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SCIENTOMETRICS IN SPORTS

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Resume

Currently, one of the most important areas of state policy is the country's transition to an innovative economy, in which the creation, transfer and use of the results of scientific and technical activities are the main conditions for sustainable economic growth. At the same time, an effective state policy should provide not only financial support for scientific research and development, but also the creation of effective mechanisms aimed at the productive use of the results of scientific and technical activities, including those created at the expense or with the involvement of budgetary funds. Ideally, the methodology for an objective assessment of the quality of scientific activity should be somewhat reminiscent of the procedure for identifying winners in sports competitions, when the best are determined based on certain quantitative results achieved by athletes.

I. Introduction

Science is a self-organizing system, the development of which is controlled by its information flows, and scientometrics is a set of quantitative methods for studying the development of science as an information process [1-6].

The purpose of scientometric research is to give an objective picture of the development of a scientific direction, to assess its relevance, potential opportunities, laws of the formation of information flows and the dissemination of scientific ideas. The implementation of this goal includes a number of specific tasks, the combined solution of which should provide an answer to most of the questions posed [7-9].

The tasks of the science of science include, among others, the search for the optimal structure of scientific institutions and the most effective methods for organizing science as an object of management, as well as determining the speed of development of scientific directions, individual and collective productivity of scientists, etc. For this purpose, various models of science are used in the science of science: economic, epistemological, logical, informational, etc. In this work, we will proceed from the information model, since phenomenologically, science can be considered as a process of obtaining substantially new information. This process is sequential and collective;

any scientific work is based on a number of previously completed work. Science is a self-organizing system, the development of which is controlled by its information flows, and scientometrics is a set of quantitative methods for studying the development of science as an information process. This article discusses scientometric research in relation to sports.

II. Materials and Research Methods

The realization of the goal of scientometric research includes the solution of a number of specific problems, the combined solution of which should provide an answer to most of the questions posed. The following general methods used in scientometrics are known:

Statistical method.
Method of counting the number of publications.
The «quotation-index» method.
The method of «content analysis».
Thesaurus method.
Slang method.

Although all or almost all scientometric methods are of a statistical nature, nevertheless, a separate statistical method stands out, which is understood as a method that uses all measures as scientometric indicators, except for the number of publications, references and individual words. Measures of science covered by the statistical method include such measures as the number of scientists, journals, orders for annual sets of journals in libraries and information centers, discoveries, and others that have relatively large «units of measurement» or are incommensurate with other scientometric measures (for example , the energy of particle accelerators).

The meter (indicator) that determines the method of counting publications is the number of scientific products, which here mean books, articles, reports, etc. Sometimes, when calculating the total volume of scientific production, these types do not differ, sometimes books, original articles, review articles, etc. are taken with different weights.

The scientometric «quotation-index» method is based on the obligatory references to the used literature in scientific publications; it is based on the scientometric indicator “the number of citations or references». At the heart of modern applications of this method is the Garfield Index - regularly published since 1964, the «Index of Scientific References», published by the Institute for Scientific Information, headed by Y. Garfield. It consists of several parts. The main part of the Index is the index of links, which allows you to determine who is citing the fixed work of a given author. Only the

surname of the first author of the work is recorded, the title of the work is not given, the title of the journal is given in an abbreviated form. The title of the work, the names and addresses of all authors can be found in the index of sources, which is the second part of the Index. The third part of the Index - the permutational subject index - allows you to find authors whose titles contain a given word. Finally, the last part of the Index contains the results of bibliometric analyzes covered by the Index of Cited and Cited Journals.

The scientometric method «content analysis» comes from the sociological content analysis of mass media. The content analysis procedure consists in reducing the text under consideration to a limited set of certain elements (words or, less often, sentences), which are then subjected to counting and analysis.

The thesaurus method is based on the method of the same name, which is widely used in the theory and practice of information retrieval. The emphasis in the thesaurus method is made on a meaningful analysis of terms for selection among publications of texts relevant to the query.

The disadvantage of these two methods is the lack of reproducibility of the calculation results, sufficient for scientometric studies. One possible way to increase the reproducibility of results is to use the slang method..

The slang method, like other scientometric methods, is based on probabilistic representations and is static. As a result of the development of «content analysis» and thesaurus methods, the slang method is also based on the tradition of statistical linguistics, which studies the frequency distributions of words and has created frequency dictionaries. The indicator in this method is not the number of «characters», as is done in content analysis, and not the number of «terms» (keywords), as is done in the thesaurus method, but simply the number of words, more precisely, dictionary words.

III. Tasks considered in scientometrics.

Scientometric analysis in sports includes a wide variety of tasks, depending on the chosen method. So, when using the statistical method, such problems are solved, for example, as the temporal dynamics of the number of discoveries, the number of journals, the number of scientists, the dynamics of co-authorship, etc. Using the method of counting the number of publications makes it possible to solve problems such as the distribution of publications by country, language, by type of publication, etc.

–When conducting scientometric research in sports, we focused on a number of problems that did not require large expenditures for their solution, on the one hand,

and would give a sufficient picture of the development of sports as a scientific direction.

–In particular, the following tasks were solved (without binding to the corresponding methods):

–Study of the dynamics of changes in the number of scientific publications on sports;

–Study of the structure of the space of scientific journals as channels for the transmission of scientific information;

–Statistical research of the language of scientific publications (slang analysis);

–Analysis of bibliographic references in scientific publications (citation analysis);

–Study of the structure and dynamics of development of invisible research teams;

–Study of the structure of scientific ties of the scientist (the scientific environment of the scientist).

This list does not exhaust all areas of research in scientometrics (in particular, the financing of the scientific direction was not at all touched upon), but it gives an idea of the position from which the study of the dynamics of sport as a scientific process was carried out.

Since the main product produced by a scientist is a publication, the analysis of the flow of publications unfolded in time is the main factor characterizing the dynamics of the development of a scientific direction [10-13]. Naturally, the arising difficulty in carrying out such an analysis is what counts as a publication. The fact is that publications differ in a number of characteristics: volume (from 1-page abstracts presented at the conference to a folio of 1000 pages of small print), place of publication (not a peer-reviewed «pocket» collection of works or a prestigious journal with an authoritative staff of reviewers). comrade), the method of distribution (reports made by the piece, preprints sent out according to the list, and a monograph published in a solid circulation and available for free sale), the number of co-authors, etc.

There are various approaches to overcoming these problems [14-20]. So, for example, a basic publication is selected (most often - a journal publication of a fixed volume) and all other publications are measured in these units. An agreement may also be made to equate one book with a certain number of reference journal publication. So, the following ratios are known: 1: 4, 1: 6, 1:18, etc.

A number of researchers propose to measure the volume of publications in printed sheets. This approach was introduced when preparing a list of printed works, where it was proposed to indicate for each publication its volume in printed sheets. However, such approaches do not completely solve the problem, and more often the number of publications is understood as the number of titles of publications. If there are

coauthors in the lists of published works, they are indicated in a column - a note, where the fact of the presence of coauthors is simply indicated (by the phrase “in coauthorship”).

The number of scientific works is a value that correlates well with the fame of the scientist, with his contribution to science. There is a significant correlation between the prestige of an institution and the number of papers it produces. Of course, it can be argued, following D. Price, that the number of publications is «a very bad scale.» «Indeed,» he further writes, «who would dare to try to balance one Einstein’s paper on the theory of relativity with at least one hundred articles by Bachelor John Doe on the elastic constants for various tree species in the forests of Lower Bazutoland, one constant per article.» To show the genius of Einstein’s article, it is necessary to publish hundreds of articles with decoding of all the details for both specialists and the general scientific community. While hundreds of bachelor’s articles cover the subject of elasticity constants are self-sufficient. As for the scientific value, it is absolutely impossible to reject these works just because they are not in demand at the moment. In the world of science, we often come across seemingly meaningless publications dealing with completely «useless research.» Examples of such works include studies of the life of insects, the languages of indigenous peoples and other similar topics.

Dynamics of growth in the number of publications.

The most famous result of research on the dynamics of the growth of the number of publications in sports is the possibility of approximating the growth curves of the number of publications by an exponential. Sometimes the sum of the exhibitors is used for this purpose. With an increase in the number of «knees» of the empirical growth curve of the number of publications, authors who do not want to abandon the language of exponentials speak of the so-called sliding exponent. It is clear that such an approximation is meaningless if we fail to establish the form of the dependence of the parameters of this moving exponent on the position of a point on the growth curve. If such a dependence is found for a given growth curve, then this will mean the approximation of this curve not by an exponential, but by a more complex dependence.

Linear approximation of empirical data on the growth of the number of publications in sports is used in studies of short time intervals. When expanding the time interval for growth curves, dependencies of the so-called logistic type are often obtained.

The scientometric indicator «number of scientific publications» has been developed more than any of the known indicators. Nevertheless, it requires further elaboration. In particular, a formalized procedure for “weighing” publications of different types and individual publications should be developed. The basis for this “weighting” can

be the rank of publications, edition or type of publication in which the publication is placed. The rank can be determined by means of quotation, sociological or any other analysis.

Prospects for the application of counting the number of publications in sports are determined by the results of pivotal studies of the number of publications as a scientometric indicator of latent variables of scientific activity. The number of publications can serve as an indicator of the recognition of a scientist, his fame, contribution to science, productivity, and the prestige of a scientific institution.

According to the basic considerations of a qualitative nature recorded in the literature, the number of publications can serve as an indicator of a scientist's elite, his activity, and intensity [21-26]. A large number of monographs in sports are associated with its richness, and the number of journal articles - with its conflicts. The value of the journal is determined by the frequency of reflection of their publications in secondary editions.

The growth rate of the number of publications is associated with the relevance of this scientific direction, in particular, sport, or with its prospects.

Based on the growth rate of the number of publications of a given research team at a given moment, correlated with the general logistic curve of their growth for this team, it is proposed to determine the phases of development of this team. Collectives that are in different phases of their development are promising to different degrees.

Stationary distributions of the number of publications in sports can also be used to identify problematic scientific areas, which are characterized by distributions that have shorter «tails» than traditional areas. In the problematic direction, publications are scattered in fewer journals than in the non-problematic.

Thus, the possibilities of using the number of publications as an indicator of scientific activity are, in principle, extensive. However, the broad practical use of the results of these studies is still a long way off, since the complete picture of correlations of the number of scientific publications has not been established either with the system of indicators or with the system of latent parameters of science. In addition, the correlations already calculated were established on the basis of Gaussian mathematical statistics, while the distributions between which these correlations were established are of a purely non-Gaussian nature. All this means that pivotal studies of the number of publications should actually be conducted anew by means of non-Gaussian mathematical statistics with a wide systematic coverage of the entire system of indicators and latent variables of science.

It should be recalled that all scientometric estimates are statistical in nature. The links between the number of publications as a scientometric indicator and the latent

variables of scientific activity, fixed by pivotal studies, are also statistical in nature. This means that, without guaranteeing the accuracy of the estimate in each specific case, the average method of counting the number of publications, when used in conjunction with other methods, gives a positive effect..

So, the first thing we have to deal with is the extreme unevenness of the number of published works; periods of recovery were interspersed with periods of decline and stagnation. Since the current scientific direction is characterized by an exponential growth in the number of publications, a study was made of the correspondence of the growth in the number of publications to the exponential law. Note that the growth in the number of articles in journals, the growth of the information array of the Web of Science and Scopus databases, and the number of specialized journals on sports and related issues had a pronounced exponential character, i.e. in general, the development of sports in the world corresponded to the development of the current direction. However, the approximation of the entire 20-year period of the life of a sport is associated with such a large scatter of data that it is not necessary to speak of an exponential law.

IV. Conclusions. In order to activate scientific research of scientists in the field of sports, it is necessary to create a number of intersectoral laboratories on the most promising scientific and technical problems for the country, including genetics and biotechnology; promising materials; creation of medicines. The choice of the scientific direction was carried out on the basis of the publication activity of Uzbek scientists.

Based on Figure 2, natural sciences account for more than 60% of publications. For example, for the period 1996-2010, the number of publications among the natural sciences amounted to 376, of which: in the field of physics and astronomy - 128, in chemistry - 110 articles, scientific publications on energy - 35, mathematical sciences - 70, the science of biochemistry, genetics and molecular biology - 33, etc.

Thus, the necessary prerequisites for further modernization of the national economy and its transition to innovative development are growing at a steady pace in the Republic of Uzbekistan.

Modern rapid socio-economic changes in society set new parameters for scientific and technological development and at the same time pose new challenges for it. Accordingly, the national system of science and technology policy should have the necessary flexibility.

The indisputable advantage of Uzbekistan is precisely the level of literacy of the population and a significant share - more than 65% - of the scientific potential of Central Asia. Considering that about 80% of them are employed in universities, the special role of higher education lies in the fact that it is this stage of education that is

the initial one in the reproduction of scientific capital for the development of innovative activities, including in the sports industry.

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