Integration of Effectiveness and Efficiency Indicators of State Support for Projects and Programmes for the Development of Higher Education in Russia

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Due to today's scarcity of financial resources, Russia's policy in higher education is oriented on the model of result-based funding of universities, which relies on the methodology of program-targeted and project-based financing. In this policy, the key issue becomes not so much the scientific and methodological foundation for the sufficient level of funding for university development programs and projects, but rather the optimization of the balance between the results achieved and the resources spent on them, considering the factors necessitating adjustments and transformation of the financial models of state support for universities. In this context, the paper aims to determine the degree of correlation of meso- and internal environment factors with the amount and accessibility of state support for Russian universities.

Keywords: project and program-based financing of universities, clustering of factors, effectiveness indicators, financial support efficiency indicators

1. Introduction[1]

At present, Russia takes 35th place in the Ranking of National Higher Education Systems. To compare, the USA is in 1st place and Germany occupies 16th place. At first glance, one of the main obstacles preventing most Russian universities from becoming the drivers of innovative development and digitalization of the economy is insufficient financing of education. Same as in other countries, the key source of funding for universities in Russia is the federal budget. According to the Organization for Economic Co-operation and Development (OECD), the share of public funds invested in higher education (HE) in Russia was 66.5% in 2018, while the average for OECD countries was about 70% (OECD, 2018; Skillbox, 2021). In the same year, the Russian government was spending nine thousand dollars on each university student, the OECD average being almost two times higher (17 thousand dollars) (Skillbox, 2021). Despite the fact that in absolute terms, funding of HE in Russia in 2018 increased relative to 2017 by 43.2 billion rubles (or

[1] Funding: The study was funded by the Federal State Budgetary Educational Institution of Higher Professional Education "Plekhanov Russian University of Economics".

8.4%), spending per student was higher in 2017 and amounted to 9.5 thousand dollars (the OECD average at the time being 16.5 thousand dollars) (Gokhberg et al., 2020). In our view, the problem lies not so much in the volume of funding for universities, as in the lack of a systemic approach to determining the degree of dependence of the results and efficiency of financial support for university development projects and programs on the complexity of internal and external environment factors and their operation. Solution of the identified problem requires the selection of methodological tools to assess the influence of the system of internal and external factors on the indicators of efficiency and effectiveness of development programs for Russian universities. The established goal presupposes the following research objectives: to assess the degree of elaboration of the research problem in the scientific literature; to conduct a retrospective analysis of the volume of funding for development programs and projects for Russian universities adopted for the period from 2006 to 2030; to assess the actual attainment of the effectiveness indicators of state support for academic excellence programs for Russian universities (on the example of Project "5–100"); to describe the system of factors affecting the efficiency and effectiveness indicators of project-based university funding; to develop a conceptual model for assessing the efficiency and effectiveness of state support for university development projects and programs and the algorithm of its implementation.

2. Literature Review

A comparative analysis of financial resources of education systems in OECD countries and the Russian Federation conducted by Semeko (2019) shows a number of major differences in the volume of financial resources and their dynamics. Specifically, Russia is falling behind both in the share of spending on education in the GDP and in terms of state contribution to this indicator. The universal opinion of researchers is that the decisive role in the accessibility and quality of education is played not by the sheer amount of funding, but by the areas of its expenditure and the efficiency of its use (Agranovich, Ermachkova & Seliverstova, 2019). Starting from the middle of the 20th century, the problem of the efficiency of public expenditures within the general theory of public expenditure management was investigated by Russian (Petrakov, 1976) and foreign (Hatry, 2006) scholars. The relationship between economic growth and the volume of investment in the development of human capital is justified in detail by Schultz (1961) and Becker (2009). A number of Russian economists (Kharitonenko &

Balynin, 2019; Chernova et al., 2017) exploring the problems of budget expenditure effectiveness specifically in HE and science based on European experience and Russian practice identify the three most relevant university funding mechanisms: funding by formula, funding by results, and negotiation funding (Chernova et al., 2017). The result-based funding model, which is prioritized by current Russian state policy in HE, is found to be the riskiest not only due to the complexity and labour intensity of determining the adequacy of financial resources to achieve the required qualitative and quantitative effectiveness indicators, but also because of a multitude of factors affecting these indicators in various ways. Predictions of global shifts in the mechanisms of funding for educational organizations, the discovery of new approaches to the methodology of human capital development, and detection of the actualizing financial models of state support for education are enabled by Rubinstein's theory of patronised goods in care (Rubinstein, 2011), and the theory of efficient budget management relying on Bandura's managerial approach (Bandura, 1977) to public finance management and neoliberal management in HE (Jarvis, 2014).

The program-targeted and project-based principles of financial management examined in the theory of efficient budget management and the knowledge economy suggest the need for legislative innovations to promote the development of project-based funding tools in virtually all sectors of the economy, including HE (Yastrebova & Bogacheva, 2014; Shmakova, 2021).Based on a logical analysis of the structure, indicators, and indices of the effectiveness of state programs implemented in Russian science and education, Russian researcher Roy concludes that "the program-targeted approach allows not only to transition from individual programs and stand-alone projects to an integral and interrelated structure of those, but to establish their association with the overall strategy for the development of education and science" (Roy, 2021). More in-depth research (Makarov & Spesivtsev, 2017) allows for determining the key socio-economic indicators of the efficiency and effectiveness of project funding in education. The importance and feasibility of their use are also supported by the practice of competitive distribution of financial resources among educational institutions, i.e., as part of various academic excellence programs. In this, the problem of correlation between the results achieved and the resources spent on their achievement becomes the most important factor.

On the whole, the review of scientific research on the problem of state support in program-targeted and project-based funding for universities reveals that in spite of all the in-depth and informative studies of the issues of funding for Russian HE, the methodological techniques and specific features

of state support for university academic excellence programs, as well as instruments to assess their efficiency and effectiveness, are studied in quite a fragmented way. The key problems continue to be the following: scientific-methodological and expert-analytical substantiation of the sufficient level of funding for projects and programs in HE; optimization of the structure of the sources and mechanism of financing; inconsistency between the targets, effectiveness indicators of programs (projects), and efficiency indicators of the use of financial resources; development of industry-specific criteria for evaluating the effectiveness of these projects and justification of their regular revision in response to changes in the external and internal factors of the functioning of universities. Research almost completely leaves out the issues of factor analysis and analysis of the sensitivity of project-based university funding to not only the external and internal factors of the educational space, but also their parameters that influence the indicators of efficiency and effectiveness of state support in a variety of ways.

What we propose as one solution to the described problems, i.e. the research hypothesis, is the assertion that the optimally constructed system of expert-analytical methods and the use of foresight technology will allow forming a conceptual model for assessing the effectiveness and efficiency of state support for university development projects and programs, which establishes the degree of correlation between the system of external and internal factors and the indicators of efficiency and effectiveness of financial support for universities.

3. Materials and Methods

The research process relied on the core provisions of the theory of human capital, the theory of goods in care, and the concept of economic sociodynamics with consideration of the new approaches to the methodology of human capital development, as well as the theoretical aspects of contemporary studies on economic globalization, which form the conceptual foundation of the knowledge economy. The initial methodological principles employed for the study of the effectiveness of state financial flow management in HE were provisions of the theory of efficient budget management and foresight methodology.

A pool of expert analytical methods was used in order to substantiate the results of the study. First of all, the study employed retrospective and deterministic factor analysis. The retrospective analysis was conducted based on data for the period between 2006 and 2030, presented in Table 1.

Table 1: *Classification of information sources by selection criteria*

Name of projects and programs	Primary sources	Secondary sources	
		Internal	External
"Priority 2030" program for 2021–2030	Indicators in the "Priority 2030" program. (program website: priority2030.ru); Annual analytical public report on the implementation of the program	Resolution No. 729 of the Government of the Russian Federation of May 13, 2021 "On Measures to Implement the Strategic Academic Leadership Program "Priority 2030"	"Priority 2030" strategic academic leadership programs of the Higher School of Economics, Plekhanov Russian University of Economics
National project "Science and Universities" for 2018–2024	Report on the intermediate results of the expert-analytical event "Monitoring of the implementation of the National Project Science". Approved by the Collegium of the Accounts Chamber of the Russian Federation (Protocol of September 17, 2019, No. 51K (1347), p. 1)	Presidential Decree of May 7, 2018, No. 204 "On the national goals and strategic objectives for the development of the Russian Federation for the period up to 2024". Passport of the National Project; passports of federal projects included in the National Project	Report of the Rector of the NRU HSE on the activities and implementation of the development program for 2009–2020
Priority Project "Development of Export Potential of the Russian Education System" for 2017–2025	Report of the Government of the Russian Federation to the Federal Assembly of the Russian Federation on the implementation of state policy in education, 2017; OECD Report on Education: Russia's Performance	Passport of the priority project "Development of export potential of the Russian education system" in the edition of the Protocol of May 30, 2017, No. 6 Protocol of the Presidium of the Presidential Council for Strategic Development and Priority Projects of May 30, 2017, No. 6	Monitoring data of the RF Ministry of Education and Science on performance indicators of universities participating in the project: Higher School of Economics, Lomonosov Moscow State University, and MIPT

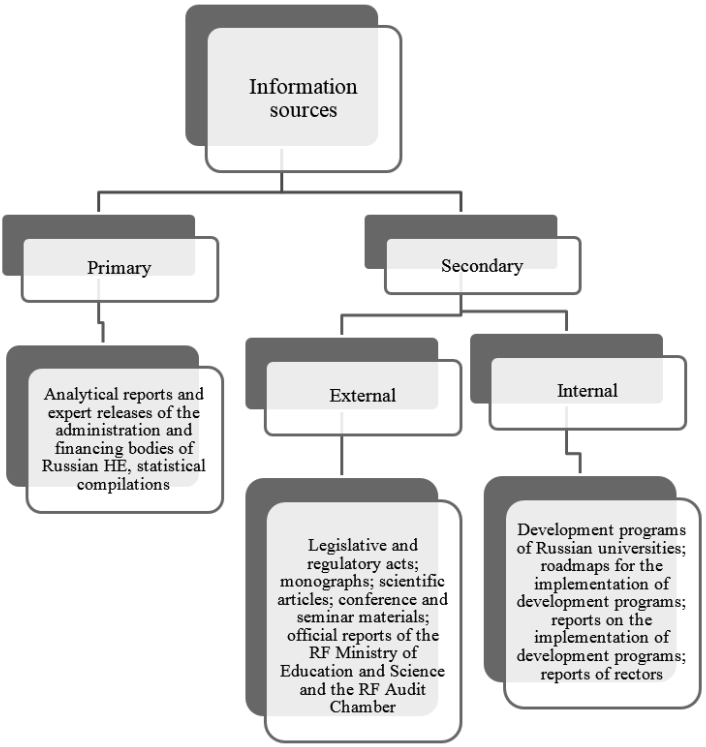
Priority Project "Universities as Centres for Creating a Space of Innovations" for 2016–2025	Education in Figures: 2020 Brief Statistical Digest	Passport of the priority project "Universities as Centres for Creating a Space of Innovations", as amended by Protocol No. 9 of October 25, 2016 Protocol of the Presidium of the Presidential Council for Strategic Development and Priority Projects of October 25, 2016, No. 9 Order of the RF Ministry of Education and Science No. R-1002 of December 19, 2017 "On approval of the list of educational institutions of higher education recognized as university centres of innovation, technological, and social development of the regions"	Report on the results of the activities of Federal State Educational Institutions of Higher Education and the use of property by B.N. Yeltsin UrFU for 2020
Project for the creation of core universities for 2015–2020		Protocol of the meeting of the Council on the implementation of development programs of core universities, of key importance for the industrial and socio-economic development of the constituent entities of the Russian Federation from April 17, 2017, No. OV-10/05pr	Public Report of the Rector of the Plekhanov Russian University of Economics on the work in 2019
Project "5–100" for 2013–2020	Report on the results of the expert-analytical event "Analysis of the efficiency of measures of state support of Russian universities aimed at improving their competitiveness among the world's leading research and educational centres" Approved by the Board of the Accounts Chamber of the Russian Federation on February 2, 2021	Resolution of the Government of the Russian Federation of March 16, 2013, No. 211 "On measures of state support of leading universities of the Russian Federation in order to increase their competitiveness among the world's leading scientific and educational centres" (ed. from December 30, 2020)	Project "5–100": results of the program (opinions of Forbes education experts)

"Personnel for the Regions" Project for 2013–2018		Tender documentation of the Russian Ministry of Education and Science "Personnel for the Regions" posted on the website of the Ministry of Education and Science of the Russian Federation	Formation of a network of regional core universities (collection of reports from the scientific-methodical conference of NRU "Tomsk Polytechnic University", 2015)
Lomonosov Moscow State University and St. Petersburg State University development programs for 2010–2020		Decree of the Government of the Russian Federation of September 27, 2010, "On the Development Program of the Federal State Educational Institution of Higher Professional Education "Lomonosov Moscow State University" until 2020" Decree of the Government of the Russian Federation No. 1696-r of October 7, 2010, "On the Development Program of the Federal State Educational Institution of Higher Professional Education "Saint Petersburg State University" until 2020"	Development Programs of Lomonosov Moscow State University and SpbSU for 2010-2020 published on the websites of the universities. Reports by the Rectors of Lomonosov Moscow State University and SpbSU on the results of the implementation of the development programs
Program for the creation of federal and national research universities for 2009–2014	Analytical report on the results of monitoring the development programs of federal and national research universities "Establishment and Development of a Network of Federal and National Research Universities 2009–2014"	Presidential Decree No. 1448 of October 7, 2008, "On Implementation of the Pilot Project on the Establishment of National Research Universities"; Presidential Decree No. 1172 of October 21, 2009, "On the creation of federal universities in the Northwestern, Volga, Ural, and Far Eastern Federal Districts"	Report on the activities and execution of the financial and economic plan of the Higher School of Economics for 2014
Federal Targeted Program "Development of Education" for 2006–2010	Preliminary analysis of the results of the implementation of the Federal Targeted Program for the Development of Education for 2006–2010, considering the results of the "Education" project"	Decree of the Government of the Russian Federation dated September 3, 2005, No. 1340-r The Concept of Modernization of Russian Education for the period until 2010	Report of the Government of the Russian Federation on the implementation of the Federal Targeted Program "Development of Education 2006–2010"

Source: Authors.

Information sources were selected based on the criteria of reliability, relevance, adequacy to the time, and accessibility. For the purpose of the study, these sources were grouped into primary and secondary (Figure 1).

Figure 1: *Types of information sources for retrospective data analysis*



Source: Authors.

Preference was given to the external sources – legislative and normative acts and official reports of the administration and financing bodies in the sphere of education – as the most reliable and corresponding to the goals and objectives of the study. The retrospective analysis of projects and programs implemented in Russian HE, conducted through a comparison of the predicted results with the achieved effectiveness, allowed not only to systematize the information and analytical sources on the program and project-based funding for Russian universities, but also to conclude that the main reserves for the increase of efficiency of HE funding lie in the strategy for managing the financial flows of the education system as a whole and of each university. An assessment of the impact of the system

of factors on the effectiveness of project-based funding for Russian universities was conducted through deterministic factor analysis. The latter was carried out in two stages: stage one – analysis of the sensitivity of the target indicators of university development programs to the external and internal factors; stage two – factor analysis of strategic university development programs. The conducted analysis has allowed establishing and mathematically formalizing the relationship of the factors with the effectiveness indicators of state support for university development projects and programs.

The next step of the study was the development of the conceptual model for the assessment of effectiveness and efficiency of state support for university development projects and programs based on the foresight technology, which in turn relies on the method of expert assessment. The proposed conceptual model is a hierarchical and logically coherent structure of the processes of assessing the effectiveness of funding of university development programs considering the system of factors that determine them. The foresight method allows to choose the optimal financial decisions in post-crisis conditions and uncertainty. In this context, from the variety of modifications of foresight, we have chosen the technology of expert assessment based on the analytic network methods by Saaty (2004), and the analysis of hierarchies with dynamic judgments by Andreychikov and Andreychikova (2013). The analytic network method was used to establish the hierarchy of factors and the strength of their impact on the effectiveness indicators of state support for university development projects and programs. The method of the analysis of hierarchies based on the modelling of logical judgments grounded in the analysis of expert opinions was employed to develop a classification of the external and internal environment factors affecting the sufficient level of funding for university development programs. The use of the research methods that account for the opinion of not just the expert community, but also the heads of educational funding and management bodies have confirmed the feasibility of using foresight technology, the main advantage of which is the involvement of various stakeholders in the process of preparing and making financial decisions.

The information-empirical base of the study consisted of official data of the Russian Government (passports of state programs for the development of education), the website of the Ministry of Science and Higher Education; information and analytical digests of the National Research University "Higher School of Economics"; databases of OECD, the World Bank, the International Monetary Fund; analytical reports and expert releases of the Audit Chamber of the Russian Federation; the media,

including data of the RBC analytical centre, informational materials of the European Journal of Operational Research (EJOR).

4. Results

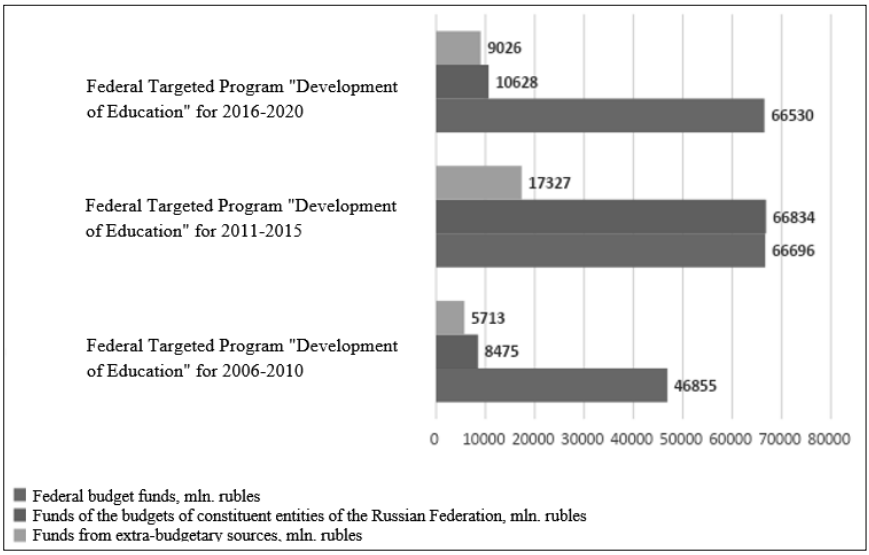
The effectiveness of public authorities' expenditures on HE can be determined by analysing the results of state programs in this sphere that ensure the implementation of the fundamental principles of state strategy and policy in training highly qualified personnel, as well as in research and development (R&D). Federal targeted programs in the field of education, which are a part of the state programs, are implemented over medium or long-term periods. During these periods, financing is often adjusted depending on the parameters of budget expenditure forecasts in order to meet the objectives. In this case, considerable amounts of public financial resources are isolated, concentrated, and directed towards the achievement of the key objectives. The program-targeted method contributes to the transparency and rationality of expenditure of budgetary funds through the system of accountability and monitoring of the attainment of target indicators characterizing the effectiveness of program activities.

Between 2006 and 2020, the Russian state allocated about 298 billion rubles for the development of education. In the coming decade, it is planned to allocate 10.6 billion rubles only to the development of science and HE (Figures 2, 3).

The above-described trend brings to the fore the problem of assessing the effectiveness of state support for Russian universities. Retrospective analysis of funding for state programs in the sphere of education implemented in the past 10 years shows that the actual values of their effectiveness indicators is lower than the target level. This gives ground for some researchers to estimate "the efficiency of attainment of program goals at zero" (Korneychuk, 2018, p. 105). However, we believe that such formal approach to assessing the effectiveness of state support for programs and projects in HE is not conducive to an efficient study of the feasibility and significance of program-targeted and project-based funding in education.

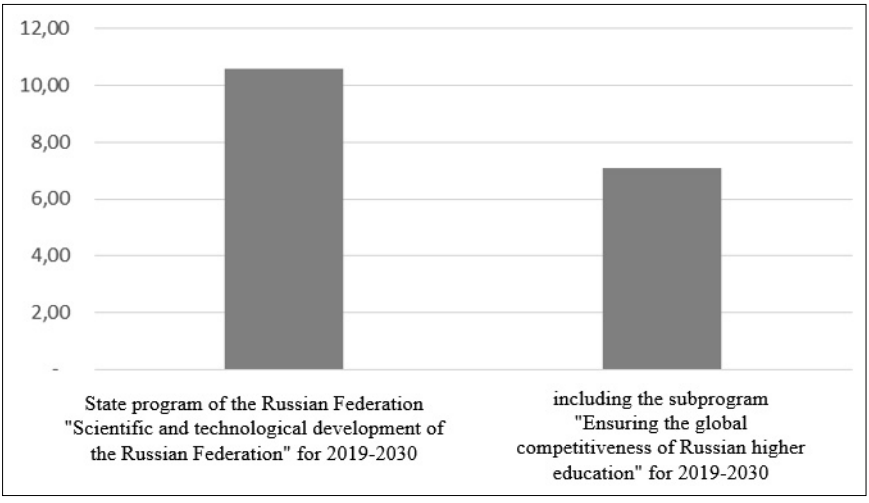
In accordance with current legislation, what is subjected to targeted analysis and control is the program part of federal budget expenditures on the sphere of education, with the state as the main source of funding. In this light, the effectiveness of state support for HE should be assessed through the attainment of the strategic goals of the respective state programs and projects (Table 2).

Figure 2: *Funding for federal targeted programs in Russian education*



Source: Authors, based on portal of state programs of the Russian Federation, 2022.

Figure 3: *Financing of the state program of the Russian Federation "Scientific and technological development of the Russian Federation"*



Source: Authors, based on Decree of the Government of the Russian Federation of March 27, 2019, No. 377

Table 2: *Financial support for subprograms and projects in HE in Russia*

Name of programs and projects	Implementation timeframe	Number of participating universities	Volume of state support, billion rubles.	Targets
First group of projects				
National Project "Education"	2006–2008	57	30.0	Development of a modern system of continuous professional education, introduction of innovative educational programs in universities
Program for the creation of national research universities	2009–2014	29	32.4	Providing human resources for the scientific and innovative sphere of the economy
Program for the creation of federal universities	2009–2015	10	9.9	Formation of a network of key universities in federal districts
"Personnel for the Regions" Project	2013–2018	14	10.6	Accessibility of free HE with priority given to support of regions
Second group of projects				
Project "5–100"	2013–2020	21	82.7	Increasing the competitiveness of Russian universities in the international educational space
Lomonosov Moscow State University and St. Petersburg State University development programs	2014–2024	2	20.1	Obtaining the status of an efficient university with a high level of competitiveness in the global and domestic educational space

Project for the creation of core universities	2015–2020	33	4.7	Formation of universities as research and innovation centres and drivers of regional development
Priority Project "Universities as Centres for Creating a Space of Innovations" (Approved by the Presidium of the Presidential Council for Strategic Development and Priority Projects (Protocol of October 25, 2016, No. 9)	2016–2025	No less than 100 universities	44.6	Improvement of the global competitiveness of Russian universities
Priority Project "Development of Export Potential of the Russian Education System" (Approved by the Presidium of the Presidential Council for Strategic Development and Priority Projects (Protocol of May 30, 2017, No. 6)	2017–2025	39	4.9	Ensuring the international attractiveness of Russian HE
Third group of projects				
National Project "Education", "Science and Universities"	2018–2024	No data	45.4 86.5	Modernization and development of the system of continuous professional education; increase in the number of foreign citizens studying at Russian universities
including the "Priority 2030" program	2020–2030	106	70.1	Strengthening the role of universities as drivers of regional and national development

Source: Authors, based on data from the websites of the Government of the Russian Federation and the Ministry of Education and Science of the Russian Federation.

Analysis of the actual funding of state programs and priority projects in Russian HE adopted in 2006-2020 gives an opportunity to group projects into three groups by their targets. The first group, comprising four large-scale projects with state support amounting to over 82 billion rubles, supports the development of the contemporary system of continuous professional education through the introduction of innovative educational programs. The second group, which includes five projects in the sphere of HE with a total of 157 billion rubles of state funding, intends to not only form scientific innovation centres for the development of the regions, but also support the global competitiveness of Russian universities. The third group, which has state financial support of 202 billion rubles, is aimed at integrating science and HE with the real sector of the economy in order to technologically transform the country and the constituent entities of the Russian Federation. In total, during the period from 2006 to 2030, more than 441 billion rubles of state financial resources (or 45% of budget financing for all levels of education in Russia in 2020) were allocated for the transformation of the model of Russian HE (Accounts Chamber of the Russian Federation, 2021; Modulbank, 2020).

The methodology of program-targeted management of state financial flows assumes that state programs should be assessed from the standpoint of both their scale and the degree of effectiveness. For instance, in the past decade, the largest project in HE by the amount of state support was the Project "5-100" with total funding of 82.7 billion rubles, in which "the 21 participating universities accounted for 17.9% of federal funding out of all budgetary funds for the system of higher education" (Forbes Education, 2020).

Along with the improvement of the global competitiveness of Russian universities and the traditional task of improving the quality of education, the objectives of this project include not only the development of science, but also the creation of scientific-educational centres and technological clusters, as well as the development of educational services export and internationalization of university activities. The main effectiveness indicators adopted for the Project "5-100" are seven target indicators: improvement of the level of competitiveness of Russian universities; implementation of breakthrough research practices; the development of world-level intellectual products; increasing exports of educational services; internationalization of R&D; modernization of infrastructure to attract the best students; integration of education, science, and entrepreneurship.

The universities participating in the Project "5-100" were mostly national research universities (13 of 21), along with four federal universities.

Despite the "starry" composition of participants, at the end of the Project, none of its participants was included in the first one hundred of the ARWU, THE, and QS international university rankings. The project also failed to meet the target effectiveness indicators in educational service export and the internationalization of R&D. The desired sharp rise in the competitiveness of Russian universities in the global educational space was thus not achieved. Nevertheless, some positive changes can be observed concerning the development of Russian HE: 63 Russian universities were included in global rankings, eight of them in the ARWU, THE, and QS subject rankings. The demand of foreign students for educational programs of universities participating in the Project "5–100" also increased. The share of revenues from R&D in the total revenues of these universities reached about 30%, which is almost 2.5 times higher than the average in Russia as a whole (Gokhberg et al., 2020).

The head of the Russian Ministry of Education argues that, despite the failure to achieve one of its goals (the inclusion of five Russian universities in the global top 100 in 2020), the Project "5–100" did lead to significant progress in Russian HE, supporting universities with an already strong research base (TASS, 2020). The corps of rectors considers the Project "5–100" the most successful in comparison with the previous ones, noting that Russia joined the programs of academic leadership rather late, but efficiently, raising the prestige of domestic universities within the country (Ministry of Science and Higher Education of the Russian Federation, 2020). According to leading analysts of the Accounts Chamber of the Russian Federation, the Project "5–100" as the first experience of Russia in implementing an academic excellence program has not achieved all its targets, but, having formed a group of leading universities in the country, has increased the importance of university science. In addition, they note that not only "the total amount of funding was insufficient for a full transformation, but the funding mechanisms laid down in the program did not allow for the full realization of the subject specialization of the universities" (Report on the results of the expert-analytical event "Analysis of the effectiveness of state support measures for Russian universities aimed at increasing their competitiveness among the world's leading scientific and educational centres", approved by the Board of the Accounting Chamber of the Russian Federation on February 2, 2021).

The Russian expert community disagrees in assessing the effectiveness and efficiency of state support for the Project "5–100". On the one hand, representatives of the academic community (Higher School of Economics) Shibanova and colleagues (2018) argue that "the primary goal of the

project, which was the entry of the universities in the top-100 best universities in institutional and subject-specific rankings, was achieved" (p. 32). On the other hand, independent experts stress the difficulty of analysing the effectiveness of the Project unambiguously. They suggest that "although funding within the project was provided to 14 to 30 universities, it did not produce a ripple effect on the entire system of HE" (Forbes Education, 2020). As a result of interim assessment of the Project, Kliucharev and Neverov (2018) conclude that "objective assessment of the results of the Project "5–100" has to be conducted in three directions: the key effectiveness indicators prescribed by the Government and the Ministry of Education and Science; improvement of the effectiveness of the activities of participants in the project; overall development of the system of science and education in Russia".

Logical analysis of the effectiveness of the Project "5–100" conducted in our study reveals the absence of a summary document (passport) establishing a clear system of effectiveness indicators for achieving the targets, which were instead scattered over the expected results of the strategic development programs of the universities participating in the project. The study of the fundamental goals and the corresponding objectives uncovers a logical inconsistency of the key parameters of the Project's targets, objectives, and indicators of their achievement. Furthermore, the universities taking part in strategic development programs were independent in determining the target effectiveness indicators and establishing the priority of funding for various events as part of the Project. All the above led to the fact that out of the 21 universities included in the Project, only three (Higher School of Economics, Engineering Physics Institute, and ITMO University) managed to meet the required results in full.

In order to determine the factual effectiveness of the the Project "5–100", we suggest that it is necessary to first draw a clear distinction between the concepts of efficiency and effectiveness. Second, the factors affecting the effectiveness indicators need to be identified. Third, there is a need to develop a model for assessing the efficiency and effectiveness of state support for university development projects and programs along with an algorithm for its realization.

In accordance with budget legislation and current Russian quality management standards, the parameters of effectiveness and efficiency, being complementary categories, have different interpretations. "Effectiveness is defined as the degree of attainment of the set goal, whereas efficiency refers to the ratio between the results and the expenditures made to attain them" (Bakulina & Zharinov, 2010, p. 131). Drucker (1992, p. 92)

suggests that "if effectiveness is the ability to choose the main goal, then efficiency is the ability to correctly use the resources to achieve it".

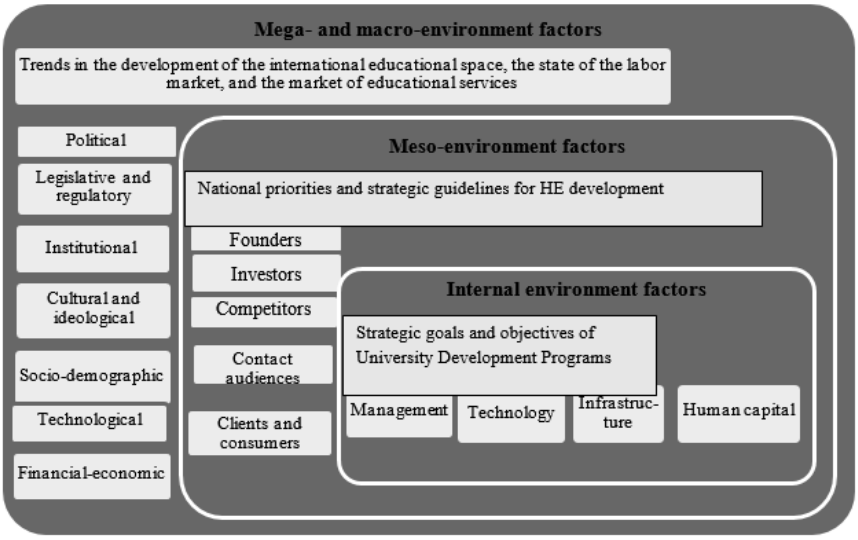
In our opinion, assessment of the results of state programs and projects in the field of education as one of the stages of implementation of state policy in this area should be primary and conducted using integral effectiveness, i.e., the degree of achievement of the goals set considering the factors affecting the level of effectiveness. In turn, assessment of the efficiency of state programs and projects is secondary and involves assessment of the economic (financial) effect from the achievement of the prescribed results. In this light, assessment of the efficiency of universities with low effectiveness in the development programs (regardless of the exact projects as part of which they are realized) is inexpedient, because the goals of the programs they have adopted remain unachieved.

The system of factors affecting the key indicators of academic excellence programs can be grouped into three levels: factors of the mega- and macroenvironment, factors of the external meso-environment, and factors of the internal environment (Figure 4). The generally recognized in the expert community mega- and macroenvironment factors that shape the strategic guidelines for the development of education can include macro-factors along with mega-factors (trends in the development of international educational space, the labour market, and the market of educational services): political, legislative and regulatory, institutional, cultural and ideological, socio-demographic, technological, and financial-economic. Two groups of factors – socio-demographic and financial-economic – produce a direct impact on the amount of funding for educational institutions.

Another group of factors determining the decisions of the state on stimulating growth points in HE are the meso-environment factors (including the status of founders, number of investors, relationship with competitors, quality of contact audiences, clients and consumers of educational services) and their interaction in the process of attaining national goals and strategic guidelines for the development of HE in the country (ensuring its accessibility, quality, and competitiveness).

While the revenues of universities at the beginning of project-targeted funding were primarily formed by financial support from the state and the share of extrabudgetary funds was 20-30%, today the average share of state universities' income from extrabudgetary sources accounts for over 40%. The level of revenues from R&D remains low and insufficient (12%). Meanwhile, the insufficiency of state financing can largely be explained by the influence of the meso- and internal environment on the level and

Figure 4: *Classification of factors affecting the attainment of target indicators of projects and programs implemented in the field of HE in Russia*



Source: Authors.

accessibility of state support for Russian universities. The search for additional sources of funding encourages universities to not only work on the investment attractiveness of strategic development programs, but also to develop roadmaps for their efficient realization accounting for the leading factors in the development of the internal environment of the university (the level of management, managerial organizational and educational technologies, the state of infrastructure, the quality of human capital, etc.).

The influence of the entire system of factors on the effectiveness of project funding for universities can be assessed by factor analysis. We suggest that factor analysis of the effectiveness of academic excellence programs be conducted in two stages:

– analysis of the sensitivity of the target effectiveness indicators of the development programs of universities participating in the Project to the external and internal factors;
– factor analysis of university development programs.

The implementation of activities within the university development programs included in the Project is composed of a set of individual processes, including internal and external ones, as well as a system of indicators (parameters) of their effectiveness (π). Sensitivity of the target effectiveness

indicators of the universities' development programs to the external and internal factors can be analysed both on the stage of the development of these programs and as part of monitoring the intermediary results, and analysis of the final results of the programs. The purpose of sensitivity analysis is to identify the processes that exert the greatest influence on the financial-economic results of program events measured by quantitative indicators $\vec{Q}$. The analysis can employ the integral method, in which the end result can be expressed as a function of several indicators. In this case, "in the general case, it is also possible to determine the sensitivity functions of the k_{tb} order" (Naumov & Naumova, 2016, p. 544).

$$\frac{\partial^k Q_i}{\partial \pi_1^{k_1} \cdots \delta \pi_p^{k_0}}, \; k_1 + k_2 + \cdots k_p = k \tag{1}$$

The sensitivity function is thus measured by the "change in the i_{tb} effectiveness indicator of a particular process with the change of its j_{tb} parameter by one" (Naumov & Naumova, 2016, p. 545). In this way, we obtain the parameters of individual processes (π_j) that have a decisive impact on the financial-economic effectiveness indicators.

Factor analysis also explores the influence of the parameters of individual processes π on the efficiency indicators $\vec{Q}$ of the development programs of universities involved in the Project. If the relationships between the indicators Q_i of the vector $\vec{Q}$ with the parameters π, as well as the values of pairs of the indicators and parameters (the desired and attained) are known and if we express by $I_{\pi_i Q_i}, i = 1,2, \ldots, p, j = 1,2, \ldots, M,$ the assessment of the influence of deviations in parameter π on the indicator Q_j can be expressed in the equation:$\Delta\partial$

$$\Delta Q_j = \Sigma_{i=1}^{p} I_{\pi_i, Q_i}, \; j = 1,2, \ldots, M \tag{2}$$

The aim of factor analysis is to find the assessments $I_{\pi_i Q_i}, i = 1,2, \ldots, p,$ the values of which can be obtained by both quantitative integration methods and the packages of applied statistics software (SPSS Statistics software for the study of social processes, SAS package for the analysis of financial flows, using MATLAB).

The detected differences between the concepts of "effectiveness" and "efficiency", which are both used for assessing university academic excellence programs, as well as the conducted factor analysis and analysis of the sensitivity of the target effectiveness indicators of the university development programs within the Project to the external and internal factors, presuppose the development of a conceptual model for assessing the effectiveness and efficiency of state support for university development

projects and programs, as well as the regulation of the analytical procedures for this assessment.

We suggest that such conceptual model should be created by means of the foresight methodology, which presents a set of methods, tools, and techniques both for scenario forecasting of the development of HE and for strategic foresight of the level of development of Russian HE in the long term.

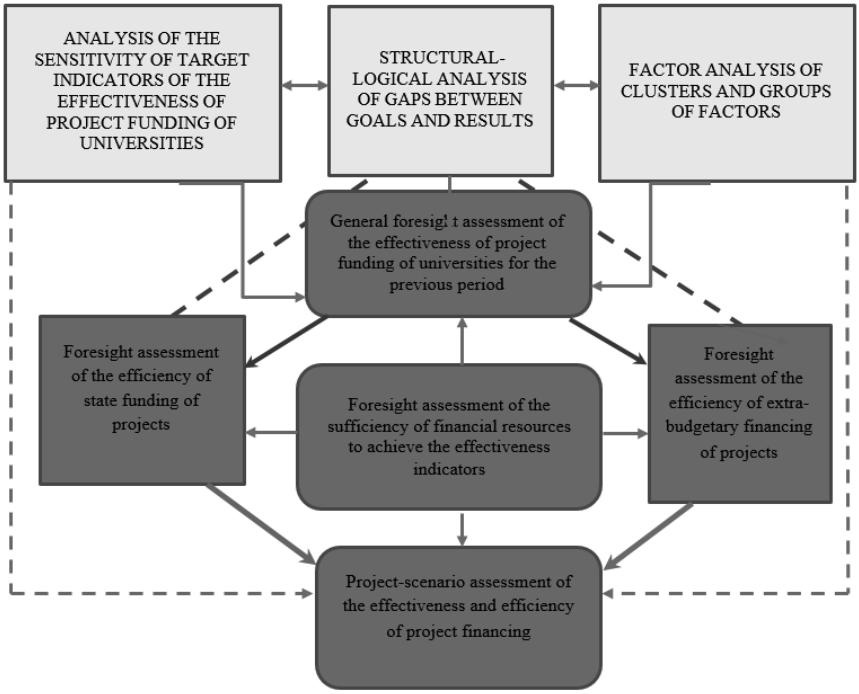
The specifics of foresight technology in the process of public funding of projects and programs for the development of universities are determined by the following facts:

- the information-analytical base is formed not only from assessments by the professional community and a narrow circle of experts, but also taking into account the opinions of all stakeholders concerned with the effectiveness of budgetary expenditures in HE;
- analysis of the processes of financial support for projects and programs involves online monitoring, control, and management;
- it relies on strategic analysis, which includes analysis of the sensitivity of the target effectiveness indicators of the projects and programs and factor analysis that accounts for "the favourable opportunities and potential threats found in the internal environment and the strengths and weaknesses of the internal environment" (Charnes, Cooper & Rhodes, 1978, p. 429);
- in post-COVID conditions, when it is difficult to make predictions by extrapolating trends, methods that provide anticipation of force majeure and critical situations are used;
- it mobilizes the leadership and staff of HE institutions, as well as all organizations, legal entities, and individuals interested in the sustainable development of HE to achieve long-term strategic objectives.

The proposed conceptual model (Figure 5), based on the assessment of the effectiveness and efficiency of the projects and programs with consideration of the factors that affect them, by virtue of foresight technology, indicator sensitivity analysis, and factor analysis, provides the following:

- eliminating logical imbalance between the targets, indicators, and indices of projects and programs and the projected long-term results (intermediate and achieved);
- revealing the weak spots and leading parameters having the greatest direct influence on effectiveness indicators by means of assessing the contribution of each factor to the attainment of the key results;

Figure 5: *The conceptual model for assessing the effectiveness and efficiency of state support for university development projects and programs*



Source: Authors.

- classifying the factors of emergence of minor risks of nonattainment of the established qualitative and quantitative indicators of effectiveness of the projects and programs, and providing the ways and methods of their prevention, including the involvement of a wide range of representatives from all sectors of society and participants in educational activities;
- resolving the problem of determining the sufficient level of funding for projects implemented in HE by means of prognostic-scenario assessment of effectiveness;
- supplementing the assessment of effectiveness with strategic analysis of the efficiency of budgetary and extra-budgetary financing of projects and programs;
- developing scenarios of predictive evaluation of the effectiveness and efficiency of university programs and project financing, considering the different tools of the mechanism of transforming goals into results;

– monitoring the effectiveness and efficiency of both academic excellence programs and university development programs in the preliminary, current, and subsequent assessment of project-based funding.

The choice of priorities and prediction of the results of project-based funding under various scenarios can be performed based on the analysis of possible discrepancies between the established strategic socio-economic goals, goals for the development of Russian HE, and the strategic goals of university development programs. Practice shows that the primary risks of non-implementation of state programs in HE appear at the final stages of their implementation. Foresight technologies and factor analysis of risks enable the systematization of factors contributing to the greatest risks, including those in the long term. In turn, monitoring of intermediate results allows establishing the degree of their probability, as well as the measures of prevention and responsibility for their neutralization. For instance, major risks can be reduced by linking the declared results to second-order goals (objectives), supporting their implementation by a wide range of intermediate indicators, and using risk prevention procedures adapted to the specifics of strategic financial management of educational institutions (Verezubova, 2018).

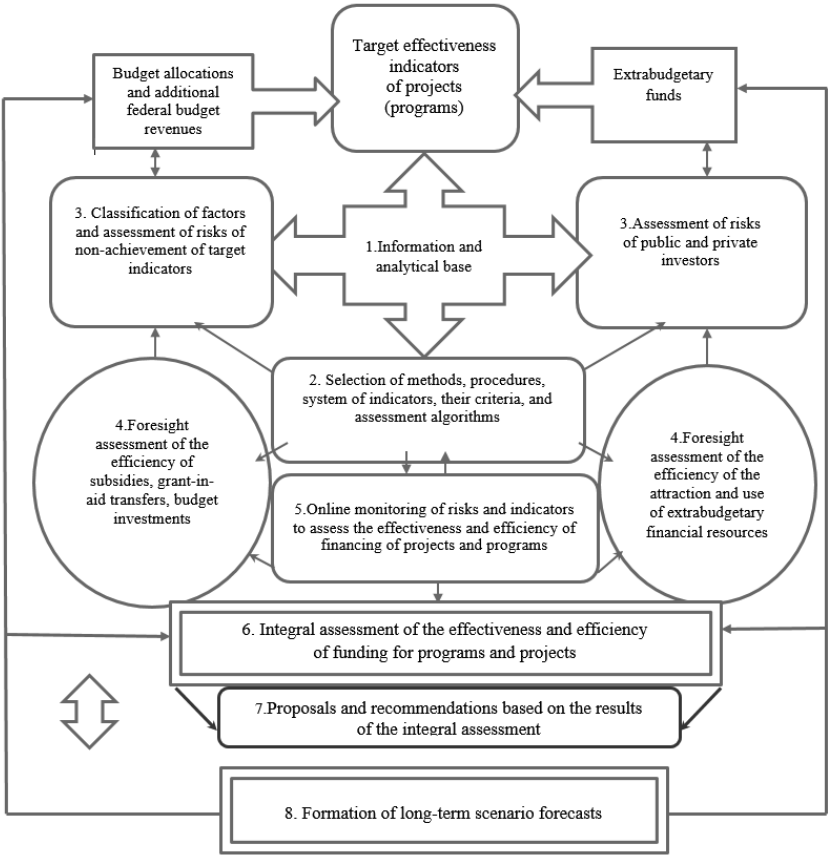
It is advisable to bring into line the system of indicators of official reports of universities (forms VPO-1, VPO-2, report on monitoring the quality of financial management, etc.) with the quantitative indicators of achievement of the target milestones of programs and projects (Korneychuk, 2018).

Due to the fact that the greatest share of funding for projects and programs in HE comes from budgetary funds, we believe that the key position of the conceptual model should be an assessment of the effectiveness and efficiency of the provision of state subsidies, which can become the basis for the rules for their provision, and adjusted based on the results of this assessment, including the economic measures of responsibility for failure to achieve the results and for non-compliance with the conditions for granting the subsidy. For the practical realization of the Conceptual model, we suggest using the proposed algorithm for its implementation (Figure 6).

The practical implementation of the Conceptual model includes seven main stages (steps):

Step 1 – collection and systematization of the information-analytical base (normative-legal base, including the passports of projects and programs; expert-analytical reports of state and non-state regulatory and expert or-

Figure 6: *Algorithm of implementation of the conceptual model for evaluating the effectiveness and efficiency of state support for projects and programs for the development of Russian institutions of higher education*



Source: Authors.

ganizations; analytical reports on the results of projects and programs; statistical data, expert releases, scenario and long-term forecasts, etc.);

Step 2 – based on the data of the information-analytical base – the selection of methods, procedures, the system of indicators and their criteria, algorithms for the assessment of effectiveness and efficiency of projects and programs both from the previous period and the ones proposed for implementation in the nearest future;

Step 3 – classification of the factors and risks of nonattainment of the indicators of effectiveness and efficiency of the proposed projects (pro-

grams) in the long term, and clusterization of the external and internal risks affecting the risks and degree of attainment of effectiveness indicators;

Step 4 – foresight assessment of the efficiency of attraction and use of financial resources in terms of the sources of funding for individual projects and programs, and with respect to all participants in their implementation and those responsible for the timeliness and effectiveness of funding;

Step 5 – selection and regulation of procedures for online monitoring of the risks and effectiveness and efficiency indicators of funding for projects and programs;

Step 6 – integral assessment of the effectiveness and efficiency of program and project funding, including assessment of the efficiency of not only each project (program), but also of their subprojects (subprograms) and of the activities of participants and heads of the projects (programs);

Step 7 – based on the results of the integral assessment – the development of proposals to improve the effectiveness and efficiency of financial support of projects and programs with respect to the particular sources of funding and the efficiency of operation of the participants and heads of the projects;

Step 8 – based on the strategic analysis and identification of tactical and strategic competitive advantages of Russian HE – the formation of different scenarios for its long-term development.

We suggest that a mandatory condition for the implementation of the proposed conceptual model for assessing the effectiveness and efficiency of state support for university development projects and programs is not only the incorporation of foresight technology into the system of strategic forecasting and financial support for the development of Russian HE, for which it is necessary to institutionalize foresight technologies at the level of educational funding and management bodies, but also making state project offices in the sphere of HE responsible for the development of proposals to improve the effectiveness and efficiency of state support and the mechanisms and tools of its realization.

5. Discussion

On the one hand, the need for the study of the effectiveness and efficiency of program-targeted and project-based funding in HE is shaped by the principles of budget management realized in the financing of university develop-

ment programs and academic excellence projects. On the other hand, it is determined by the need for investment in the development of human capital from extra-budgetary sources, the overall result of which is the attainment of the strategic target indicators of long-term programs for the development of education (Ilina, 2016; Mitchell, Palacios & Leachman, 2015).

The opinion that "comparison of the planned and actual values of the target indicators serves as a tool for assessing the effectiveness of educational development programs" appears to be debatable (Korneychuk, 2018, p. 105). We believe that this ratio is primarily a tool to assess the effectiveness of program-targeted and project-based funding for educational organizations, as it characterizes the degree of attainment of the results planned (GOST ISO 9000-2011). The scientific-methodological and expert-analytical justification of the degree of effectiveness of state support for university development projects and programs presupposes not only retrospective and factor analysis of their funding, but also the analysis of logical coherence of state programs, which denotes "the internal link between the declared goals and the expected results" (Roy, 2021). This link can be provided within the framework of the conceptual model proposed in this study, which accounts for the entire system of factors affecting the indicators of effectiveness (Pond, 2002; Zinchenko & Egorov, 2019).

As demonstrated in practice, the greatest difficulties arise at "the final stages of implementation of university development projects and programs" (Smolin, 2020, p. 6), owing to a number of limitations associated with the external and internal environment factors that hinder the attainment of target effectiveness indicators. An advisable way to resolve this problem as part of the proposed conceptual model is to divide the entire range of factors into two clusters – the factors that stimulate the attainment of target indicators, and those that hinder it – and two classes of factors – those having a direct and an indirect influence on the target indicators and the amount of funding (Table 3).

Table 3: *Summary matrix of factors*

Factor cluster	Factor class	
Stimulating the achievement of target milestones	Exerting direct and indirect influence on the target indicators	Exerting direct and indirect influence on the amount of funding
Impediments to the achievement of target milestones, including risks of non-achievement		

Source: Authors.

The distribution of factors by clusters and classes is to be performed based on the following criteria: the level of influence of the factor on the degree of attainment of the planned target indicators of the effectiveness of the university development programs that are part of the Project; the efficiency of implementation of the key events of the development programs and their correspondence to the planned level of spendings. The purpose of this clusterization of factors is to select the projects and programs to be prioritized in funding, under the condition of conducting factor analysis of project-based funding and qualitative analysis of the sensitivity of these programs' target effectiveness indicators to the external and internal factors (Naumov & Naumova, 2016).

Next, the use of foresight technology allows to systematize the factors conducive to the development of the risks of underfunding of university development projects and programs that hinder the achievement of the declared results, as well as to establish the relationship between the target effectiveness and efficiency indicators of project funding for universities (Emirov, 2012). In the identification of the effectiveness of state policy in HE and strategic university development programs, some issues related to the "ratio between the results achieved and the resources allocated for their achievement", i.e., the issues of the efficiency of funding, remain unresolved to the present day. Virtually all international university rankings, including the official monitoring of the efficiency of Russian universities, primarily rely on the indicators of effectiveness, leaving out an assessment of the volume of resources (Egorov, 2020). In order to strengthen the role of monitoring and public control of the effectiveness of program and project financing in HE based on foresight methodology, it is advised to use "the participative model of project financing of universities, which ensures not only the involvement of a wide range of public and private institutions in financial decision-making processes, but also the efficiency of public and private investment in higher education" (Rodenkova & Pokamestov, 2020).

Agreeing with Agasisti and colleagues (2020) on the point that the efficiency of public expenditures can be evaluated on the basis of strategic target indicators, as well as basic and additional indicators, we believe that this assessment can be supplemented with an integral assessment of the effectiveness and efficiency of program and project financing which is provided by the algorithm of implementation of our conceptual model, and allows to form expert-analytical reports with the mandatory justification of the efficiency of program-targeted and project-based university funding mechanisms, as well as to develop corresponding proposals and recommendations for the selection of projects.

6. Conclusion

Russia's lagging behind the average OECD countries in terms of the share of expenditures on education in GDP, in the role of the state in this indicator, and the high risks of underfunding of projects and programs in HE in the post-pandemic period in conditions of global instability bring to the fore the problem of transforming the financial models of state support for Russian universities. Prediction of global and national trends in the mechanisms of financial support for educational organizations in HE with consideration of their multifacetedness increases the significance of research on the assessment of effectiveness and efficiency of state support for university development projects and programs.

In our view, the main result of the conducted study is the conclusion that the result-based model of financing educational organizations, which is currently employed in Russia and many other European countries, can be optimized by the proposed Conceptual model for assessing the effectiveness and efficiency of state support for university development projects and programs, which relies on foresight methods and establishes the relationship of the external and internal factors with the indicators of effectiveness and efficiency of financial support. The key results of the study include the following findings:

– the critical components of solving the problem of assessing the effectiveness of project-based financing of Russian universities include not only the retrospective and logical analysis of financial support for state programs and priority projects in Russian HE adopted for the period from 2006 to 2030 and the assessment of the actual effectiveness of these programs, but also a classification of factors stimulating and hindering the achievement of effectiveness and efficiency indicators in the long term;
– in the process of practical use of the algorithm for the implementation of the conceptual model, what is of critical importance is not only the analysis of sensitivity of university development programs' effectiveness indicators to external and internal factors and factor analysis of the risks of nonachievement of target indicators, but also the introduction of the participative model of project funding into the system of planning and strategic forecasting of the development of HE by means of foresight methodology.

The conducted study of the problem of effectiveness of state funding for projects and programs for the development of Russian universities for

2006–2020 involves an expert-analytical assessment of the effectiveness of financial support for three groups of projects, including two national projects, one federal targeted program for the development of education, and eight federal projects, including two university academic excellence programs. We can note the following limitations of the study: firstly, the selected research methods are found to be most relevant for academic excellence programs. The study consequently is limited to the assessment of effectiveness indicators of Project "5–100"; the second limitation of the study is the focus on the qualitative and quantitative efficiency and effectiveness indicators of state funding for Project "5–100", which, nevertheless, does enable scientific substantiation of the key conclusions made.

What can be considered as prospects for further research on the topic are the issues regarding the financial structure of university academic excellence programs and projects, the economic justification of the sufficient level of funding, as well as the problem of clustering the risks of underfunding.

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INTEGRATION OF EFFECTIVENESS AND EFFICIENCY INDICATORS OF STATE SUPPORT FOR PROJECTS AND PROGRAMMES FOR THE DEVELOPMENT OF HIGHER EDUCATION IN RUSSIA

Summary

To achieve the set goal, the study employs expert-analytical methods of retrospective, deterministic, and factor analysis, as well as the tools of foresight technology, allowing the assessment of the impact of the system of factors on the effectiveness indicators of state financial support for universities. The key result of the study is a conceptual model for assessing the effectiveness and efficiency of state support for university development projects and programs, which is based on foresight methodology and establishes the interrelation between the system of factors and the indicators of efficiency and effectiveness of state funding for Russian universities. The proposed model not only offers a quality expert-analytical foundation for important financial decisions on state support for university development programs and academic excellence projects, but also encourages educational organizations to develop strategic development programs and roadmaps for their effective implementation.

Keywords: *project and program-based financing of universities, clustering of factors, effectiveness indicators, financial support efficiency indicators*

INTEGRACIJA ČIMBENIKA UČINKOVITOSTI I DJELOTVORNOSTI DRŽAVNIH POTPORA ZA PROJEKTE I PROGRAME RAZVOJA VISOKOG OBRAZOVANJA U RUSIJI

Sažetak

Da bi postigla postavljeni cilj, studija koristi stručno-analitičke metode retrospekcije te determinističke i faktorske analize, kao i instrumente tehnologije predviđanja koje omogućavaju procjenu učinka raznih faktora na čimbenike učinkovitosti i djelotvornosti državnih financijskih potpora sveučilištima. Ključni rezultat studije jest konceptualni model za ocjenjivanje učinkovitosti i djelotvornosti državnih potpora sveučilišnim razvojnim projektima i programima. Model se temelji na tehnologiji predviđanja i uspostavlja međupovezanost sustava čimbenika te pokazatelja učinkovitosti i djelotvornosti državnog financiranja sveučilišta u Rusiji. Predloženi model ne samo da nudi kvalitetan stručno-analitički temelj za važne financijske odluke o državnoj potpori sveučilišnim programima nego također potiče obrazovne institucije da razvijaju strateške razvojne programe i putokaze za njihovu učinkovitu provedbu.

Ključne riječi: *projektno i programsko financiranje sveučilišta, grupiranje čimbenika, čimbenici učinkovitosti, čimbenici djelotvornosti, financijska potpora*