ASSESSMENT OF HIGHER EDUCATION ORGANIZATIONS’ INVOLVEMENT IN THE PROCESS OF SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT

INTRODUCTION

According to Article 69 of the Federal Law “On Education in the Russian Federation”, “higher education is aimed at training the highly qualified staff in all the main areas of socially useful activity following the needs of society and the state, meeting the needs of a person in intellectual, cultural, and moral development, deepening and expanding education and scientific and pedagogical qualifications” (FEDERALNIY ZAKON, 2012). Higher education institutions aim at synthesizing the expectations of the people, society, and the state in the field of higher education based on the communication of relevant knowledge and skills to students. For students, the given mechanism of communication becomes a source of professional self-determination. For society, it is a guaranteed evolutionary shift, which is based on the transfer of preserved and enriched knowledge from one generation to another. For the state, it is the basis for the expanded reproduction of human potential based on staff training, which is necessary to achieve a given level of professional skill, maintain personal competitiveness, and increase adaptability to continuously changing market conditions (SHATSKAYA, 2014). In the end, such a synthesis provides “the formation and development of intelligent and creative young people who can create innovations for high-tech industries” (MANDYCH & BYKOVA, 2019).

We believe that each of the above mentioned tasks should correspond to specific efficiency aims to avoid generalization and a pared-down connotation. “Efficiency” in this case is the achievement of the expected condition of the object under control, the goal of control, or the level of correspondence to it (KOROSTELEV, 2010). Speaking about students, these indicators are used to control the acquired knowledge legislatively (FEDERALNIY ZAKON, 2012) and are determined by the educational organization’s curriculum. These indicators can also include those characterizing the efficiency of employment of educational institutions’ graduates.

The resulting indicators of educational activity for society are not regulated. However, in our opinion, they include several quantitative criteria of social development given in international reports by the World Bank, the UN, and other international organizations. These criteria include the human development index, the education level index, the life quality index, the global innovation index, etc. Each of these indicators characterizes various aspects of the economic and social life of the state during a certain period: the standard of living, literacy, and education, employment prospects, etc. They reflect either directly or indirectly the contribution of educational organizations to the development of human society.

As for the participation of the higher education system in solving the problem of expanded reproduction of human potential and meeting the needs of the Russian economy in qualified staff, we can state the absence of the resulting indicators describing this process. In our opinion, the systemic relationship between education and the priorities of state economic policy should provide for the possibility of a quantitative assessment of its performance.

METHODS

Research design

The study is based on a design and calculation method, aimed at characterizing the phenomena and processes in the field of higher education in Russia, as well as identifying the established patterns between them and developing evidence-based projections of the development of phenomena and processes. During the research, we also used the method of mathematical statistics the correlation method. With its help we were able to examine the relationship between random variables and features. The given methods made it possible to obtain credible information on the influence of factor indicators on the resulting indicators that
determine the participation of educational organizations in the implementation of priority state economic tasks.

**Algorithm**

We introduced an indicator, the calculation of which is based on a comparison of educational programs implemented by higher education institutions with the priority areas of modernization and technological development of the Russian economy (RASPOROYAZHENIE PRAVITELESTVA ROSSIISKOI FEDERATSIII NO. 7-R, 2015).

The \( C_i \) indicator refers to the  \( i \)-higher education organization’s contribution to the process of scientific and technological development of the Russian Federation and is calculated according to the formula:

\[
C_i = \frac{EP_{\text{modern}}}{EP_{\text{total}}} \times \frac{SFP_{\text{modern}}}{SFP_{\text{total}}} \times \frac{PG_{\text{average modern}}}{PG_{\text{average total}}} = C_1 \times C_2 \times C_3 \quad (1),
\]

where:

\( C_i \) is an indicator of the correspondence of the  \( i \)-higher education organization’s activities in the field of professional training of specialists (bachelors, masters) to the strategic objectives of the state in the field of modernization and technological development of the economy;

\( C_1 \) is the share of educational programs from the list approved by the Russian Federation Government Decision No. 7-r (\( EP_{\text{modern}} \)) in the total number of educational programs of an educational organization within the examined level of education (\( EP_{\text{total}} \));

\( C_2 \) is the share of state-funded scholarships among educational programs from the list approved by the Russian Federation Government Decision No. 7-r (\( SFP_{\text{modern}} \)) in the total number of state-funded scholarships within the examined level of education (\( SFP_{\text{total}} \));

\( C_3 \) is the relation between the average passing grade for admission to educational programs from the list approved by the Russian Federation Government Decision No. 7-r (\( PG_{\text{average modern}} \)) and the total average passing grade based on the results of the admission campaign of an educational organization within the examined level of education (\( PG_{\text{average total}} \)).

The advantage of the proposed indicator is the ability to quantitatively measure the response of the education system to priority government tasks. Based on the \( C_i \) indicator, it is possible to assess the compatibility of a higher education organization’s activities with the state strategic course for the professional training of workers whose qualifications will correspond to the priority areas of modernization and technological development of the Russian economy. Based on the \( C_i \) indicator, it is possible to calculate the \( C_{\text{region}} \) indicator, which is the contribution of higher education institutions of the region to the scientific and technological development of the country.

\[
C_{\text{region}} = \sum_{i=1}^{n} C_i \quad (2)
\]

**RESULTS**

The calculation of the \( C_i \) and \( C_{\text{region}} \) indicators for higher education institutions of Russian federal subjects allowed us to draw the following conclusions:

1. In terms of the \( C_{\text{region}} \) indicator, the leading regions in 2020 are Moscow, the Moscow Region, Saint Petersburg, and the Volga Federal District. First, this is explained by the outnumbered higher education institutions in these regions in comparison with the other federal subjects. Thus, in Moscow and the Moscow region, 27% of higher education institutions train students in priority areas approved by the Russian Government, including the most popular training directions and specialties, such as 09.03.01 and 09.03.02, which are Computer Science and Computer Engineering (33 educational organizations) and Information Systems and Technologies (27 educational organizations) respectively (calculated by us according to (SBORNIK VUZOV ROSSI, n.d.)). In comparison, in Saint Petersburg, the number of educational organizations implementing the same educational programs is 13 and 14 organizations respectively.
Assessment of higher education organizations’ involvement in the process of scientific and technological development of the country.

2. We present the obtained results in the form of a table for illustrative purposes. According to Table 1, only in the above-mentioned regions, the $C_{region}$ indicator is above three points; in 64% of regions, the $C_{region}$ indicator is below one point or is equal to zero. In our opinion, this demonstrates a systemic imbalance in the interconnection between educational activities and state priorities, which underlines the insignificant contribution of higher education institutions to the process of scientific and technological development of the country.

<table>
<thead>
<tr>
<th>Regions with a high $C_{region}$ indicator</th>
<th>Regions with a medium $C_{region}$ indicator</th>
<th>Regions with a low $C_{region}$ indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{region} &gt; 3$</td>
<td>$1 &lt; C_{region} &lt; 3$</td>
<td>$C_{region} &lt; 1$</td>
</tr>
<tr>
<td>Moscow, Moscow Region, Saint Petersburg, Tatarstan, Nizhny Novgorod Region</td>
<td>Bashkortostan, Sverdlovsk Region, Rostov Region, Tver Region, Volgograd Region, Tyumen Region, Khabarovsk Territory, Vladimir Region</td>
<td>Stavropol Territory, Penza Region, Khakassia Region, Krasnodar Region, Tomsk Region, Samara Region, Chuvash Region, Ivanovo Region, Khanty-Mansi Autonomous Okrug-Yugra, Ulyanovsk Region, Kirov Region, Kemerovo Region, Ryazan region, Belgorod region, etc.</td>
</tr>
</tbody>
</table>

Source: Calculated by the author according to (UCHEBA.RU, n.d.).

According to Table 1, even in traditionally manufacture-oriented regions, the $C_{region}$ indicator is low. For example, in the Volgograd region, which is the leading region in terms of manufacturing output per capita accounting for 30% of the gross regional product (REGIONY ROSSIIOI: EKONOMIKA, n.d.), only 21% of higher education institutions train students in priority areas; the $C_{region}$ indicator is 1.44.

3. To assess the involvement of the education system in regional socio-economic processes, we compared the $C_{region}$ indicators with the rating of the socio-economic development of the Russian regions (REITING SOTSIALNO-RASPOORYAZHENIE PRAVITELESTVA ROSSIISKOI FEDERATSII NO. 7-R, 2018). As a result, we drew several conclusions about the high level of involvement of higher education institutions in regional socio-economic processes. The leading positions in both lists belong to Moscow and the Moscow Region, Saint Petersburg, Tatarstan, the Khanty-Mansi Autonomous Okrug-Yugra, the Sverdlovsk Region, the Tyumen Region, etc. The lowest positions belong to such federal subjects as Tuva, Ingushetia, Altai, etc. We can assume that the revealed pattern is not accidental. The high level of socio-economic development resulting from the positive dynamics of the used indicators contributes to the differentiation of the range of educational services of higher education institutions. The rating of the socio-economic situation of the regions was calculated based on aggregating groups of indicators characterizing the economic, social, and budgetary spheres. Each group of indicators includes several quantitative indicators, the data on which are available on the official Internet resources of the Federal State Statistics Service (FEDERAL STATE STATISTICS SERVICE, n.d.) and the Ministry of Finance of the Russian Federation (MINISTRY OF FINANCE OF RUSSIA, n.d.).

The revealed pattern may be explained by the increase in economic activity in various spheres and, consequently, the demand for qualified staff for employment. Economic stability and guaranteed employment contribute to the differentiation of demand for educational services.
CONCLUSION

Based on the results of the analytical review of the normative sources regulating educational activities, we recorded the lack of quantitative indicators that describe the education system’s participation in meeting the needs of the economy in qualified staff. In this regard, we introduced the indicator, the calculation of which is based on a comparison of educational programs implemented by higher education institutions with the priority areas of modernization and technological development of the Russian economy. We believe that the examination of this indicator and its dynamics can become the basis for strategic projections in the field of education. It can also be considered by educational organizations in their strategic development programs.

REFERENCES


KOROSTELEV, A.A. Osobennosti “piramidy tselei” v upravlenii obrazovatelnym uchrezhdeniem [Peculiarities of the “pyramid of goals” in an educational institution management]. Science Vector of Togliatti State University, 2, 68, 2010.


RASPOROYAZHENIE PRAVITELSTVA ROSSIISKOI FEDERATSIIO NO. 7-R “Ob utverzhdenii perechnya spetsialnostei i napravlenii podgotovki vysshego obrazovaniya, sotvetstvuyuschikh prioritetnym napravleniyam modernizatsii i tehnologicheskogo razvitiya rossiiskoi ekonomiki” ot 6 yanvarya 2015 g. (s redaktsiei ot 16 aprelya 2016 g.; 17 maya 2018 g.) The Russian Federation Government Decision of January 6, 2015 No. 7-r “On approval of the list of training directions and specialties of higher education according to the priority areas of modernization and technological development of the Russian economy” (with amendments of April 16, 2016; May 17, 2018). 15, 2020.


Assessment of higher education organizations’ involvement in the process of scientific and technological development

O artigo é dedicado aos métodos de avaliação do envolvimento das organizações de ensino superior no processo de desenvolvimento científico e tecnológico da Rússia. Esses métodos são baseados em uma comparação de programas educacionais implementados por instituições de ensino superior com áreas prioritárias de modernização da economia russa e desenvolvimento tecnológico. O artigo contém várias conclusões tiradas após testar os métodos propostos.


Resumo

El artículo está dedicado a los métodos de evaluación de la participación de las organizaciones de educación superior en el proceso de desarrollo científico y tecnológico de Rusia. Estos métodos se basan en una comparación de los programas educativos implementados por las instituciones de educación superior con áreas prioritarias de la modernización de la economía rusa y el desarrollo tecnológico. El artículo contiene varias conclusiones extraídas después de probar los métodos propuestos.

Palabras-clave: Sistema de educación superior. Desarrollo científico y tecnológico. Áreas prioritarias de modernización y desarrollo tecnológico de la economía. Métodos de evaluación.
