# UNIVERSITY SPACE ORGANIZATION IN REGIONAL SPACE SYSTEM: METHODOLOGY OF ANALYSIS AND EFFECTIVENESS EVALUATION OF THE VOLGA FEDERAL DISTRICT

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Abstract: The emerging challenges, expressed in the accelerated development of reproductive processes, require the adaptation of the institutional space that ensures the solution of strategically important and priority tasks. Among them is the technological breakthrough in the sectors of economy, which is practically impossible to implement without an effective organization of scientific and educational environment. In this regard, an extremely topical issue at the current time is the search for the ways and the mechanisms that make it possible not only to understand the current situation in the sphere of regional and, accordingly, national organization of the university space, its relevance to current and future needs in RF labor market, but also to identify the main trends that facilitate the speedy transformation of functional processes in the considered sector of social and economic sphere. The purpose of this study is a comprehensive analysis and the evaluation of the training system development effectiveness for highly qualified personnel in the regional context and the development of the trends on this basis for the adaptation of the university space within regional economic systems in accordance with the personnel needs of the economy. The subject of the study is the organization of higher education in the region within the context of higher education institution profile orientation analysis within the area of educational training program implementation. In the course of the assessments, the clustering of the Volga Federal District regions was carried out depending on the functional orientation of a high school, its market orientation, and qualitative characteristics for the purpose of regional higher education system typology development, which can serve as the basis for higher education management model development in the regional context.

Key words: regional higher education system, staffing needs, labor market, the clustering of higher education space, the quality of higher education development, educational programs, region competitiveness.

## 1 Introduction

At the current time, the issues concerning the prospects and the opportunities for the transition of Russian economic system to the so-called channel of the fourth industrial revolution, which is called Russia 4.0 conventionally. This type of economic development is based on absolutely new principles of human development, which is based on almost complete absolutization of cooperation process in human, biological and digital technologies. It is sufficient to note that according to the estimates of a number of leading experts and expert agencies, it is expected that by the end of 2035 the number of robotic and automated workplaces will reach about 95%, about half of the current jobs will be unclaimed (Kalinina, 2017).

It should be noted that Russian economy has significant potential not only in terms of synchronization, global trends, the process of entering the fourth industrial revolution, actively absorbing the global economic system, but also the signs of a fast-moving transition to a new type of economic order. At the same time, despite an active role of the state in this issue, expressed in particular by the development and the implementation of the state program "National Technological Initiative" (Ferrer et al, 2015), the most important factor that justifies or, on the contrary, refutes the theses on the possibilities of Russian economy transition to a new reality, is the degree of economic entity readiness for such transformations and changes, as well as the level of institutional infrastructure that provides this process. Undoubtedly, this measure of preparedness in a natural evolutionary way, combined with the measures of state influence, will reach its apogee, and Russian economy will be integrated into global trends that provide for the replacement of a new technological order. The only questions are the following: when will this happen and what are the key factors that will contribute to this and what is the quality of such a transformation?

## 2 Methodology

One of the key factors in the process of the national economy and its regions effective development is traditionally the level and the quality of higher education development. A particularly topical issue in the context of this problem is the analysis of the structure quality and the functional organization of the higher education system. This is conditioned by a number of reasons, the most significant of which are determined by the need to create an adapted system of qualified personnel training in accordance with current and future needs for labor resources in the national and regional markets.

It should be noted that under the conditions of the administrative-command economy, especially in the era of its industrialism, this issue was given a very significant and close attention, somewhat reduced during the transformation of the institutional reforms of the 1990-ies. It is enough to draw attention to the fact that the state policy of the USSR clearly defined the corresponding priorities for the development of higher education system in accordance with the emerging needs in the labor market. In accordance with them, as the result of the efforts concerning the "connection" and the adaptation of higher education system to the staffing needs of economy (and partly to the development needs), three main types of higher education institutions were developed (Kuzminov et al, 2017; Gafurov et al, 2011).

1. Universities created by the territorial-production principle. Their functions consisted in the staffing of the regional socio-economic system specific sector.
2. Sectoral universities, focused on staff provision for a specific economy sector on a national scale.
3. Classical universities, training staff for science and other universities.

Unfortunately, it is worth noting that despite a significant recent progress in an effective development of higher education, its functional content still requires institutional reforms.

Thus, taking into account the foregoing, the issue of synchronizing the process of the training system with the emerging demand for labor, which is corrected in accordance with global trends, is an acute one in Russian economy at the current moment. The solution of this issue is a very difficult task and requires an integrated, systematic approach.

One of the methodological approaches contributing to the solution of the raised issue on the conformity of the higher education system to the generating needs in the labor market can be the tool which allows to determine the share of universities grouped in accordance with the above classification, in their total number within the higher education system.

In accordance with the indicated approach, and also guided by the group of universities, which is relevant for the industrial economy of the USSR, the systematization of the higher educational institutions of the Privolzhsky Federal District is implemented in the context of its separate regions. At the same time, the approach was chosen as an essential tool for the implementation of this stage of the study, according to which an institution membership in the corresponding category was determined on the basis of concentration coefficient value calculation concerning applied training trends (Herfindahl-Hirschman index).

$$HHI = S_1{}^2 + S_1{}^2 \ldots + S_n{}^2 \qquad (1)$$

where

$S_1, \ldots, S_n$ — the distribution of the reduced contingent of students by the branches of science in their total volume.

This index characterizes the level of university specialization in the areas of training determined in accordance with the traditional classification.

The logic of higher education institutions distribution into conditional groups (multidisciplinary (classical in accordance with the graduation of the USSR universities) and monoprofile) is formed on the basis of the current value comparison of university HHI coefficient to the average value in the area ($HHI^{округ}_{ср.}$) – the general range of values of the analyzed sample (Formulas 2, 3).

$$HHI_{ВУЗа} > HHI^{округ}_{ср.} \rightarrow \text{versatile university} \quad (2)$$

$$HHI_{ВУЗа} < HHI^{округ}_{ср.} \rightarrow \text{versatile university} \quad (3)$$

In a concentrated form, the procedure of university distribution into two conditional groups is shown on Fig 1.

| Distribution of universities by the criterion of the reduced student contingent according to the branches of science |
|---|
| mathematical and natural sciences · engineering, technology and technical sciences · healthcare and medical sciences · agriculture and agricultural sciences · science of society · education and pedagogical sciences · humanitarian sciences · art and culture · defense and state security, military science |

Determination of the value for the index $HHI_{ВУЗа}$ – the indicator that characterizes the concentration of university training trends

Determination of the average value by the federal district of the index $HHI^{округ}_{ср.}$

Grouping of higher education institutions by profile

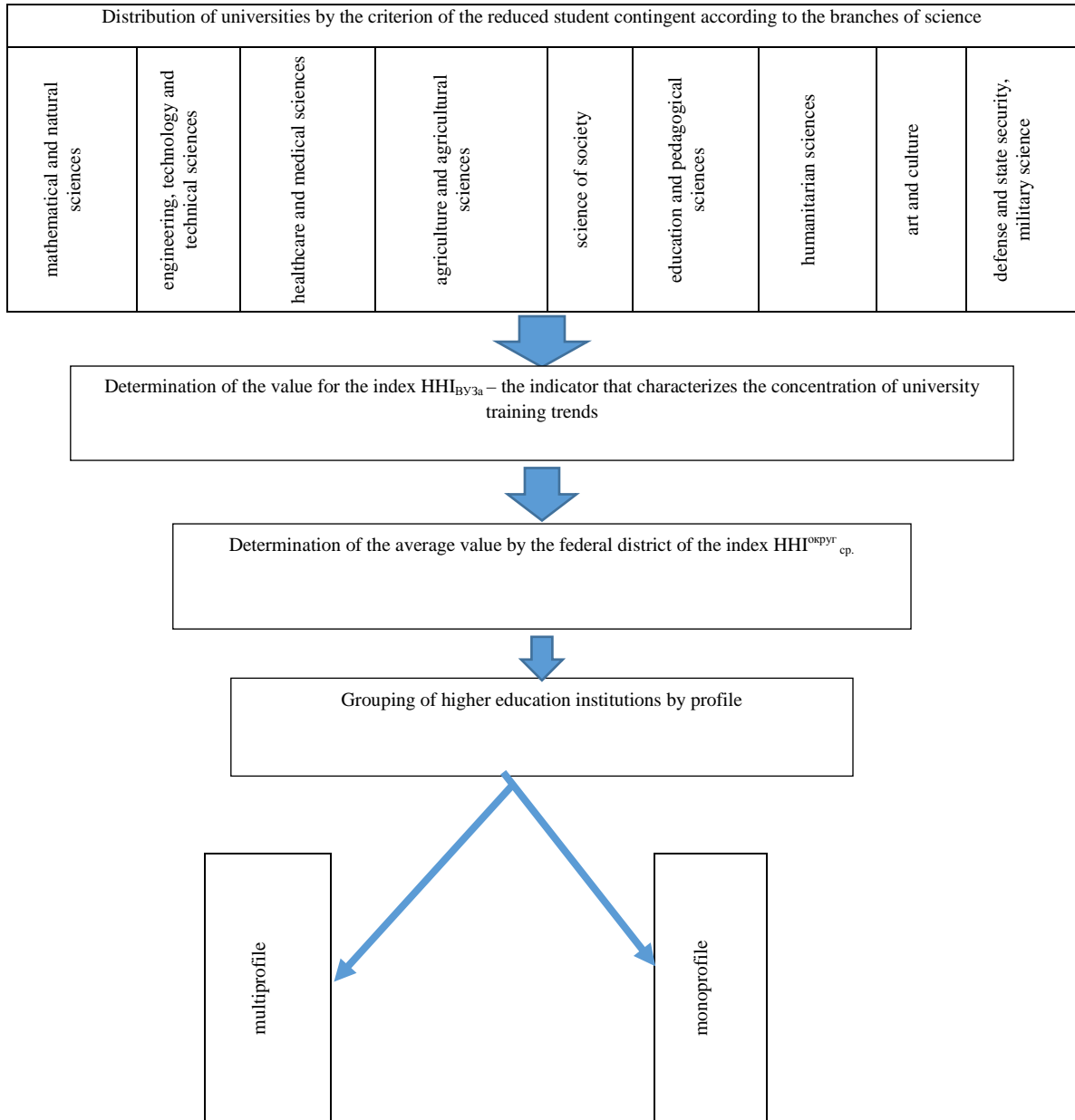multiprofile                                    monoprofile

Fig 1. The procedure for the distribution of universities into two conditional groups in accordance with the orientation toward a mono-multidisciplinary approach to educational program implementation

The results of the assessments in the context of the Volga Federal District regions are shown on Fig 2.
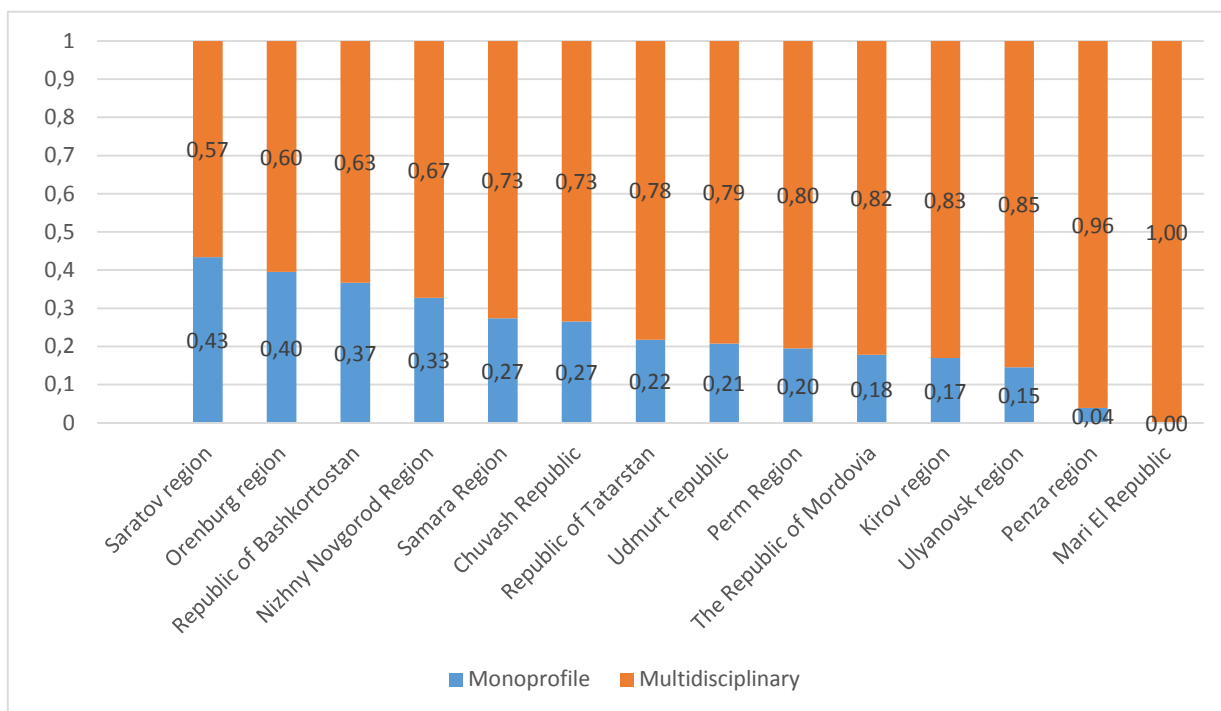


Fig 2. The ratio of mono-profile universities to multi-profile ones in the regions of the Volga Federal District (in order of single-profile university decrease) was developed by the authors

## 3 Results and Discussion

In accordance with the received estimates, the system of higher education in modern Russia has a significant imbalance between mono-and multi-profile higher education institutions. On the average, the share of single-profile universities in the district is about 23% of the total number of educational institutions (Zimmerman, 2008; Timofeeva et al, 2017).

According to the implemented evaluations obtained within the framework of a comprehensive analysis of higher education regional system competitiveness, in accordance with the previously proposed methodological approach, the main characteristic features of the current state of affairs in the sphere of the university space organization are determined by the example of the Volga Federal District.

In accordance with them, it was established that the regions of the Volga Federal District, such as the Saratov Region, the Orenburg Region, the Republic of Bashkortostan, the Nizhny Novgorod Region, the Samara Region, the Chuvash Republic and the Republic of Tatarstan (Fig 3) have the highest level of efficiency of training system organization efficiency for the training of highly qualified personnel, from the point of view of the following ratio: mono-profile universities to multi-profile

ones. This is due to the fact that the share of multidisciplinary universities makes 20 - 40%, in the structure of the university space of the regional systems under consideration which is significantly higher than for the district on the average.

An important element to analyze the competitiveness of higher education system development in the regions is not only the assessment of the regional university space efficiency, but also the study of additional parameters characterizing the quality of highly qualified personnel training system developed in the region. These include the quality of the reception, as well as the presence of university national status.

In accordance with this approach, and also using the received estimates for the grouping of regional universities in relation to their status to mono-, multiprofile university category, the cluster analysis has been implemented that makes it possible to assess the qualitative characteristics of higher education development in the regions of the Volga Federal District and to allocate regions with similar characteristics on this basis.

The results of the cluster analysis are presented in Table 1, Fig 3.

Table 1. Cluster analysis of the higher education system development efficiency in the regions of the Volga Federal District of Russian Federation (calculated by the authors on the basis of monitoring data concerning the effectiveness of higher education institutions activities in 2017) (Zimmerman, 2008).

| Region | Number of students assigned to each type from the total number of students | | | | Belonging to a cluster |
|---|---|---|---|---|---|
| | Multiprofile | Monoprofile | Research | Universities for mass education | |
| Kirov region | 0,70 | 0,14 | 0,00 | 0,16 | 3 |
| Perm Region | 0,32 | 0,14 | 0,47 | 0,06 | 2 |
| Bashkortostan | 0,50 | 0,22 | 0,00 | 0,28 | 3 |

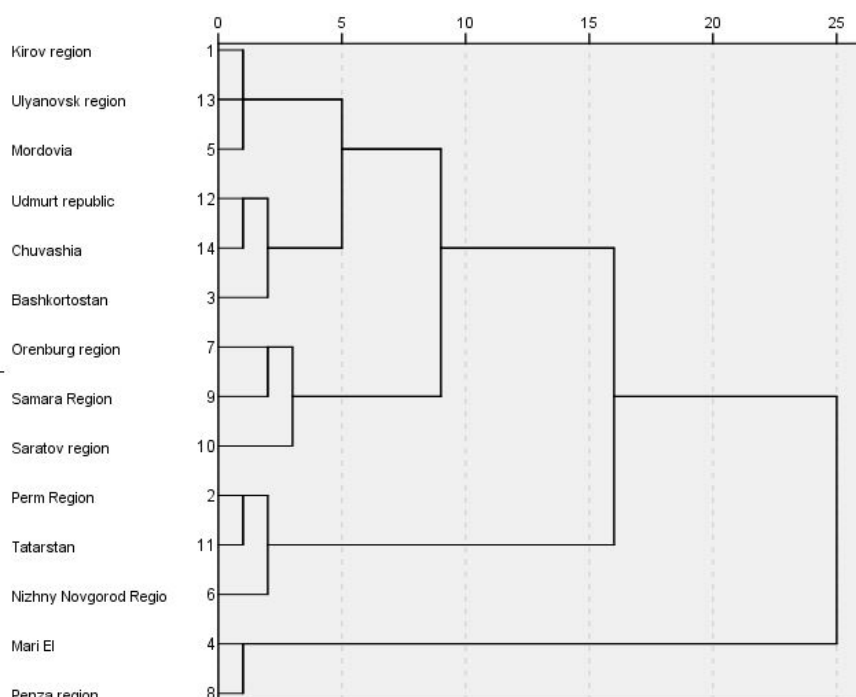| | | | | | |
|---|---|---|---|---|---|
| Mari El | 1,00 | 0,00 | 0,00 | 0,00 | 4 |
| Mordovia | 0,78 | 0,06 | 0,00 | 0,16 | 3 |
| Nizhny Novgorod Region | 0,34 | 0,29 | 0,29 | 0,07 | 2 |
| Orenburg region | 0,60 | 0,38 | 0,01 | 0,00 | 1 |
| Penza region | 0,88 | 0,01 | 0,00 | 0,11 | 4 |
| Samara Region | 0,52 | 0,27 | 0,15 | 0,05 | 1 |
| Saratov region | 0,41 | 0,39 | 0,00 | 0,21 | 1 |
| Tatarstan | 0,35 | 0,11 | 0,42 | 0,12 | 2 |
| Udmurt republic | 0,61 | 0,15 | 0,00 | 0,24 | 3 |
| Ulyanovsk region | 0,71 | 0,13 | 0,00 | 0,17 | 3 |
| Chuvashia | 0,64 | 0,15 | 0,00 | 0,20 | 3 |



Fig 3. Cluster analysis of higher education development effectiveness in the regions of the Volga Federal District

According to the results of the comprehensive analysis, it is necessary to state that four types of regional university space were formed in the VFD (Figure 6):

Type 1: the high school space of the region is characterized by a high proportion of mono-profile universities, the quality of reception of which is at a high level, and the regions of this group are also characterized by a low level of higher educational institutions with a national university status and which are the members of TOP 5-100 project. The regions of this cluster are Orenburg, Samara and Saratov regions.

Type 2: The regions of this group are characterized by a moderate level of universities with the status "multidisciplinary", a high level of higher educational institution number with the status of higher education national institution and enter the project TOP 5-100. The reception quality is low. The regions of

the 2nd type: the Perm Region, the Nizhny Novgorod Region and the Republic of Tatarstan.

Type 3: The regions with an elevated level of multidisciplinary universities that do not have the status of a national institution and are not included in the TOP 5-100 project. The reception quality is low in relation to the regions of other clusters. The regions of Type 3 are represented by the Kirov Region, the Republic of Bashkortostan, the Udmurt Republic, the Ulyanovsk Region and the Republic of Chuvashia.

Type 4: the higher education space of the regions is characterized by multi-profile nature, with a moderate level of quality of incoming contingent, the higher education institutions of this cluster do not have the status of a national one and are not included in the project TOP 5-100.
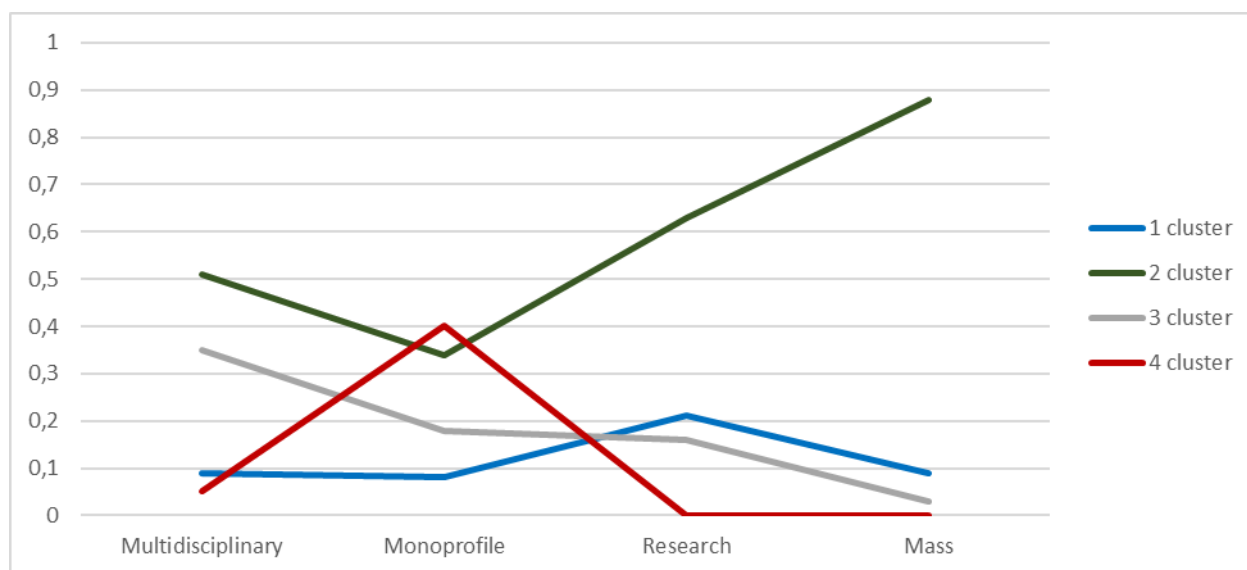
Fig 4. Cluster profiles

**4 Conclusions**

The greatest potential and competitiveness are characterized by the regions belonging to group 1 and 2, since they are characterized by leading indicators on the share of single-profile universities. The regions of the group 2 have an additional competitive advantage, expressed in the presence of a larger number of universities with the national status and entering the project TOP 5-100. Besides, it is necessary to state that the universities of the considered group of regions have a high level of incoming contingent quality.

Regions 3 and 4 of the cluster have lower competitive advantages in the context of the higher education system development effectiveness, since they are characterized by a much lower level of effectiveness in the context of the problems posed in this study.

On the whole, it should be noted that at the present stage of development, despite the obvious breakthroughs that have taken place in the last few years, higher education does not fully meet the expected challenges of future transformations in the system of global reproduction processes based, among other things, on the digitization of the economy, which determines a new type of labor market organization and development, the new trends in labor productivity development and the new creative potential of society. Meanwhile, a new type of economic growth requires new forms of higher school system organization aimed at the development of such activities and the types of labor organization that would contribute and organically meet new labor market needs in 15-20 years.

In many ways, the current state of affairs is conditioned by the lack of attention to the higher education sector in the 1990-ies (Altbach & Salmi, 2011; Buckingham, 2003; Safiullin et al, 2017). However, despite the significant intensification of development activation processes concerning higher education system since the 2000-ies, the problems acquired in the era of "perestroika" still remain. The most important of them are an ineffective structure of higher education system functional organization in the regions and, accordingly, in the national economy as a whole (Jonassen et al, 1999). Using the example of the Volga Federal District regions it was established that the share of higher educational institutions with the status "multidisciplinary" reaches 60 and more percent on the average in the general "field" of the university system of the region.

**5 Summary**

Thus, it can be stated that the key problem of Russian universities is the "isolation" from the real economy sector and from the modern achievements in science and technology. In this regard, it is required to implement targeted measures aimed at the harmonization of these phenomena and processes as the result of network relation development with the external and internal environment of universities, as well as an effective organization of a regional university space. The inertial development of higher education system in Russia under the current conditions, apparently will not allow the Russian economy to move to the trajectory of an accelerated technological development.

The system of higher education is the link that can and must ensure a qualitative transition of the Russian economy to the channel of the fourth industrial revolution and forms a stable basis for economic growth. However, in order to implement this process, they need a significant reassessment of higher education values and development formats for university and the entire education system as a whole. And first of all, they require the institutionalization of new functional processes and results and new principles for higher education organization (Eisenstadt & Roniger, 1999).

The elimination of the identified problems in the sphere of higher education will create the basis that promotes more progressive and accelerated development of the national economy during the next long-term economic cycle, at the beginning of which the national economic system is placed now.

**Literature:**

1.   Kalinina K. (2017). The ways of the country to the fourth industrial revolution. [Electronic resource], URL: https://www.rbc.ru/opinions/economics/13/01/2017/5878d2389a 79470077130332
2.   Ferrer K., Villalobos Antúnez J.V., Morón A., Montoya C., Vera L. (2015). Estilos de pensamiento según la teoría de cerebro integral en docentes del área química de la Escuela de Bioanálisis, Multiciencias, 14(3), pp. 281-288.
3.   Kuzminov Y.I., Semenov D.S., Frumin I.D. (2017). The structure of the university network: from the Soviet to Russian "master plan" [Electronic resource], URL: https://www.hse.ru/ data/02/15/1328107666/Kusminov_%C2%A0New.indd_008.pdf
4.   Gafurov I.R., Safiullin M.R., Elshin L.A. (2011). The mechanisms and the trends of higher education development in the system of innovation and technological development of the

national economy, Alma mater (Bulletin of the Higher School). No. 11, pp. 5-10.

5. Zimmerman B. (2008). Investigating Self-Regulation and Motivation: Historical Backgraund, Methodological Developments, and Future Prospects, B. Zimmerman, American Education Research Journal. 45(1), pp. 166-183

6. Altbach P.G., Salmi J. (2011). The Road to Academic Excellence: The Making of World-Class Research Universities. World Bank Publications, No.64668

7. Buckingham D. (2003). Media Education: Literacy, Learning and Contemporary Culture. Cambridge, UK: Polity Press, p. 219.

8. Safiullin M.R., Elshin L.A., Abdukaeva A.A. (2017). The features of innovative and technological development of Russia in the system of higher education emerging trends , Theoretical and Applied Economics, No. 3, pp. 1-11.

9. Jonassen D., Peck H., Kyle L., Wilson B. (1999). Learning with Technology. A construc-tivistic perspective, NJ: Prentice Hall Inc, p. 234.

10. Eisenstadt S.N., Roniger L. (1999). Patrons, Clients and Friends: Interpersonal Relations and the Structure of Trust in Society. –Cambridge.

11. Timofeeva L.S., Kadyrova M.I., Akhmetova A.R. (2017). The historic city as an object of cultural tourism (on the example of Yelabuga), Astra Salvensis, Supplement No. 2, p. 177-183.