EXPERT-ANALYTICAL SYSTEM ASSESSING INSTITUTIONAL EFFECTIVENESS AIMED AT STRATEGIC MANAGEMENT UPGRADE

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Abstract

The article describes the development of a tool for strategic analysis for performance management of the university. The theoretical approach and practical tool for the development of inter-related mathematic models is considered, the tool allows projecting long-term dynamics of integral university performance key indicators which are the base for evaluation of the university as part of the Ministry of Education of Russia "monitoring of the educational institutions of higher education effectiveness". The implementation of suggested approach as an information system would allow higher educational institutions to carry self-assessment including activity and place evaluation in the ranking, and to correct the development trajectory; to perform scientifically-based administrative decisions on advancing any institution-competitor.

Keywords: strategic management, long-term projection, mathematical modeling, performance indexes, higher education.

1 INTRODUCTION

The institutional research is becoming increasingly crucial in terms of higher educational institutions, subjects for education services, acting like competitions. Such research contributes to strategic planning and data support for decision-making, development trends choosing, institutional design, strategic management, international cooperation management.

Information about the most credible scenarios of development of events would allow to accept corresponding administrative decisions in advance, improving a situation in institution of higher education and around him, to co-ordinate management of university, prevent the origin of crisis situations beforehand paying attention to weak points.

For scientifically-based decision-making in the field of higher educational institution' strategic management, it is highly necessary to elaborate and create an expert-analytical system dealing with long-term projection of institutional effectiveness and external environments fluctuations.

Dynamics projection of higher educational institutions development is the basis for internal and external ranking, development of trend analysis of the leading educational institutions in Russia and abroad, recommendations elaboration as well as national institutions compliance with international rankings. Quality projection of higher educational institutions functioning is one of the most topical trends in international economic science, since it helps to rank institutions' beforehand, and correspondingly, assess education quality as well as graduates' successful employability.

2 THE EXPERIENCE OF RUSSIAN AND FOREIGN UNIVERSITIES

Best foreign practice in institutional research centers and universities of the USA, Netherlands, Germany, Great Britain and other countries proves the necessity of scientifically-based decision-making for strategic planning.

For example, Pratt Institute (New York, U.S.A), the mission of the department is to provide the data necessary for decision-making by the administration of the university to plan and make research in the academic programs of educational policy and the environment in which the institution operates.

University of Twente (Enschede (Netherlands)), the overarching theme of their research programme for the coming years activities addresses the dynamics of the 'Transformation of Higher Education and Research in the Knowledge Society'. This theme stresses the ongoing reformulation of the function of higher education and research to play an important role in strengthening modern societies' innovative capacities. All basic functions - research, teaching, scholarship and the 'third mission' – are subjected to revisions in both their objectives and in the conditions under which they are carried out. Universities

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and colleges find themselves in a changing environment with sometimes competing claims from governments, markets, interest groups and stakeholders. In this highly dynamic context, politicians, institutional decision-makers, students, academics and other stakeholders raise fundamental questions about the further development of higher education.

Center of international competitiveness of higher education HSE (Moscow (Russia)) has been studying, developing and improving approaches to the management of the system of vocational education [1,2]. The main mission of the center is to promote the development of vocational education in Russia through the implementation of research and consulting projects for government and non-governmental organizations, agencies, enterprises and other legal entities and individuals.

3 EFFICIENCY MONITORING OF HIGHER EDUCATIONAL ORGANIZATIONS

The certain knowledge of the situation in the future is an essential condition for improving the quality of managerial decisions affecting the future of the university. It can only provide scientifically-based forecasting changes of integral indicators of the university and the environment. In this connection, the most relevant is the development and establishment of an appropriate tool for strategic analysis to perform the functions of monitoring, analysis and projection of performance of universities under the jurisdiction of the Ministry of Education of Russia. Therefore, one of the first tasks is to collect and monitor data needed for the calculation of performance indicators.

Since 2012, the Ministry of Education and Science of the Russian Federation holds "efficiency monitoring of higher educational organizations".

Monitoring is a systematic, standardized observation of education and the dynamics of changes in the results, conditions, educational activities, a contingent of students, academic and extra-curricular achievements of students, graduates of the professional achievements of organizations engaged in educational activities. [3]

The aim of efficiency monitoring is to develop statistical and analytical materials based on the information about the educational organizations [4].

Monitoring objects are educational institutions of higher education of the Russian Federation (universities and branches). Evaluation of the branch is held separately from the main university.

During monitoring, universities and branches with specific activities are selected, namely, military educational organizations, medical educational organization, agricultural sector educational organizations, creative educational organization, sports educational organizations and educational organization of the transport field.

Indicators for assessing the effectiveness of universities and branches and their threshold values are determined and approved by the Russian Ministry of Education. There is an approved by the Ministry of Education of the Russian Federation consistent method of calculating the performance indicators for all higher education institutions. In accordance with the methodology, the calculation of performance indicators of the university depends, in turn, from the internal quantitative indicators of the following groups: research staff, the material and technical base; the undergraduate and graduate students, the results of scientific and financial activities, etc.

At the moment, as a part of the "efficiency monitoring of higher educational organizations", the institutions of higher education are evaluated by the external environment in the form of the Russian Ministry with the following integral indicators [4]:

1. Educational Activities

The essence of the index: the average score of the unified state examination of students admitted by the results of the exam to study full-time at the expense of the respective budgets of the budget system of the Russian Federation and with payment of the training cost by individuals and legal entities.

Unit: points.

Method of calculation: the ratio of the average unified state examination scores of students enrolled to study full-time on the results of the exam, or the results of the exam and additional tests, except those taken on the results of target enrollment, in all areas and specializations of bachelor programs and specializations, multiplied by the number of students enrolled in the respective fields and professions bachelor programs and specializations, to the total number of such students.

2. Research and development

The essence of the index: Research and Development (R&D) spending per number of research and teaching stuff.

Unit: thousands rubles.

Method of calculation: the ratio of the total amount of the research and development to the number of research and teaching staff.

3. International Activities

The essence of the index: the proportion of the foreign students' number studying in the higher education institutions, the total number of students (reported contingent)).

Unit: percent (%).

Method of calculation: the ratio of the reported contingent of students - foreign nationals, to the reported contingent of students (excluding students of the specializations, where the admission of foreign students is not provided).

4. Financial and economic activity

The essence of the index: income of the university from all sources per research and teaching staff.

Unit: thousands rubles

Method of calculation: the ratio of the amount of institution funds received from the budget and extra-budgetary sources, excluding equity to the number of research and teaching staff.

5. Infrastructure

The essence of the index: the total area of teaching and research facilities per student (reported contingent) owned by university and assigned to the university for the operational management and gratuitous use.

Unit: square meters

Method of calculation: the ratio of the total area of teaching and laboratory facilities owned by university and assigned to the university for the operational management, as well as transferred by the federal (regional, municipal) bodies of executive authorities in the gratuitous use of a number of given number of students.

6. Employment (for universities)

The essence of the index: the proportion of the graduates enrolled in full-time education, who had not applied to the employment services to assist in finding employment during the first year after graduating from high school, in the total number of graduates.

Unit: percent (%).

Method of calculation: the ratio of the number of graduates enrolled in full-time education that had not applied to the employment services to assist in finding employment during the first year after graduating from high school, as well as of the number of employed who applied to the employment services to the total number of graduates from full-time education, expressed as a percentage.

7. Number of students (for branches)

The essence of the index: reported contingent of students.

Unit: Unit.

Method of calculation: the number of the reported contingent of students enrolled in bachelor, and specializations and master programs.

Information necessary for the calculation of these indicators universities provide during the filling of statistic forms "N Higher Education-1 "Information on educational institutions implementing programs of higher education" and N Higher Education -2 "Information on logistical and information base, financial and economic activities of the educational institution implementing programs of higher education. "The data contained in the Form "N Higher Education -1", are used in the calculation of the three indicators (educational activities, international activities and an additional indicator), the form data "N Higher Education -2" are also involved in the calculation of the three measures (research and

development activities, the financial and economic activities and infrastructure). The indicator "employment" is calculated on the data provided by the Ministry of Labour and Social Protection of the Russian Federation.

How is threshold performance index set? Since 2014 universities and branches that were involved in the monitoring were divided on territorial criteria into four groups. The first group included all universities and branches in Moscow, the second - in St. Petersburg, in the third group - universities and branches of 17 subjects of the Russian Federation and the fourth - universities and branches of the remaining 66 subjects, and the division of the latter two groups was held depending on the financial and economic situation in the region. Universities in the regions with better economic situation were placed in the third group, and the rest - in the fourth. It was decided to establish uniform threshold performance indexes that characterize the educational, scientific, international, financial and economic activities, infrastructure and an additional indicator for universities and branches of each group. As the threshold values for monitoring the effectiveness were adopted the median values in their respective groups. [3] Formerly (until 2014) the division took place in two groups. The first group consisted of all the parent organizations, the second - the branches. There were established their own threshold performance indexes for each group, as well as the number of indicators that were required to pass.

According to the results of the monitoring, the group of effective educational institutions and branches is formed. The institution or branch is considered effective if it achieved the threshold values by the number of indicators, which was approved by the Ministry of Education and Science of the Russian Federation. Decision criteria were applied equally to educational institutions and branches as having specific activities, and not having it.

4 THE APPROACHES AND METHODS OF MODELING ACTIVITIES OF THE UNIVERSITY

The methodology for the above-mentioned goals is based upon 2 approaches combination – systemic and informational. In terms of systemic approach both external and internal factors influencing negatively indicator values are exposed; a number of administrative decisions are elaborated for this problem elimination. Informational approach is dealing with both statistic data collection and procession for projection as well as in tool-kit development and creation for the adoption of science-based solutions in the form of a set of interrelated economic and mathematical models.

The main idea is to co-simulation of the three areas of activity related to the organization of higher education: simulation of the basic structural units of the university; modeling of integrated indicators of the university; modeling of the environment of the university and drawing ratings. The proposed three-tier examination is recognized as the most optimal from a systematical point of view. The solution of such a complicated and non-trivial task is impossible to carry out outside the systemic paradigm that combines modern methods of qualitative analysis and quantitative modeling of complex systems. The qualitative approach is used to build adequate structural and functional model of the university; in the assessment of global educational trends, trends in the development of economy and society; predicting the key turning points and events in the actual areas; creating a list of the most important and integral indicators of the order parameters of economic and mathematical models; assessing the prospects of development of the university; formation scenarios consequences of managerial decisions.

The quantitative approach provides: modeling needs of employers for specialists of various levels of education and occupations / professions; modeling competencies demanded by employers; modeling of demographic flows of entrants; flow modeling of educational and labor migration; modeling of the labor market (employment, demand, supply, employment, unemployment, etc.); modeling of integrated performance of higher education institutions (receptions, issues, contingent financing); modeling and performance evaluation ratings of the quality of graduates of vocational education institutions; system-dynamic and integral modeling of the structural-functional model of the university.

5 PROJECTION OF INTERNAL QUANTITATIVE INDICATORS OF UNIVERSITIES

In order to project performance indexes of the university or a branch, there is a need of forecast values that affect internal quantitative indicators that are used in the calculation.

The forecasted number of students enrolled for the first year, as well as the number of enrolled students of institutions of all levels of professional education for the period up to 2020 can be obtained using the model described in [6, 7]. Flows of entering persons are recorded as balance equations based on the law of conservation of their numbers. The mathematical model consists of three parts: modeling of admissions to educational institutions of vocational education, the modeling number of graduates and simulation of the number of enrolled students. Such a model is additive and can adequately describe the collective behavior of students. In [8, 9] the interregional migration of graduates of 11-grade schools, associated with the acquisition of higher education. Regions that are major educational centers are highlighted. Measure of the attractiveness of the region's education, which influences the migration and the factors on which it depends is introduced.

Projection of the size and structure of the university faculty can be done using models and methods specified in [10-12]. In [11,12], a mathematical model based on a system of difference equations with discrete time sampling, describing the motion of highly qualified personnel within the institution. The coefficients of the block matrix of the state space of the system set the transition probabilities from one category of academic staff (not having a degree, PhD, Doctor of Science) to another, depending on the age of the employee. The results of this study can be used to predict the population dynamics of the relevant categories of academic staff which will use it to build a threshold assessment of performance indicators. Approach [10] allows the management of the university to implement sound policies in the field of performance management dissertation councils and make recommendations in the formation of plans for admission to graduate and doctoral programs in order to create the optimal structure of academic staff.

Analysis of existing monitoring systems of graduates' employment is given in [13]. Assessment of the quality of graduates of vocational education institutions using a systematic approach, which is expressed in the evaluation process as a norm (traditional indicators characterizing the activity of universities) and norms result of educational institutions (the effectiveness of employment of graduates) [14,15].

Forecasting of the number of students in Russian universities can be carried out based on the models and methods specified in [8, 16], in which the dynamics of forecasting the number of students in higher educational institutions of Russia from the point of view of the behavior of the explanatory factors is calculated.

Areas of the premises owned by or in the operational management and the number of foreign students enrolled at the university are few variable values, so they can be predicted by methods of trends extrapolation. There is an increase in the volume of R&D funding, for which predicted values can also be obtained by the extrapolation methods. In the construction of predictive models of indicators of financial and economic activities, where an important role is played by government funding, it is necessary, first of all, to track changes in the regulatory framework. For example, the introduction of per capita financing will facilitate forecasting performance of this group [17].

The projection of the value of the average score of the exam received the first course is possible, with the forecast for the number of first-year students. On the one hand, on what would be the value of the exam passing score depends on how many students will be enrolled in the first year, and as a consequence, the number of students of the university as a whole and its financing. On the other hand, the predictive values of the number of first-year students on the basis of the admission quotas in university obtained [18, 19]. Thus, the number of students enrolled for the first year can be represented as a function of number of arguments which have an average score of the exam. Keeping this in mind, the average score of the exam is determined by solving the inverse problem.

6 CONCLUSION

Information on the values of the targets would be highly demand by university management, as well as by federal and regional authorities, labor market actors and employers in the region, who are the consumers of college graduates as the labor force.

Scenarios of key performance indicators of universities, obtained this way, would allow universities to practice self-assessment, including both its activity and place evaluation in the ranking, the development trajectory correction, and scientifically-based administrative decisions performing on advancing any institution-competitor.

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