

Efficient System of Higher Education: The Role of State

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Abstract—It is proposed to define efficiency as the productivity, which means creation of the necessary and useful products of due quality in the necessary and sufficient amount, at the optimal result/cost ratio. Criteria proposed by the ministry of education and science of the Russian Federation for the estimation of the efficiency of universities are analyzed, as well as the methodological basis of the Thomson Reuters university ranking. It is noted that the efficiency of not only universities, but also the ministry can be estimated only when infrastructural and financial conditions for the efficient work of the university staff are provided and the state goals in the sphere of education are formulated. The ministry should determine the state demand in the sphere of specialist training and provide universities with everything necessary for that, while the universities should duly teach and train those specialists to be. A conclusion is made that national priorities in the field of education and science should be shifted.

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Concept of Efficiency

Before formulating the criteria for evaluating the efficiency of certain activity in a certain area, including the sphere of education, it is necessary to clearly define the subject we want to evaluate. Efficiency means productivity attained at the optimal output-to-input ratio. In this case, productivity is not just the gross output. Productivity implies the creation of a product that is necessary and useful for the society, has appropriate quality, and is produced in the required and sufficient amount.

The proposed definition can be applied to any sphere of human activity, such as, production, agriculture, or education. And here all the aspects are important. It is possible to produce a lot of something; however, if no one needs this product, what were the corresponding efforts made for? It is possible to produce something useful but of poor quality. It is possible to produce something useful of high quality but in excess or deficiency. In each case the result does not meet expectations of the society (and the state). For example, why produce screws with such a pitch that is not used anywhere? Why produce 10 million poles for high-voltage lines if only one million is needed for building new power transmission lines and upgrading the existing ones? Finally, what is the point of manufacturing such components that cannot be used

because of their defectiveness and require additional finishing?

Likewise, why produce undereducated bachelors when competent intellectual thinking specialists of broad erudition are in growing demand in national economy? What will the state do with a million lawyers if the real demand of the society is several times lower? Finally, do we need to boundlessly increase the number of managers and accountants who in the absence of stable and regular industrial or agricultural production and under conditions of the spreading financial crisis will have nothing to sell or take account of? Overproduction as well as underproduction can be harmful and even dangerous.

It should be noted that an uncontrolled increase in production cannot but lead to a crisis of overproduction, to combat which in the last half century the global financial system has chosen the last available option, namely, expanding marketing outlets. However, this path will soon come to a dead end. Indeed, advertising can ensure selling of products, manufactured in excess, for a certain period of time; however, such production only accelerates the depletion of resources and has nothing to do with saving, which has been currently declared as the main global objective. We can be no means speak about savings in electricity or any other field when

boundlessly (and for unknown reasons) building up production to increase the gross domestic product in this way. First of all, it is necessary to manufacture products that are required and sufficient for comfortable life of people. Moreover, this comfortable life should be guaranteed to the overwhelming majority, but not to selected few.

The same is true for the sphere of higher education. Here, it is also possible to rise artificially the demand for specialists in certain areas for a short period. However, the consequences will be no less catastrophic. For a certain period the human potential, which has been very irrationally used, will be exhausted. During the crisis of the 1920s–1930s people could throw tons of coffee into the ocean or extremely cheap wheat into the fire. Nowadays, there is no place for such barbarism any more. Manufacturers find much more rational ways of action: they simply send surplus of goods (mostly, of low quality) to less developed countries. However, that cannot be done with people. The population of our country is not as great and the number of well-educated people is even smaller. Even if we found some country that would need our fresh economists and lawyers (among which the level of unemployment is currently especially high), would we receive specialists that are so badly needed in other areas in return? I think the answer to this rhetorical hyperbole is obvious.

In Russia there is a great number of managers, economists, and lawyers; however, we are short of qualified specialists in industrial production and agriculture; there is lack of engineers and designers and not enough highly qualified workers. With all their knowledge and skills lawyers and managers cannot produce a single gram of food products or a single simple industrial item, without which (unlike legal assistance) people cannot live. Neither can they design and assemble even the most primitive unit, for example, a communication device, without which they themselves cannot make a single step (both in their everyday life and at work).

In Russia the number of domestic developments put into practice is progressively decreasing. The Russian industry is turning into an assembly shop for Western European and Asian motor car giants, into a field where natural resources are used without control or benefit for the society and the state, into a technological line manufacturing the cheapest and less useful (and even harmful) food products. Although

Russia is one of the world's richest countries in various natural resources, we live in general like poorest states of the South-East Asia. An obvious reason for that is the absence of the state interest in the development of the country's own production facilities that require the involvement of all the aforementioned specialists.

In order to restore the status of the leading world power Russia should make the following steps:

- in the shortest possible time to raise the prestige of teachers, scientists, and engineers, using the ideological and financial instruments of the state;

- to reconstruct (in financial and organizational terms) research institutes and engineering bureaus so that next generations of university graduates have an opportunity to work within their area of specialization and receive appropriate remuneration for their work;

- to disseminate the basic educational principles, used in classical universities and aimed at training specialists of the broadest erudition, to the maximum possible extent;

- to encourage people to acquire additional knowledge (like, for example, in Japan) not only in the sphere of their specialization; and

- to implement introduce coordinated planned organization of the work of all production facilities, engineering and design bureaus and institutes, social enterprises, and educational institutions.

In other words, it is necessary to create a state plan in the field of production and a state order that determines the number of specialists required for the optimal functioning of the entire national economy.

Efficiency of Higher Educational Institutions and Efficiency of the Government

For rational operation of higher educational institutions it is necessary to have information how many and what specialists are needed by the state or, more exactly, will be needed in approximately a decade. Moreover, due to a natural and inevitable increase in the scope of knowledge in all spheres of the human activity and the corresponding development of technology, training of specialists should not be highly specialized. To adapt to the conditions of the changing technological world it is necessary to have a broad theoretical and practical base.

Collecting and analyzing information about the development trends in all basic branches of the

industry and agriculture as well as in the sphere of engineering and technology should be a task for the Ministry of Education and Science. On the basis of these data the ministry should formulate a state demand in the field of education and control granting the demand concurrently determining the counter demand of the corresponding higher educational institutions for financial support from the state required to maintain and expand their infrastructure, upgrade the equipment, and ensure decent salaries for the teaching staff. Only when such general arrangements, ensuring that all the conditions for efficient work of the staff are created in higher educational institutions and the state goals in the field of education are defined, have been made, it is possible to start evaluating the efficiency of not only the higher educational institutions, but also the relevant ministry.

Efficient work of the ministry involves adequately determining the state demand and providing the higher educational institutions with everything they need to grant the demand. In turn, efficient work of higher educational institutions consists in the high quality training for the required number of specialists.

Speaking about the quality of specialists' training in higher educational institutions, let us turn to the second part of the above definition of efficiency, namely, the optimal output/input ratio. It is the optimal and not the maximum ratio! For example, the maximum number of students per a teacher, of course, means that the specific costs will be lower; however, the quality of training will be significantly reduced. The optimal ratio should be determined taking into account the methodological aspects of teaching different subjects, as well as the psychological characteristics of the existence and work of groups with different numbers of participants. In this situation, the main criterion of the optimal ratio should be an opportunity for the students to acquire knowledge and the main indicator should be their ability to use the acquired knowledge, verified by examinations.

The technical aspect of the teaching process (availability of computer equipment, visualization tools etc.) and the influence of the facilities of the teaching process on training efficiency is a separate issue. Of course, a specialist should know how to use modern computational and information devices; however, even in the absence of such equipment, which is quite possible in emergency situations, he or she should be able to obtain the required result, albeit approximate, but nevertheless quite reliable. Another

point that seems useful is detailed psychological analysis of the ways of presenting information that provide the best result, namely a live presentation or a slide show, and the ways that ensure better assimilation of the material, for example, reading of a conventional or an electronic book, working at a usual or interactive whiteboard etc. The results of such analysis should form the basis for general recommendations on organization of the educational process. And this work also has to be performed by the ministry, whereas teachers, taking into account these general recommendations, can and have to develop their own, most rational methods and approaches, which will be obviously different for different subjects taught in different social groups.

A natural method to control training efficiency is writing an original qualifying (mid-term) paper or passing examination, which cannot be limited to reproduction of memorized facts or choice of the correct option from the list. It is necessary to include a creative component, which can be accomplished to the fullest extent in a course work or an oral examination when the dialogue between the student and the teacher is aimed at revealing the degree to which the student comprehends the subject and is able to find, if not the final solution, at least, a way to solve the suggested problem that is not limited to a simple combination of well-known statements or facts but requires critical creative analysis.

Indicators of Efficiency of Higher Educational Institutions Proposed by the Ministry of Education and Science

Taking into account the above discussion, let us analyze the criteria for evaluation of the efficiency of higher educational institutions proposed by the Ministry of Education and Science in the fall of 2012.

(1) Educational level: an average score for the Unified State Exam (USE) among school graduates enrolled as full-time students on the basis of their USE results in bachelor or specialist programs funded from the state budget or with the corresponding training costs paid by physical or legal bodies (weighted average value).

(2) Research activities: a volume of research and engineering work scaled against research and teaching staff (RTS) numbers.

(3) International activities: the number of foreign students who have completed training within the

framework of major educational programs of higher professional education among all graduates (relative number).

(4) Financial and economic activities: revenues of the higher educational institution from all sources scaled against RTS numbers.

(5) Infrastructure: the total area of educational and laboratory buildings calculated per a student (relative value) operated by the higher educational institution based on the right of ownership or operational management.

All the listed criteria are gross indicators, which are similar to an average temperature of patients in one hospital room. In this case, the optimal average value can mean that half of the patients have a fever and delirium and the residual are already dead; however, the statistics indicates that everything is ok. Similar situation is found in our higher educational institutions. Even within the boundaries of one university the situation at different faculties can be drastically different. Some faculties have an opportunity to attract money from sponsors or interested production companies, whereas the work of other faculties is mostly of a theoretical fundamental character. Who should provide funding for the latter? Obviously, it is a duty of the state. However, the indicators proposed do not separate direct budget funding allocated to a higher educational institution and each faculty in particular from non-budgetary revenues of this institution. Hence, there is no reliable information about the level of financial support received by higher educational institutions. Moreover, in case all average indicators look normal, the state, allegedly, has nothing to worry about.

Another characteristic feature of the above list of criteria is its ultimate formalism and the absence of any real interest in the quality of education. Even researchers and teachers of higher educational institutions are simply referred to as RTS members. They are not viewed as people with certain knowledge and experience, but as statistical units comparable to square meters of the area or rubles earned by higher educational institutions as a result of their financial and economic activity. No one is interested in the quality of specialists' training or their future employment.

Let us address the proposed indicators one by one. In this context, infrastructure of higher educational institutions is understood as their total area. However, it has nothing to do with infrastructure! Infrastructure

of higher educational institutions implies duly equipped rooms for lectures and seminars as well as special rooms for laboratory works. Infrastructure includes everything that is used to create conditions for efficient development and functioning of higher educational institutions. And it has to be formed within the framework of state programs.

Scientific and research activities are characterized only by volume (in monetary terms) of scientific, research, and engineering works scaled against staff numbers. However, it cannot serve as an indicator of scientific and research activities. Such activities should be judged not from the grant volumes, but the achieved results. And the results should include academic (candidate and doctoral) degrees awarded to researchers, works published in scientific journals, and other achievements acknowledged by the international scientific community. There is not a single word about that.

Another indicator of efficiency of higher educational institutions, which is the most important in essence, is their educational activities. It should include both characteristics of the higher educational institution teaching staff (number of academics, their qualification, work experience, and academic degrees and titles) and successes in students' training, expressed as the number of trained specialists, post-graduate students, candidates who have defended their PhD theses, and a relative number of graduates who have been employed according to their specialization. However, neither of the above is mentioned. According to the ministry, the performance indicator of educational activities is an average score for the Unified State Exam among the entrants enrolled in the higher educational institution. But that is absurd. This average score only characterizes the level of school graduates' training, i.e. the work of secondary school teachers in the country. How is that connected to the work of higher educational institutions? Such an approach is understandable nevertheless. How can the level of higher school graduates be evaluated when the majority of them cannot find a job according to their specialization in Russia due to insufficient state funding for scientific and research activities and the absence of interest in the results of not only fundamental research works, but also applied developments? As a consequence, fresh specialists either work outside the boundaries of their specialty or leave Russia for other countries where the state attitude to science and education is greatly different from the current Russian approach. Therefore, an additional

criterion for evaluating the efficiency of higher educational institutions proposed in February of 2013, namely, the employment rate among graduates of higher educational institutions, makes no sense in our current situation. First, it is necessary to create working places with adequate working conditions and only after that it will be possible to talk about the employment rate.

So, what have we come to? We have come to the fact that speaking about efficiency of higher educational institutions the state represented by the Ministry of Education and Science is not at all interested in the quality of work of higher educational institutions, the quality of specialists' training, or the quality of research works carried out in higher educational institutions. The latter are not mentioned at all, which once again reflects the currently imposed concept, according to which higher educational institutions should not carry out any research at all. Such works should be carried out by corresponding institutes with which higher educational institutions can cooperate. Such an approach fundamentally contradicts the basic principles for existence and development of universities accepted in the Soviet Union and advanced develop countries of Europe and America.

In connection with the last remark, it makes sense to consider the criteria used in these countries in annual university rankings; all the more so as another task set by the Government to the Ministry of Education and Science is to ensure the leading positions of Russian higher educational institutions in these rankings.

The World University Rankings, Powered by Thomson Reuters

Let us consider the methodological basis for the world university rankings proposed by Thomson Reuters. This ranking system is not chosen randomly. Apart from the fact that its results are considered weighty and acknowledged by various structures all over the world, this system is connected with Web of Science, a database of scientific publications, which is accepted in Russia as one of the main tools to evaluate personal citation indices of scientists.

This ranking system is based on 13 performance indicators grouped into five areas:

Teaching: the learning environment (worth 30% of the overall ranking score);

Research: volume, income and reputation (worth 30%);

Citations: research influence (worth 30%);

Industry income: innovation (worth 2.5%); and

International outlook: staff, students, and research (worth 7.5%).

What characteristics or indicators are included in each group?

The international outlook category is made up of three indicators.

The ability of a university to attract undergraduates and postgraduates from other countries is key to its success on the world stage. Formally, this factor is measured by the ratio of international to domestic students and is worth 2.5% of the overall score.

The number of invited foreign scientists is considered equally important. Therefore, another indicator is a similar ratio of international to domestic staff employed by the higher educational institution; this factor is also worth 2.5%.

In the third international indicator (which is also worth 2.5%), the proportion of a university's total research journal publications that have at least one international co-author is calculated for a five-year period, taking into account the academic ranking of the corresponding journals.

The research category (volume, income, and reputation) is also made up of three indicators.

The most prominent indicator, given a weighting of 18%, looks at a university's reputation for research excellence among its peers, which is evaluated based on an annual academic reputation survey.

Another factor in this category is university research income scaled against staff numbers and normalized for purchasing-power parity of the national currency, also taking into account relative sizes of grants allocated for research works in corresponding areas (natural and social sciences). This is a controversial indicator because, among other things, it can be influenced by national policy and economic circumstances. Nevertheless, as income is crucial to the development of world-class research and because, as a rule, financial support is subject to competition and peer expert evaluation, this factor is given a significant weighting of 6%.

Another indicator that is worth 6% of the total score is research volume (output) scaled against staff numbers. It is calculated based on the number of papers published in the academic journals indexed by Web of Science, normalized for subject of research.

Citations (research influence) is the single most influential indicator (weighted at 30% of the overall score) reflecting the role of universities in creating and spreading new knowledge and ideas. It is counted how many times a work published by the university staff is cited by researchers from other higher educational institutions all over the world. The data are fully normalized to reflect variations in citation volume between different subject areas. For example, in the course of preparation of the 2012–2013 University Rankings more than 50 million citations to 6 million journal articles, published in five years (2006–2011), were examined. The data were drawn from the 12,000 academic journals indexed by Thomson Reuters' Web of Science. Based on this factor it is possible to judge how much each university is contributing to the sum of human knowledge, what higher educational institutions carry out research works in fundamentally new areas or applying fundamentally new approaches that are picked up and built on by other scholars and are shared around the global scientific community to push further the boundaries of our collective understanding, irrespective of discipline.

The performance indicator called "industry income" (innovation) reflects a contribution of university research in rationalization of production, consulting activities, and introduction of inventions. This factor is based on how much research income an institution earns from industry, scaled against the number of academic staff it employs. It suggests the extent to which businesses are willing to pay for research and a university's ability to attract funding from commercial structures. This factor is weighted at 2.5% of the total score.

Teaching (the learning environment) category employs five performance indicators reflecting the quality of the educational process.

The dominant indicator (worth 15%) is based on the results of a wide academic reputation survey conducted by Thomson Reuters taking into account both research and teaching aspects.

The second indicator is a staff-to-student ratio (an institution's total number of undergraduates and postgraduates), which is considered a rather crude but

adequate characteristic of the teaching quality (4.5%). It is assumed that in higher educational institutions where there is a healthy ratio of students to staff, the former will get the personal attention they require.

The third indicator (2.25%) examines the ratio of candidate's (doctoral) to bachelor's degrees awarded by each institution. It is assumed that educational programs in higher educational institutions with a high proportion of research students are broader and deeper. And the existence of an active postgraduate community indicates that the educational process is associated with a wide range of research works, valued by undergraduates and postgraduates alike.

The fourth indicator (6%) is the number of candidate's (doctoral) degrees awarded by a university, scaled against its size as measured by the number of academic staff it employs. A high proportion of postgraduate research students does not only reflect an ability of an institution to nurture the next generation of researchers, but also demonstrates to what extent further training is attractive to graduates and is viewed by them as useful and promising.

And, finally, the fifth indicator in this category (2.25%) is a simple measure of institutional income scaled against academic staff numbers, adjusted for purchasing-power parity of the national currency. This indicator reflects the level of infrastructure and facilities available to students and staff.

As we can see, this approach to university rankings is significantly more well thought out and balanced (under conditions of the established European and U.S. practice). Of course, the weight of subjective assessments in this system is very high, as the results of reputation surveys account for 33% of the total score. However, the remaining 67% are mostly focused not on the financial component (weighted at 10.75%), but on the level and qualifications of the scientific community of a higher educational institution, which brings up specialists from undergraduates and postgraduates, and on the quality and quantity of trained specialists.

In this context, the research component of university's activities turns out to be very significant. It is reflected not only in the number and rate of citations of works published by staff members of a higher educational institution (unfortunately, in the last decades this indicator, applied to recent works, has increasingly reflected the current situation and the

degree of formation of scientific communities, in which it is normal to cite works of other authors as a kind of recognition of the fact that they also carry out research in the given area), but also in the number of candidates of science trained by a higher educational institution (scaled against the total number of students and staff members of the university). Research work is a very important component of activities of higher educational institutions. Education does not stop even at a stage when a diploma of higher education is received, it goes on further. Now, people have realized that the task of universities is not limited to training of specialists. At the current stage of development of science and technology candidates of science (philosophy doctors), i.e. independent researchers, are needed.

Turning back to the problems of funding, it should be noted that an ability of a higher educational institution to implement its own developments in the techno-logical sphere (the weight of which is 2.5-fold lower as compared to the number of candidates of science trained by a higher educational institution calculated per a staff member) depends not only on the level of research works, but also on willingness of commercial enterprises to provide funding for such works and to use their results in practice, which in our country is currently more an exception than a rule. In this context, state funding, including both direct budget allocations and means from various funds distributed among universities in the form of target grants, is weighted significantly higher in the total score of a higher educational institution.

What actions should be taken to significantly improve the ranking positions of Russian higher educational institutions? It should be noted that it should not be an end in itself. The main task is to increase the level and prestige of higher education in Russia, whereas higher scores are a consequence, both pleasant and beneficial for the state.

Ways to Increase Efficiency of Russian Higher Educational Institutions

The first and most important is to create conditions and only after that it will be possible to ask for returns. In the absence of a normal resource base (infrastructure) and sufficient funding for works no significant results can be achieved in universities. In this context, funding means not only adequate financial rewards to staff members, which should be calculated not as the total aggregate budget of a higher educational institution divided by the number of its

staff members (the resulting figures do not reflect reality), but as a clearly defined state-guaranteed salary, which can be supplemented with payments from grants, contracts, or other sources. An equally important component is represented by budgeted funds covering business trip expenses (which will create equal opportunities for researchers from different regions and higher educational institutions to participate in scientific conferences both in Russia and abroad), publication of scientific works, attraction of foreign specialists, and creation of temporary jobs for undergraduates and postgraduates from other educational institutions, including foreign universities, who are invited for probation.

Formally, the international activity of Russian higher educational institutions has recently increased. However, it is a one-way movement, as our students go abroad (to Europe or the United States, or sometimes to Asia) for probation, staying there from two months to two years. Then they come back to Russia to defend their diploma works, after which these fresh specialists leave Russia again in order to continue their education as postgraduate students in foreign higher educational institutions (often choosing the institutions where they have worked during the probation period). Another logical step for them to make is to get involved in research or teaching work in Europe or the United States. Our graduates are not to blame for such a choice.

What can Russia offer them? It is a salary at the level of a shopping trolley collector or a street sweeper; the absence of or at best problems with acquisition of equipment and reagents necessary for their work. In very rare cases, it is paid accommodation. The result is obvious; in this situation, people either go into business or go abroad where conditions are a lot better. Thus, people who stay in Russian higher educational institutions and research institutes are either enthusiasts or mediocrities, or those who have understood how to make money on science in the current situation, without carrying out any serious research.

How in this situation can we want to become a leading scientific and technological power with a high level of culture and education among the population?!

If we do want to have a future for our national science and to play a prominent role in the international arena, we have to create such conditions that not only our own fresh specialists are eager to stay

in Russia and be employed by our universities, research institutes, or design bureaus, but also foreign undergraduates and postgraduates consider it prestigious to come to study in Russian higher educational institutions.

Instead of that, the Ministry of Education and Science suggests we should invite foreign specialists (as almost the main way to increase efficiency of Russian higher educational institutions). However, it is nothing more than a PR move in modern understanding of this term, i.e. it is an action aimed to create a certain impression, but not to achieve a real result. A cost-conscious owner will not constantly hire expensive temporary workers, who cannot be relied upon, as with the appearance of a more attractive alternative they will simply prefer to change their job. A wise owner who thinks about the future will find a possibility to train specialists who will work not until they are offered better conditions but because they (as permanent residents of the region and co-owners of the production) are interested in the development and prosperity of this region. No one will look after the temporary rented accommodation in the same way as the own apartment or house!

So, why instead of making the citizens of the country its owners, interested in the country's development, the state is doing everything to instill in them the psychology of temporary workers, for whom the main task is not to organize and improve life, but by any means to get as much as possible for themselves while they can? It is a road to nowhere!

With such a policy no financial assets invested in production or re-equipment will give the desired result. No one is interested in it.

Such an interest arises when citizens feel a part of a single whole, of a state in which everyone can work according to natural inclinations, whereas the state ensures decent salaries and creates conditions for a comfortable life, education, medical assistance etc.

A country proclaiming freedom as one of its main values, in which freedom is understood as the absence of the citizens' obligations to other members of the society and the state as a whole and as the absence of the state obligations to all its citizens, cannot become really powerful or attractive to people.

For this end, it is necessary to fundamentally change the national priorities in the sphere of education and science. Moreover, it is necessary to change the state ideology in general. The main human values are not material, but spiritual and intellectual. The latter also have material embodiments. Scientific discoveries and engineering developments create a basis for new technologies. Musical works, paintings, sculptural works, architectural masterpieces, as well as poetic, prosaic, and philosophical works enrich people both spiritually and intellectually; whereas a craving for material riches is a road to nowhere, self-destruction of the humanity. And if our state does not understand this, it will vanish like many once-great empires which lost a spiritual component of their development.