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TRANSFORMATION OF HIGHER EDUCATION: FROM STATE DIAGNOSTICS TO MANAGEMENT DECISIONS

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Abstract

The current stage of the society's socio-economic development is characterized by the soaring pace of digital transformation, which has been radically changing the landscape of all spheres of life: production, consumption, education, etc. In Russia, the formation of the labor and innovation markets has been changing and, consequently, the higher education is changing as well. Specialists with new unique digital competencies are required. To ensure the graduation of such specialists, a systematic change in the management of higher education at the state level is required. The research of dynamic changes in the system of educational organizations of the Russia in the period from 2013 to 2019 revealed significant changes in segment: the quantitative compression of the educational organizations and the qualitative growth of the educational system as a whole. The study of dynamic changes made it possible to forecast the development trend of higher education. The territorial differentiation of the educational landscape is assessed. The qualitative study of the funding aspect of students' admission was carried out. One of the innovative elements of managing the higher education system is the introduction of a strategic academic mobility program. This program provides for the allocation of substantial state funding to universities applying for the status of national research or national flagship universities on the basis of competitive selection. Individual educational tracks will allow graduating the specialists of a new formation. Increasing the number of educational platforms with high-quality online content gives rise to the academic mobility of students within individual educational tracks.

Keywords: Education landscape, higher education, management, transformation

1. Introduction

The modern economic development of society is largely determined by the quality of human capital development. At the same time, digital transformation has a huge impact on the speed of development of the socio – economic system. Digital transformation has been changing the landscape of the foreground economic activities and the state and infrastructure of the social sphere, in particular the education sector. In these circumstances, personal and professional qualities of a person are a key component of economic development, and the modification of the management model in higher education is required.

The development of digitalization is gaining momentum. It causes the reduction the life span of certain professions, and requires a review of the labor activity content. According to the forecasts of American researchers, more than 30% of professions that currently exist will no longer be in demand within 10-15 years. The education sector will need to respond to the change in the paradigm of socio-economic development of society, taking into account this fact, by modifying management processes. The digital transformation of education is a consequence of the fourth technological revolution (Vicente et al., 2020). The changes taking place in society are based on the soaring pace of development of virtual reality technologies and cyber expansion. Those factors create certain threats to the existing socio-economic system. But at the same time, it opens up a wide field of opportunities for personal development and quality growth (Ivanova & Ivanov, 2020).

The new coronavirus pandemic has accelerated the digital transformation of education worldwide. Digital transformation in higher education institutions is taking place along technological, pedagogical and organizational directions (Rodríguez-Abitia et al., 2020). There is no doubt that it is necessary to take into account the different adaptability of students to the total implementation of distance learning (Iivari et al., 2020). It is extremely important to methodically assess the effectiveness of digital solutions in the educational and management processes (Mohmmed et al., 2020).

Federal law "On education" is in force in the Russian Federation. This law formulates the goal of higher education, which is, namely: to ensure the training of highly qualified personnel in all major areas of socially useful activities in accordance with the needs of society and the state, to meet the needs of an individual in intellectual, cultural and moral development, to deepen and expand education, scientific and pedagogical qualifications (Federal law of 29.12.2012 N 273-FZ).

The government of the Russian Federation has identified several key tasks of higher education based on the challenges that have developed under the influence of the digital transformation of the social order in accordance with the passport of the national project "Education" (Passport of the national project "Education". Approved by the Presidium of the presidential Council for strategic development and national projects on 24.12.2018):

‾ to meet the ever-increasing demand for strategic sectors of the Russian economy in particularly significant technological areas of development, specialties and professions and provide them with personnel, that has a high level of universal, general cultural and professional competencies;

‾ to create a comprehensive system for the supply of research personnel that can meet the technological challenges;

‾ Russia's entry into the top 10 countries in the world in terms of the level and quality of education;

‾ to increase the number of Russian universities in the top 500 global University rankings.

The activity of higher education organizations covers several institutional markets, namely: the direct market of educational services, the labor market, the market of technologies and innovations (Glazyev, 2018). At the same time, these markets are interconnected. The education sector should meet the needs for highly qualified personnel for promising sectors of the economy, providing a foundation for scientific and technological development of the socio – economic system. Currently, the higher education system in the Russian Federation consists of 741 higher education organizations, with a network of 596 (Rosstat, 2020). Provided that 91% of organizations of state and municipal ownership are subordinate to the federal executive authorities, and 9% are under the jurisdiction of municipalities and subjects of the Russian Federation. The founders of higher education organizations are 19 branch ministries and departments, most of the organizations are subordinate to the Ministry of Science and Higher Education of the Russian Federation.

The spatial and territorial network of higher education organizations in the Russian Federation is extremely uneven. Thus, the Central Federal district (518 organizations, 12 of them are research universities, in turn 6 of them are participants of the 5/100 project, 127 organizations operate in Moscow), the Volga Federal district and the Siberian Federal district are the most well-provided with educational institutions of higher education (Ministry of Science and Higher Education, 2020).

Half of the Russian Federation constituent entities have less than 6 higher education organizations, and 11 constituent entities have less than 2 organizations. And only the branches of the main universities operate in the Yamalo-Nenets and Chukotka Autonomous Okrugs.

The law "On Education" provides for several levels of higher education: bachelor's degree / specialist's, master's degree, training of highly qualified personnel (post-graduate, external post-graduate, doctoral). Terms of training are also regulated. Obtaining a bachelor's degree provides training for 4 years, a specialist's degree – 5 years, and a master's degree - 2 years. In the Russian Federation, it is possible to implement the educational process in the following forms: full – time education, part-time education, combined full-time and part-time education. There is also a system of additional education aimed at implementing the educational principle of "lifelong learning" (Dneprovskaya, 2018). Additional professional education allows acquiring the competencies that are either not formed by the main program of higher education, or the need for which arises in the course of professional activity of the carrier of human intellectual capital. According to Rosstat (2020), in the 2018/2019 academic year, 4.2 million people were enrolled in higher education programs in the Russian Federation, 59% of them were enrolled in full-time education. Funding of students in the higher education system is possible from three sources: budget allocations (state assignment to higher education institutions), a contract for the provision of paid educational services, and employer-sponsored education. In the Russian Federation, at the start of 2020, 45.9 % of students study at the expense of budget funds (1.9 million people, 10.7% of them are enrolled in employer-sponsored education, and 54.1 % are getting paid education.

Currently, the areas of training in the field of engineering and technical sciences are very popular, as well as there is an increase in applicants for pedagogical, medical, natural, mathematical and agricultural majors (Idrisov et al., 2018). The number of students studying social sciences has significantly reduced. As of 01.01.2020, the number of academic staff in higher education organizations is 243.8 thousand people, 72% of them with postgraduate degrees, 47% have an academic title. It should be noted that the teaching

staff of higher education institutions is subject to aging factors, the share of young teachers under the age of 30 is only 7% of the total number of academic staff.

2. Problem Statement

The relevance of the research is determined by the need to change the landscape of higher education organizations. This is urgent for the formation of an effective mechanism for developing the competencies of specialists in prospective, strategically important sectors of the economy. It is mandatory to take into account the global digital transformation of education. To determine the directions of higher education development at the present stage, it is necessary to make a theoretical understanding of the quality and content of educational programs. An effective quality monitoring system should be used. It is necessary to verify the mechanisms of system critical analysis. Digitalization provides chances for education to make academic mobility tracks more variable.

3. Research Questions

Currently, the Ministry of Science and Higher Education is planning to implement the strategic academic leadership program. It is expected to be implemented until 2024. The main principle of the program is to create consortia of universities, scientific organizations and industrial partners in order to develop higher education and achieve national goals, which are reflected in the National projects "Education" and "Science" (Passport of the national project "Education". Approved by the Presidium of the presidential Council for strategic development and national projects on 24.12.2018). It is assumed that the winners of the competitive selection under this program will receive grants for development and will be able to apply for the status of a National Research University (NRU) and a National Flagship University (NFU). Higher education organizations are implementing distance digital technologies based on various electronic platforms. There are several research questions that this study seeks to answer. What are the inertial dynamic changes in the existing system of higher education in Russia? What are the advantages and disadvantages of distance learning? Is it possible to implement individual educational tracks under the current conditions of distance interaction "student – university"?

4. Purpose of the Study

The analysis of the current level of development of higher education in the Russian Federation will allow revealing the inertial dynamic changes in the system of higher educational organizations. The study of dynamic changes will make it possible to forecast the development trend. Russia is a country with a huge territory and significant territorial differences. That is why it is necessary to assess the territorial differentiation of the educational landscape. It is important to study the quality of student admission in terms of funding sources. Adaptation of the academic community to work in the context of digital transformation of the educational process is a necessary condition for ensuring high quality education (Park, 2020). It is possible to suggest a hypothesis about the impact of digital transformation of higher education on the quality of training in higher education institutions in the country.

5. Research Methods

Theoretical and empirical methods were applied in the course of the research. General logical and systematic approaches were used. Statistical research methods were adopted for the purpose of this study. Statistical tools assume dynamic analysis. The correlation between the studied indicators was studied using multiple correlation analysis. Modelling of statistically significant correlation was performed with the regression analysis tool. The analytical part of the study was performed in MS Excel and GRETL.

6. Findings

Since 2013 the landscape of the higher education market has been changing in the Russian Federation. The state policy is aimed at withdrawing educational organizations with low quality of service from the market. The emergence of a large number of private educational institutions in the higher education sector has been accompanied by a decline in the quality of training (Pugach, 2020). Over the period from 2013 to 2019, the number of independent educational organizations in the higher education market of the Russian Federation decreased in absolute terms by 245 units. The average rate of decline for the period was 4.08%. The sharpest reduction in the number of organizations was observed in 2015-2016. So, in 2015, compared to 2014, the number of organizations decreased by 54 units, and in 2016, compared to 2015, by another 78 organizations. The structure of higher education institutions in terms of ownership has generally changed, but the difference in structures is not significant. The number of state and municipal organizations increased by 8% in 2019 compared to 2013.

The number of students is subject to significant fluctuations. The rapid growth of the students in Russia began in 1995 and reached its peak of 7.5 million in 2008. Since then, the number of students has been decreasing due to demographic reasons. The dynamics of the number of students for the period 2013-2019 is shown in Figure 1. For the period from 2013 to 2019, the number of students decreased by -1,578,344 people. The average growth rate for the period was -4.53% per year. The downward trend in the student population will continue until 2021, then, it is projected to grow to 4.8 million people by 2024.
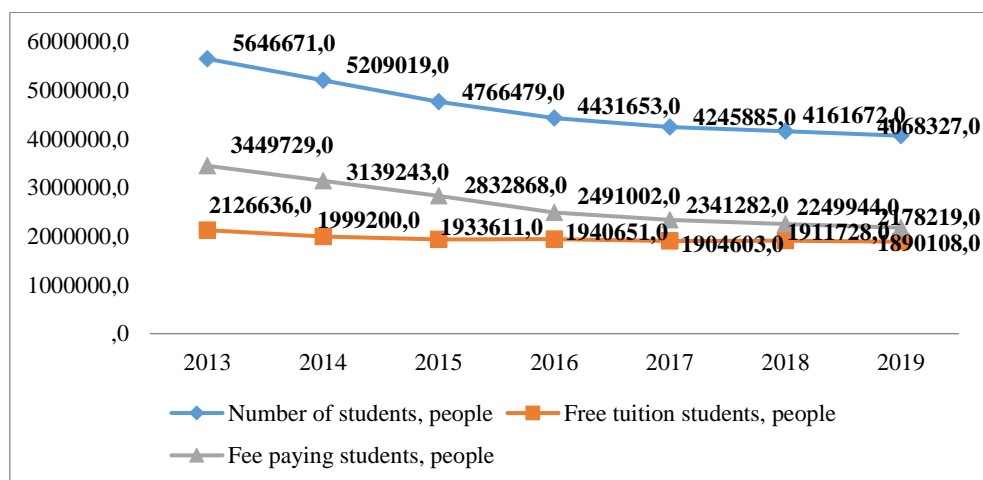
Figure 1. Inertial dynamic changes in the higher education from 2013 to 2019

Source: author.

While there is a tendency of reducing the number of students enrolled in undergraduate programs (from 3.2 million in 2016 to 2.9 million in 2018); an increasing number of students in specialist's programs (from 0.68 million in 2016 to 0.72 million in 2018) and master's programs (from 0.45 million in 2016 to 0.54 million in 2018).

The remuneration of academic staff in educational organizations increased significantly during the period from 2013 to 2019. That indicates the increased attention of the state towards higher education. In 2019 compared to 2013 the growth rate of the indicator was 200% for teachers and 254% for researchers.

According to this international rating, Russia ranks 50th among 188 countries and is included in the group of countries with "high human potential". The main factor in maintaining and increasing the share of the population with higher education is the formation of admission quotas (AQ) at the expense of the federal budget. Table 2 shows the total enrollment figures for students, within the admission quotas students with full reimbursement of tuition costs.

Data analysis allowed reaching the following conclusions (Ministry of Science and Higher Education, 2020):

1.The admission of students to the 1st year for the period from 2013 to 2019 decreased by 117.1 thousand people. That marked a negative dynamic trend.

2.The admission of students for the 1st year within AQ as a whole for the period under review increased by 9.1 thousand people.

3.The admission of self-financed students to the 1st year is characterized by a downward trend. Absolute growth for the period from 2013 to 2019 amounted to 126.2 thousand people.

4.The overall reduction in university admissions was due to a decrease in the number of self-financed students, which is hypothetically explained by a drop in real incomes of the population during the period under review.

It should be noted that the Federal law "On education" allocates places in higher education institutions within admission quotes funded from budget according to the standard: for every 10 thousand people of the population aged 17 to 30 years living on the territory of the Russian Federation at least 800 budget places in higher education institutions of the country are allocated. In the period from 2014 to 2019, every second graduate of a secondary school hypothetically had the opportunity to enter a university and be taught at the expense of the budget. For example, the total amount of state-financed places for bachelor's, master's, specialist's programs, postgraduate research and teaching staff training programs, residency programs, and assistant-internship programs for the 2018/19 academic year was about 540 thousand budget places.

It should also be noted that there is a significant differentiation in the availability of higher education depending on the geography of the region and its level of economic development. The largest coverage of the population aged 17-25 years in higher education institutions is provided in the Moscow region (Moscow and the Moscow region - 49.2%), Tomsk region (46.4%). In almost half of the regions the coverage is less than 28%. In the Nenets and Chukotka *Okrugs*, the Republic of Dagestan, the Republic of Altai, Chechnya, Ingushetia, the Republic of Tuva and Yamalo-Nenets Autonomous *Okrug*, the access to higher education is complicated. Among the regions with the lowest level of territorial accessibility are the Khabarovsk

Territory, the Magadan region, the Republic of Buryatia, the Trans-Baikal Territory and the Sakhalin region.

In order to develop a predictive assessment of the development of higher education in the Russian Federation, a correlation and regression analysis of the statistical relationship between the indicators was performed, where:

Y − number of fee paying students enrolled, people;

X_1 – monthly per capita income, rub.;

X_2 - population below working age, thousand people;

X_3 − average annual number of employees, thousand people.

The analysis was based on a spatial statistical population consisting of 85 constituent entities of the Russian Federation for the time period is 2018. Three anomalous sampling units (outliers) were identified: the Federal cities, i.e. Moscow, Saint Petersburg, and Sevastopol. These constituent entities of the Federation have the maximum number of students enrolled with full tuition cost reimbursement, which differs sharply from the average level. This fact could be explained by the excessive concentration of the country's strongest universities in these cities. Further correlation and regression analysis was performed for the statistical sample of 82 regions. In the process of correlation analysis, a multiple correlation coefficient was calculated, the statistical significance of which was established by applying Student test at the 5% significance level:

$$r_{selected\ set} = 0,64;\ \alpha = 0,05;\ t_{est.} = 7,49;\ t_{critical\ two-sided} = 1,99\ .$$

The least squares method implemented in the Gretl application package was used to model the dependence of the number of students enrolled with full tuition cost reimbursement on the average per capita monetary income of the population, the population below working age, and the average annual number of employees in the region. The model specification was:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \varepsilon. (1)$$

In the process of model verification (1), the estimation of the theoretical regression coefficient $\hat{b}_1$ was found to be insignificant. The regressor X_1 was excluded from the regression analysis process. Statistical estimation (parameterization) of a regression model without a regressor was:

$$\hat{Y} = 1000,72 - 25,97X_2 + 18,5X_3. (2)$$
$$\quad (1794,72) \quad (10,18) \quad (2,95)$$

Standard errors of estimates of theoretical regression coefficients were calculated with a correction for heteroscedasticity, i.e. they are robust standard errors. Theoretical estimates of the regression coefficients are statistically significant at the 5% level. The normalized coefficient of determination was 71.45%, which indicates a high explanatory power of the constructed econometric model. It should be noted that the significance of the coefficient of determination was established using Fisher-Snedecor test (p-value = 2.60-14).

Thus, by increasing the number of employees in the constituent entity of the RF will increase the number of self-financed students under the constant size of the population below working age. If the population below working age increases, the number of students with full tuition cost reimbursement will decrease while the number of employees in the region remains constant. Based on the constructed model, it is possible to build a point forecast of the number of students enrolled with full tuition cost reimbursement

for the "average" region, i.e. a region with an average population below working age and an average employment level for the country: $\overline{X_2} = 300$; $\overline{X_3} = 712{,}6$: $\widehat{Y_p} = 6393$ people.

Based on a time series of values of the number of students with full tuition cost reimbursement for the period from 2013 to 2019, analytical smoothing was performed according to the specification model:

$$Y_t = b_0 + b_1 t + b_2 t^2 + \varepsilon. \quad (4)$$

The results of the least squares modeling, which in turn is based on a time series consisting of 7 observations, are shown in Figure 2.

Y = 31587x² - 1E+08x + 1E+11
R² = 0,9951
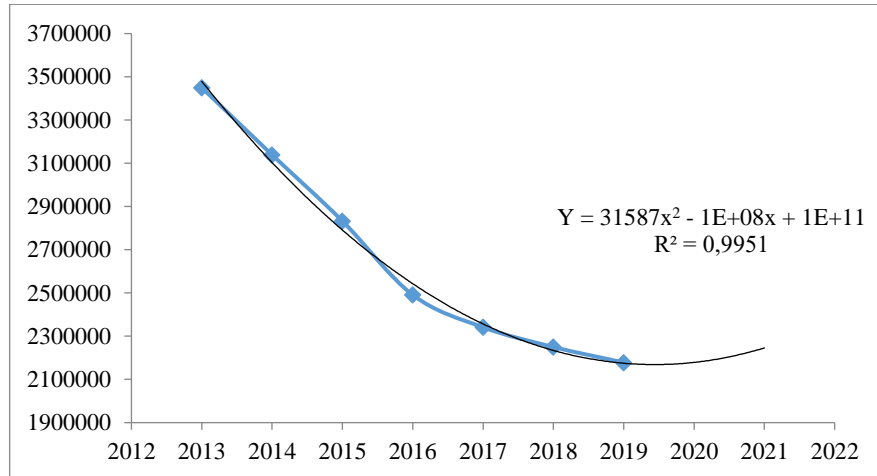
Figure 2. Analytical smoothing of index values for the number of students enrolled with full tuition cost reimbursement from 2013 to 2019

Source: author.

Using the second-order polynomial trend model shown in Figure 2, it is possible to calculate a point forecast for the number of students enrolled in Russian universities in 2020. This number equals to 2 178 694 people. The forecasts provide the basis for determining the volume and profiles of personnel training in the higher education system, determining priority professions for additional professional education and vocational training, and making managerial decisions for the labor market and employment of the population. Given the above, it is possible to put forward a hypothesis about the growth of the education quality in Russian universities, taking into account the digital transformation of higher education. Only the strongest universities that can transform the educational process taking into account global trends, namely: the use of remote educational technologies, the globalization of the educational space with the rapid growth of high-quality digital content of leading universities and national and global educational platforms, the introduction of individual educational tracks for their students, will remain on the market of educational services.

7. Conclusion

7.1. The key findings of the evaluation

Higher education system is connected with the labor market, scientific organizations, and the economy as a whole is both directly and indirectly. At the same time, the higher education system should not only provide rapid response to current demand, but also prepare highly qualified personnel to work in the conditions of dynamical technological changes. This implies a change in the management model of higher education at the state level. One of the elements of the model could be the implementation of a strategic academic leadership program aimed at transforming the network of higher education institutions.

7.2. Limitations

The study did not include an analysis of data for the first half of 2020, as the data from state and departmental statistics are not available for objective reasons.

7.3. Future research

The research can be expanded in terms of studying the relationship between the introduction of individual educational tracks in higher education institutions and the number of students enrolled with full tuition cost reimbursement. It would be interesting to analyze the results of the program of strategic academic leadership in universities, and the changes in the landscape of educational organizations in the course of its implementation.

7.4. Lessons learned

Current trends in the digital transformation of higher education will lead to an even greater contraction of the educational organizations segment in Russia. The growth in the number of educational platforms with high-quality online content, on the one hand, will increase the academic mobility of students in the context of individual educational tracks. On the other hand, only large universities with substantial state funding and clear multi – profile educational programs in digital format will be competitive in the market of educational services in the nearest future.

References

Dneprovskaya, N. V. (2018). Assessment of the readiness of Russian higher education for the digital economy. *Statistics and Economics, 15*(4), 16-28.

Federal law of 29.12.2012 N 273-FZ "On education". https://fzrf.su/zakon/ob-obrazovanii-273-fz/

Glazyev, S. Yu. (2018). Information and digital revolution. *Eurasian Integration: Economics, Law, Politics, 1*(23), 70-83.

Idrisov, G. I., Knyaginin, V. N., Kudrin, A. L., & Rozhkova, E. S. (2018). New technological revolution: Challenges and opportunities for Russia. *Voprosy Ekonomiki, 4,* 5-25.

Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life – How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management, 55,* 102183.

Ivanova, S. V., & Ivanov, O. B. (2020). Education in the era of the fourth industrial revolution: Development vector, prospects and challenges for Russia. *Space and Culture, India, 7*(5), 70-79.

Ministry of Science and Higher Education (2020). Statistical information in research and development and higher education. https://www.minobrnauki.gov.ru/ru/activity/stat/highed/index.php

Mohmmed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020). Emergency remote teaching during Coronavirus pandemic: The current trend and future directive at Middle East College Oman. *Innovative Infrastructure Solutions, 5,* 72.

Park, Y. (2020). Uncovering trend-based research insights on teaching and learning in big data. *Journal of Big Data, 7,* 93.

Passport of the national project "Education". Approved by the Presidium of the presidential Council for strategic development and national projects on 24.12.2018. http://static.government.ru/media/files/UuG1ErcOWtjfOFCsqdLsLxC8oPFDkmBB.pdf

Pugach, V. F. (2020). Mass higher education in Russia: Features of dynamics. *Vysshee Obrazovanie v Rossii, 29*(2), 74-82.

Rodríguez-Abitia, G., Martínez-Pérez, S., Ramirez-Montoya, M. S., & Lopez-Caudana, E. (2020). Digital gap in universities and challenges for quality education: A diagnostic study in Mexico and Spain. *Sustainability, 12*(21), 9069.

Rosstat (2020). Regions of Russia. Socio-economic situation. https://rosstat.gov.ru/bgd/regl/b19_14p/Main.htm

Vicente, P. N., Lucas, M., & Carlos, V. (2020). Higher education in a material world: Constraints to digital innovation in Portuguese universities and polytechnic institutes. *Education and Information Technologies, 25,* 5815-5833.