quantity of Russian research papers. Generally for Russian publications, presented in the international indexes there is tendency of mismatch in the fields of knowledge in compare with most developed and developing countries.

There are lots of discussions on its reasons. There is reversed correlation between citation of papers and number of national journals. It finds out that the problem is in absence of any motivation to publish. That was the main reason of the introduction of the system of publication in Saint-Petersburg State University, aimed to increase number of publications, represented in the international databases as Web of Science or Scopus, pornographies, published by international and influenced national editions. The key criteria were affiliation to Saint-Petersburg State University.

IV. SAINT-PETERSBURG STATE UNIVERSITY – CASE STUDY

System of additional payment in Saint-Petersburg State University that was introduced includes several key principles:

- Affiliation to SPSU;
- Once per year after analysis of the publication activity staff for previous 3 years;
- Doesn't depend on job position and title;
- Verification by librarians of SPSU.

For comparison between different level of publications in the difference fields of knowledge, the evaluation of publication was accounted by the same formula, comprises journal impact-factor, normalized on the average papers citation in this field of knowledge.

Every staff has its rating of publication activity scores, that included scores for periodic, scores for monographies.

Scores for periodic were accounted under the formula:

$$(I/C)R$$

where I – Impact factor; C – average paper citation in the appropriate field for last 10 years, R – share of the affiliated authors to the total number of authors.

Scores for monographies included the obligation for ISBN, increasing coefficient for the books, reviewed in the top journals, level of the publishing house, number of authors and share of authors, affiliated to SPSU

In may 2011 in Saint-Petersburg State University new Information & Analytics system was introduced. It allows analyze quality and quantity of publication activity indicators, taking into account fields of knowledge and types of publications. It allows us to make comparative analysis of our activity.

Saint-Petersburg State University has the Program of Development which reflects all trends in the development of the research and science activity [3].

Analysis of SPSU scientific maps “Figure1”, created in SciVal Spotlight for the different periods, can show certain changes, being the result of development program implementation. On the pictures, given below, we can see both the increasing of the number of competences as to compare the period before the beginning of development program (2004-2008) and the 3 years of its realization (2007-2011), but also the quality changes. The new competences appeared first of all in research fields, connected with priorities of Development program, i.e. biomedicine, computer science, geosciences and nanotechnology.

We use these indicators of scientometrics for the building of University policy:

- Development and stimulation of research activity. Saint-Petersburg State University announces several internal grants for different fields of knowledge and research activities for SPSU academic staff. The choosing of research field is done with accordance with scientometric indicators, given by such tools as InCites and SciVal-. Among different criteria for competitiveness for the financing of different

research grants there are also research productivity, measured by number of articles in leading journals, citation per paper, etc. We introduced additional payment for the publication activities in order to stimulate of research activity especially within University;

- Finding new partners both national and international level;
- Development of the international cooperation and prospective research projects. The perspective and future of new projects or the development of the old ones should be based on the acting resources and capacities of any University. When we plan further academic and research projects we look generally on the University achievements and reputation, that is mainly based on the scientometrics.

To sum up publication activity in SPSU we may conclude the main problems for evaluation of research productivity in Russian institutions:

- Insufficient quantity of Russian papers in Web of Science and Scopus;
- Incorrect affiliation of Russian authors;

- Absence of ratings for academic edition (for monographies).

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2004-2008

5,970
articles in Scopus

Researchers at St. Petersburg State University published 5,970 articles over the period 2004-2008.

[View the list of articles in SciVerse Scopus](#)



5,320
articles in Spotlight

5,320 of those articles were included in Spotlight, 650 fewer articles than in SciVerse Scopus.

[Why are there fewer articles in SciVal Spotlight?](#)



1,395
articles in
54 competencies

1,395 of those 5,320 included articles contributed to the competencies of St. Petersburg State University. In total, Spotlight identified 54 different competencies.

[How are articles assigned to competencies?](#)

2007-2011

6,138
articles in Scopus

Researchers at St. Petersburg State University published 6,138 articles over the period 2007-2011.

[View the list of articles in SciVerse Scopus](#)



5,771
articles in Spotlight

5,771 of those articles were included in Spotlight, 367 fewer articles than in SciVerse Scopus.

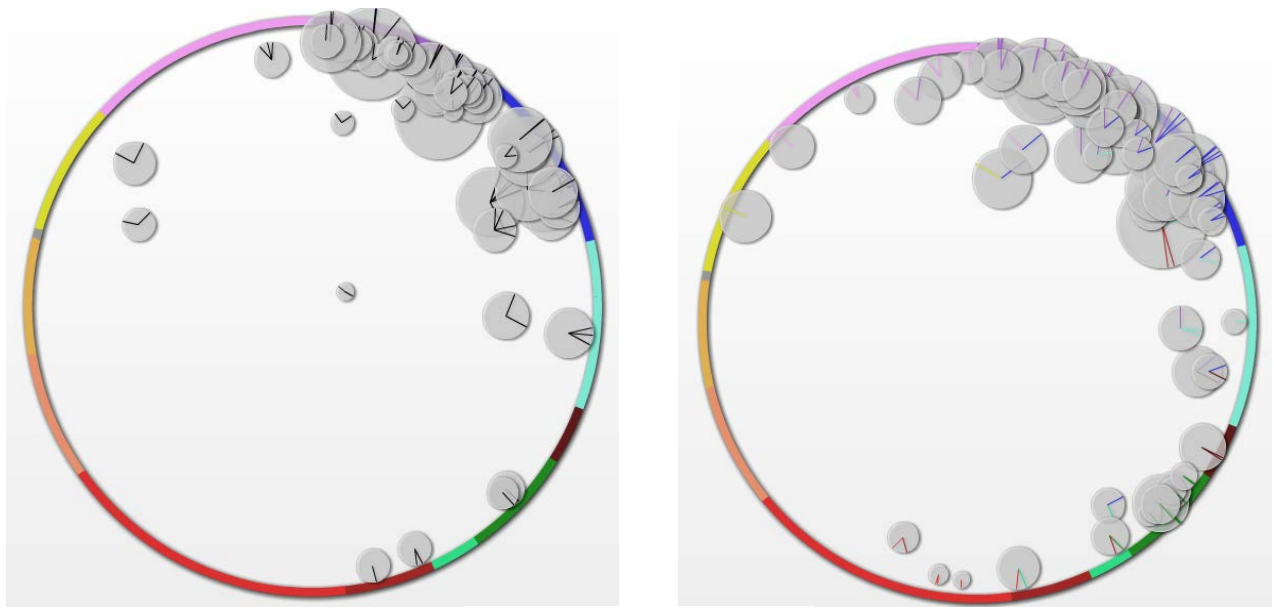
[Why are there fewer articles in SciVal Spotlight?](#)



1,487
articles in
72 competencies

1,487 of those 5,771 included articles contributed to the competencies of St. Petersburg State University. In total, Spotlight identified 72 different competencies.

[How are articles assigned to competencies?](#)



Subject areas

- | | |
|----------------------|---|
| Math & Physics | ☐ |
| Chemistry | ☐ |
| Engineering | ☐ |
| Earth Sciences | ☐ |
| Biology | ☐ |
| Biotechnology | ☐ |
| Infectious Diseases | ☐ |
| Medical Specialities | ☐ |
| Health Sciences | ☐ |
| Brain Research | ☐ |
| Humanities | ☐ |
| Social Sciences | ☐ |
| Computer Science | ☐ |
| Other | ☐ |

Figure 1. Number of competences to compare before the beginning of the Development Program (2004-2008) and 3 years after its realization in saint-Petersburg State University.