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ЭМПИРИЧЕСКОЕ ИЗМЕРЕНИЕ РОССИЙСКОЙ НАУКИ

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World science, especially in developed countries, is going to the new form of organization and assessment of scientific activity. Unfortunately, our science is lagging with assimilation of positive innovations.

Keywords: academic science, post-Soviet transformation, lagging, innovations

Social processes in Russian academic science during the post-Soviet decades
The results of sociological research[1]

Last two decades the reality in Russia clearly fits the notion of “unstable times”. The collapse of the Soviet Union (1991) has provoked serious political and socio-economic changes in all spheres of Russian life. The subject of our study was and is the **domestic academic science — the professional activity of scientists** working in the research institutes of the Russian Academy of Sciences (RAS). From 1994 to the present time our sector of Sociology of Science, which belong to Institute of the History of Science and Technology RAS, realized a monitoring of this phenomenon. Monitoring was based on regular sociological interrogations in representative groups of academic scientists and systematic analysis of data collected in these surveys. In 1990-ies the transformations in the political and socio-economic spheres were continuous. A long time academics are also expected to upgrade their sphere — science. However, during this period the State has ceased to be interested in science: funding (which has always been the only state one) declined sharply, many scientific organizations were liquidated. Academy of Sciences, as the focus of national basic research is preserved (converted from the USSR in the RAS). The scientists of academic institutions

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eked out a miserable existence and waited for state reform of science. Finally, this long-awaited reform, from which all scientists were waiting a modernization, it was held only in 2006–2008. The reform was realized, but it results have shown for scientists that not every reform have to lead to modernization.

Most scientists are unhappy with the results of reform, combined data of these years survey showed that the vast majority — 96 % of scientists (both managers and performers) — at the final stage of the reform treated it negatively. Taking rising wages as a necessary but long overdue action, almost all of them said that it will not add to their interest in the work (90 %) and did not give additional motivation to the more hard work (92 %). A large proportion of respondents (72 %) expressed irritation connected with unprofessional approach which was revealed in many concrete proposals for reform coming from the government.

Scientists were disappointed that the main, in their view, the task of reform — the *modernization* of science system — has not been implemented, and in fact, as became clear, a program for reform had not implied it. Well understanding that the impact of science depends on an adequate combination of formal institutional actions with the structures of self-organization of scientific activity, most of the scientists is left to his own opinion: for a successful science requires its true modernization, which is not reducible to an increase in salary.

Outcome of the reform did not give the significant reasons for optimism, but scientists have always reserve hope for a positive outlook. An important result of the reform was the common comprehension of the fact that the modernization will not be conducted "from above" — it must be made by those people who really need to update the organization of innovative science and research activities, i. e. by academic community itself. Initially, the activity of scientists in an attempt to achieve modernization of the national science by them own was quite high. But gradually, recognizing the complexity and dimension of this task, they moved to their ordinary daily activity, projecting "to study this issue". This situation makes very important and actual ***a study of the principal innovations typical for the world science, as well as the deep analysis of their relevant implementation in our Academy.***

* * *

Usually the science is perceived as a *subject* of innovation. Scientific research are creating the new knowledge; in the process of development (R&D) it transforms into the latest technology and then — in production. Integrally all this is innovation. From academic science which is the focus of national basic research, of course, society expects the same. But that in the innovation chain, it could be productive, it itself should be at the forefront of scientific and technological progress, updating the character of its own operations, introducing its "internal innovation". In recent years, innovative activities are carried out in all the larger scale and in different forms, respectively there are new concepts — "innovation climate" (IR), "innovative potential" (IP), etc. Our analysis has revealed the innovations, which are most important for the Russian academic science (these ones were confirmed by opinions of the majority of respondents — the leading scientists of the RAS).

They are:

1) new types of organization and evaluation of research,
2) modern forms of research funding,
3) rejuvenation of staff,
4) update the instrument base,
5) modern information and communication support (ICTs).

Apparently, the focus should be on them. The above list is built "top-down", i. e. lower in the list is an innovation, the less innovative potential. Both of these indicators (and IE, and IR) — are the integrated indicators calculated by the combination of parameters. Without going into details, we restrict our intuitive understanding of these expressions (it is enough).

Suppose that we agree with such a distribution of the importance of these innovations (there are also other ones). It is interesting to find out how scientists assess the degree of assimilation of various innovations in their institutions. To unify the interviewing we used a single "Questionnaire" on which was held for more than 20 in-depth interviews with leading scientists of natural science institutes. In particular, the researchers evaluated the IR — the level of assimilation of innovators in the academic science of the Russian "school system" — from 1 (min) to 5 (max) points.

The scientists estimated them as follows:

development of information and communication technology (ICTs) — 4.3 points;
election financing — 3.2 points,
rejuvenation rate — 2.2 points;
permanent updating of the instrument base — 2.1 points;
new kinds of organization and assessment of scientific activity — 1.2 points.

Of course, that are the *average* results, but it should be noted that the difference between estimates in different institutions was very low. If we average once more, this next average score of the innovation climate (on our scale) is 2.6 points, i. e. on school terminology — "2+". So, the most important innovation — *new forms of organization and assessment of scientific activity* advances in the weakest way. And the fact that experts at first thought the simplest (purely technological innovation) — *the development and improvement of information and communication technologies*, not only had the maximum assimilation, but also strongly supported our science in difficult times.

Sociologists implementing the project leaved traces and recorded the emergence, development and deployment of ICTs with special care. It was a real INNOVATION, which came into the national academic science before our eyes, gradually assimilated, the object of desire for ones and relentless hostility for others, a symbol of elitism, a toy and a beautiful assistant in the work! But for sociologists — a unique case-study of the dynamics of tradition and innovation, seen with their own eyes, and fixed in their own questionnaires.

The latest information and communication technologies are one of the main factors of modernization of science. And their use in the scientific community of RAS was continuously growing since the 90's. This innovation has radically expanded the professional capabilities of scientists, but unfortunately, its productivity in the science itself during long time was not confirmed in an explicit form, although usually not questioned. Studying this innovation, we carefully recorded the dynamics of indicators characterizing not only the degree of ICTs usage, but also their impact on the productivity of professional scientists.

Enough mass appeal of Russian research community to ICTs was first noticed in the test-survey of academic institutions in 1994. A year later, in survey 1995, we have already fixed the significance of this new factor, so that length of time can be considered as an initial phase of development of computer mediated telecommunications. Year after year, assimilation of innovations enlarged: a growing interest of users and intensity of use, expanded geography of contacts, and an assortment of commonly used services. By 1998, all of the leading academic institutions connected to the Internet, and the survey

of this time showed qualitative changes which the latest ICTs introduced into research activity. From a means of interpersonal communication, which were often decided by the scientific and organizational problems, there were also the most responsive source of scientific information. Exactly, *information* and *communication* compose the basis of productivity of scientist. Many new features, such as the use of international data-bases, participate in global trade networks, setting out its tasks to other people's computers, etc., etc. And these opportunities were actually used, which was clearly documented by empirical evidence.

Only one impatiently waiting result did not manifest itself. Not only in 1995 but also in 1998, data processing was not identified positive effects of ICTs on the professional productivity of scientists. Both surveys showed the same correlation: the scientists who were most actively and successfully engaged in scientific work, were also active users of ICTs, but an inverse relationship was absent — "super active" in the ICTs group was weaker for scientific achievements of other users. AND minimally active group of users of ICTs showed excellent academic results, especially for the publication indicator. All this lead to the conclusion that the active use of ICTs is rather the *consequence* of a common professional activity but not the *cause* of professional success scientists.

After 1998, no radical events in the academic system of RAS was not happening. Over time, innovation has become a familiar comfort. Everyone understood that it speeds up certain kinds of work, but sociologists trusted their data and knew, to their regret, that this innovation does ***not increase*** the productivity of scientific activity. It was unclear and provoked disturbance, so, in 2001/02, a third survey was made with special attention to this phenomenon. Apparently, the past years were the time of ripening stage for results of innovation. Data obtained in this survey were non-trivial and have revealed exactly a long-awaited law.

This survey, fixing up the three years since the previous one, has clearly demonstrated a radical change in the role of ICTs in research teams. Completely in all groups of respondents appeared stable positive correlation between the use of ICTs and professional productivity. Major users of ICTs significantly improved their productivity as the increase of number of publications and reports and participation in international grants. Extra-active ICTs team took first place and on indicators of professional performance. And previously successful team which little use ICTs significantly lost its effectiveness. So, on the basis of empirical evidence 10-year monitoring of concrete innovation, there was first shown unequivocally positive final correlation between the degree of involvement of the scientists in the ICTs and their professional success (*Mirskaya,* 2009; *Mirskaya,* 2010).

But innovations also have their own development and it is impossible to satisfy the needs of scientists in communication and information technologies once and for all. Constant updating of information and communication infrastructure of national science is necessary even in order to keep abreast of international scientific information and to maintain international contacts. Therefore, our prospects for success in the global science seriously linked to the emphasis in the near future will be on further implementation and, most importantly — the development of advanced information and communication technologies. Our complex history of this innovation has one simple conclusion: do not rush to assess the impact of innovations. Their prospects have to be carefully weighed beforehand, but then do not rush the evaluation: that is impossible to receive "all at once".

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Russian Mathematical Journals in World and National Corpora of Scientific Journals: bibliometric analysis

In memoriam of Vladimir Arnold

The present paper is devoted to a discussion of results of the bibliometric analysis of a number of mathematical journals (more than 700) and scientific fields of knowledge (more than 50) in the JCR databases for the 1998–2010 period. An attempt is made to assess Russian journals in the mathematical sciences in the world and national corporaofscientificjournalsby the impact factor Ip and the normalized impact factor K.

Keywords: bibliometric analysis, mathematical journals, Normalized Impact Factor K, Impact factor, ranking lists, ISI Web of Knowledge: Journal Citation Reports Science Edition

Introduction

Since the beginning of the 1960-ies, a new direction in the study of science has been gaining ground — the quantitative analysis of information flows (bibliometrics). (Some precedents of bibliometric studies go back to 1917). A specific feature of bibliometrics is the use of secondary information: all kinds of bibliographic indexes, abstracts, etc. The corresponding statistics are of substantial interest for the analysts of the development of science, they can help in the planning and management of science. The objects counted in bibliometrics are authors, journals, thematic groupings, organizations, words, etc. Bibliometrics is aimed at the quantitative analysis of documentary output in science as a whole or in specific fields of science. The bibliometric approach opens new vistas for the study of science, supplying it with an empirical base covering both the science's past and (which is especially important) the forefront of science in the making.