

SOCIAL INFRASTRUCTURE OF THE REPUBLIC OF TATARSTAN AS AN ENVIRONMENT FOR FORMING THE QUALITY OF HUMAN RESOURCES

البنية التحتية الاجتماعية لجمهورية تاتارستان كبيئة لتكوين جودة الموارد البشرية

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Abstract:

The study analyzes the role of social infrastructure in the Republic of Tatarstan in forming the quality of human resources in the region. Key components are examined – educational institutions, the healthcare system, and professional training institutes. The regional specificity of social infrastructure development determines the differentiation of territories by qualitative characteristics of human resources. A system of assessment indicators is proposed, including educational level, qualification skills, cognitive abilities, creative potential, and adaptability. A comparative analysis

of 44 districts of the Republic of Tatarstan and 14 regions of the Volga Federal District was conducted. It was found that the Republic of Tatarstan is among the leading regions in human resource quality, ranking first in the eco-sustainability index. Proposals for improving regional human capital development programs have been developed.

Keywords: social infrastructure; quality of human resources; human capital; educational level; cognitive abilities; creative potential; adaptability.

البنية التحتية الاجتماعية لجمهورية تاتارستان كبيئة لتكوين جودة الموارد البشرية

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ملخص

مقارن لـ 44 مقاطعة في جمهورية تاتارستان و14 منطقة في مقاطعة فولغا الفيدرالية.

وخلصت الدراسة إلى أن جمهورية تاتارستان تُعد من بين المناطق الرائدة في جودة الموارد البشرية، حيث تحتل المرتبة الأولى في مؤشر الاستدامة البيئية. وقد طُورت مقترحات لتحسين برامج تنمية رأس المال البشري الإقليمية.

الكلمات المفتاحية: البنية التحتية الاجتماعية، جودة الموارد البشرية، رأس المال البشري، المستوى التعليمي، القدرات المعرفية، الإمكانيات الإبداعية، القدرة على التكيف.

تُحلل هذه الدراسة دور البنية التحتية الاجتماعية في جمهورية تاتارستان في بناء جودة الموارد البشرية في المنطقة. وتُفحص المكونات الرئيسية، وهي: المؤسسات التعليمية، ونظام الرعاية الصحية، ومعاهد التدريب المهني. وتُحدد الخصوصية الإقليمية لتطوير البنية التحتية الاجتماعية تبين المناطق من حيث الخصائص النوعية للموارد البشرية. ويُقترح نظام لمؤشرات التقييم، يشمل المستوى التعليمي، والمهارات التأهيلية، والقدرات المعرفية، والإمكانات الإبداعية، والقدرة على التكيف. وقد أُجري تحليل

Introduction

The current stage of the country's economic development is characterized by a transition to a knowledge-intensive model of management, where scientific progress, based on the growth of intellectual and human capital, accounts for more than 90% of economic growth in industrially developed countries. The relationship between investments in human capital and economic growth rates is demonstrated both in theoretical research and in the experience of developed nations. The shift in technological and global economic paradigms is characterized by changes in both quantitative and qualitative indicators describing human capital.

The development of the human capital concept dates back to 1962, when the Journal of Political Economy published a series of articles on the central problem of human capital theory. Among the first scholars to study this theory were American economists T. Schultz and G. Becker. They laid the theoretical foundations and made it a subject of scientific inquiry, proposing that human capital is realized through labor resources based on productive skills and knowledge that hold economic value in the future [1][2].

The quality of human resources is becoming a critical factor determining the socio-economic development of regions. By investing in professional development, individuals acquire valuable assets that increase their market value. Companies are interested in attracting and retaining skilled personnel, as such employees provide business sustainability and competitive advantages. Education, healthcare, and cultural institutions form the foundation of the social infrastructure that creates an environment for developing and improving the characteristics of the population.

Regional differences in the accessibility and effectiveness of social sector institutions predetermine the differentiation of territories by level of education, health status, and professional competencies of residents. Differentiation of regions by human resource quality can be reflected through such aspects as the level of competition, desire to maintain status, level of information technology, speed and pace of development, and degree of economic progressiveness.

The Republic of Tatarstan is among the leading regions of the Russian Federation in terms of socio-economic development. The region has a developed social infrastructure, including an extensive network of educational organizations at various levels, medical institutions, and cultural centers. According to the World Bank, Russia ranks 41st in the global Human Capital Index (HCI) rating, with an index of 0.73, or 73% [3]. Russia's education indicators are better than those in many higher-income countries, but its health indicators are below the global average.

The issue of a comprehensive assessment of the impact of social infrastructure elements on the qualitative characteristics of human resources remains insufficiently studied, which determines the relevance of this research. The aim of the study is to analyze the social infrastructure of the Republic of Tatarstan as an environment for

forming the quality of human resources and to develop a system of indicators for assessing their qualitative characteristics.

Theoretical and Methodological Foundations of the Study

The information base of the study comprised statistical data from the Federal State Statistics Service, the territorial body of the Federal State Statistics Service for the Republic of Tatarstan (Tatarstanstat), and statistical yearbooks of 14 regions of the Volga Federal District for the period 2015–2024 [4][5]. The analysis covered data from the 2015 microcensus and the 2020 All-Russian Population Census regarding the educational characteristics of the employed population across 44 districts of the Republic of Tatarstan [6][7].

The research methodology is based on a systems approach to studying the quality of human resources. Methods of comparative analysis, statistical data processing, and the index assessment method were applied. A system of human resource quality indicators was developed, comprising six groups of measures.

The first group – the eco-sustainability index – includes investments in fixed assets directed at environmental protection and rational use of natural resources, and the number of people whose quality of life improves due to the elimination of unauthorized landfills within city boundaries [8][9]. The second group – the educational level index – reflects the share of employed persons with secondary vocational education and the share with higher education.

The third group – the qualification and professional skills index – contains the employment level and the average age of the workforce. The fourth group – the creative potential index – covers the share of entrepreneurial income in all income sources (as an indicator of initiative and risk-taking), the share of production of goods for personal use (reflecting self-sufficiency and adaptability), and the share of employed persons in activities related to culture, art, information technology, and scientific research. The fifth group – the cognitive abilities index – is represented by the share of personnel with academic degrees, the level of digital literacy, the incidence of mental disorders, and life expectancy. The sixth group – the adaptability index – includes the share of households with their own housing and the share of the population that are active Internet users. The complete structure of the developed indicator system is presented in Table 1.

Table 1: System of Human Resource Quality Indicators for the Region

Indicator	Notation
Eco-Sustainability	
Investments in fixed assets directed at environmental protection and rational use of natural resources	X1
Number of people whose quality of life will improve due to the elimination of unauthorized landfills within city boundaries	X2
Educational Level	
Share of employed persons with secondary vocational education, %	X3
Share of employed persons with higher education, %	X4
Employment rate, %	X5
Average age of the workforce, years	X6
Creative Potential	
Share of income from rents, patents, and copyrights, %	X7
Share of entrepreneurial income in all income sources, %	X8
Share of production of goods for personal use, %	X9
Cognitive Abilities	
Share of personnel with academic degrees, %	X10
Digital literacy level, points	X11
Incidence of drug addiction, chronic alcoholism, and alcohol psychoses per 100,000 population	X12
Incidence of mental disorders per 1,000 persons	X13
Life expectancy, years	X14
Adaptability	
Share of households with their own housing, %	X15
Share of the population that are active Internet users, %	X16

Source: compiled by the author

Each indicator is calculated on the basis of normalization of primary statistical values. For indicators with a favorable impact, a formula is applied that scales values to the range from 0 to 1, where the minimum value among the analyzed territories equals 0 and the maximum equals 1. For indicators with a negative impact (e.g., morbidity rates), the inverse normalization formula is used.

The composite human resource quality index is formed as the arithmetic mean of six partial indices. The choice of an equal-weight aggregation approach is justified by the absence of a universal system of priorities for the components of human resource quality: for industrial districts, professional skills and health are critical; for academic centers, educational level and creativity; for rural areas, adaptability and environmental conditions. Equal weights make it possible to avoid subjective bias in assessments and ensure comparability of results across different types of territories. Application of this methodology to the analysis of 44 districts of the Republic of Tatarstan and 14 regions of the Volga Federal District enables identification of

strengths and areas for growth of human resource quality in the region, comparison of territories with one another, and identification of districts with the best and worst human development indicators. The results of the composite assessment of human resource quality demonstrate significant differentiation among the regions of the Volga Federal District. Summary data for the constituent entities of the VFD for 2023 are presented in Table 2.

Table 2: Human Resource Quality Indices of Volga Federal District Regions in 2023

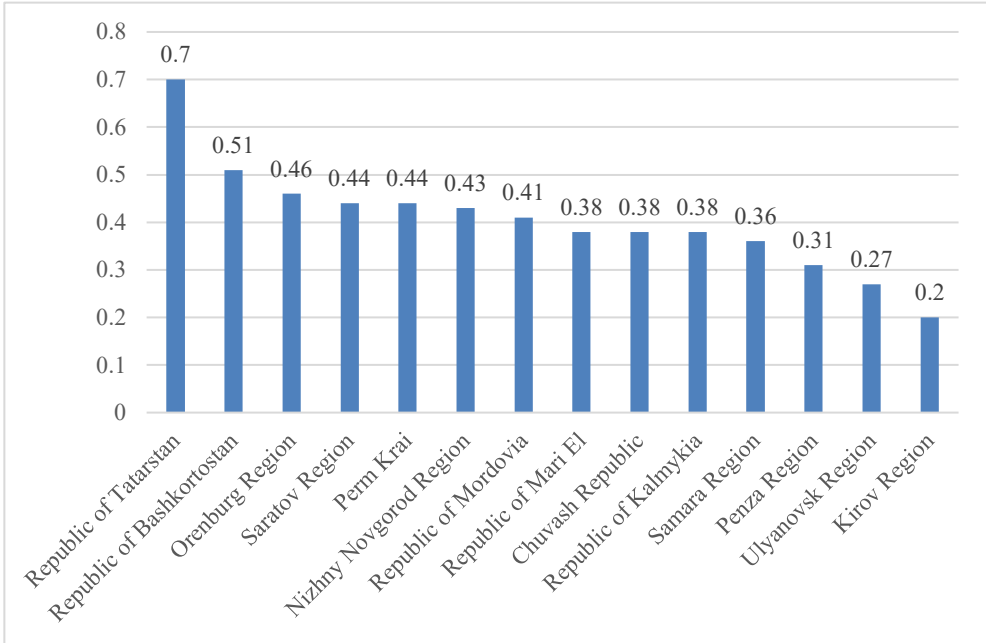
Region of the Russian Federation	GRP (thousand RUB)	ESI	ELI	QPSI	CPI	CAI	AI
Republic of Tatarstan	1 145 173,9	1,00	0,62	0,62	0,14	0,80	1,00
Republic of Bashkortostan	604 343,3	0,64	0,69	0,86	0,39	0,27	0,57
Perm Krai	880 567,5	0,82	0,38	0,90	0,28	0,39	0,35
Nizhny Novgorod Oblast	870 132,1	0,53	0,52	0,46	0,19	0,55	0,24
Orenburg Oblast	961 298,3	0,22	0,50	0,48	0,57	0,51	0,48
Samara Oblast	844 104,3	0,41	0,71	0,24	0,12	0,57	0,42
Saratov Oblast	1 001 258,4	0,35	0,49	0,43	0,38	0,54	0,52
Udmurt Republic	766 752,8	0,10	0,40	0,50	0,51	0,68	0,23
Ulyanovsk Oblast	561 439,0	0,02	0,53	0,31	0,13	0,58	0,22
Kirov Oblast	534 306,1	0,03	0,19	0,19	0,20	0,57	0,09
Chuvash Republic	513 893,6	0,01	0,17	0,67	0,66	0,66	0,17
Penza Oblast	530 871,2	0,02	0,46	0,23	0,57	0,64	0,01
Republic of Mordovia	516 284,8	0,04	0,43	0,27	0,77	0,65	0,41
Republic of Mari El	453 700,8	0,02	0,16	0,71	0,57	0,39	0,54

Source: compiled by the author based on data from Rosstat, Tatarstanstat, and statistical yearbooks of VFD regions.

Note: ESI – eco-sustainability index; ELI – educational level index; QPSI – qualification and professional skills index; CPI – creative potential index; CAI – cognitive abilities index; AI – adaptability index.

As can be seen from Table 2, the Republic of Tatarstan demonstrates clear leadership, occupying the top positions in eco-sustainability (1.00), cognitive abilities (0.80), and adaptability (1.00). High GRP per capita figures are combined with balanced development across all six components of human resource quality. To visually present the results of the human resource quality assessment for the Volga Federal District regions, a graphical representation is appropriate. Figure 1 shows the human resource quality index values for all constituent entities of the VFD.

Fig. 1: Human Resource Quality Index of the Constituent Entities of the Volga Federal District



Source: compiled by the author.

The chart clearly demonstrates that the Republic of Tatarstan holds the leading position among all regions of the Volga Federal District in terms of human resource quality. The significant gap from other constituent entities is explained by the balanced development across all six components of human resource quality, whereas other regions show uneven development in individual areas.

Results of the Empirical Study and Their Interpretation

Analysis of the social infrastructure of the Republic of Tatarstan showed that the region has a well-developed network of educational organizations. According to the 2015 microcensus and the 2020 All-Russian Population Census, the structure of the employed population shows a growing share of persons with higher education [6][7]. Among the 44 urban districts and municipal districts, the leading positions on this indicator are held by Verkhneuslonsky District (43.2% of employed persons with higher education), the city of Kazan (41.8%), and Laishevsky District (38.5%).

The presence of Innopolis University – the country's most technologically advanced university – in Verkhneuslonsky District explains the district's top ranking by share of employed persons with higher education. The concentration of higher education institutions in Kazan (more than 30 universities and institutes) accounts

for the high indicator in the regional capital. Naberezhnye Chelny, the second-largest city in the republic, ranks 6th (35.7%), indicating that residents of major cities in Tatarstan tend to prefer higher education.

Secondary vocational education is widespread in the industrial districts of the republic. The leaders in the share of employed persons with secondary vocational education are Bugulma District (52.3%), Almetyevsky District (51.7%), and Leninogorsky District (50.8%), where large oil extraction and oil refining enterprises operate, requiring skilled workers and mid-level specialists. In the Kama Economic Zone, which includes the Naberezhnye Chelny and Nizhnekamsk industrial hubs, high rates of secondary vocational education are also observed – 49.5% and 48.2% respectively.

The city of Kazan, with its high share of the population holding higher education, demonstrates lower rates for secondary vocational education (38.4%), since residents of the regional capital predominantly focus on obtaining higher education. Calculation of the employment rate across the 44 districts of the Republic of Tatarstan revealed that the leaders are Bugulma District (94.8%), Almetyevsky District (94.3%), and Nizhnekamsky District (93.7%). These trends are explained by the presence of large industrial enterprises in these territories.

The development of social infrastructure in the healthcare sector influences the cognitive abilities of the population through health preservation and increased life expectancy. Trends in average wages in Russia over the period 2015–2024 reflect steady growth – from 34,030 rubles in 2015 to 87,952 rubles in 2024 – which favorably affects human capital in the country. Employment trends in Russia over the same period show a positive trajectory, despite a temporary decline in 2020 due to the COVID-19 pandemic [10].

The Republic of Tatarstan implements programs promoting healthy lifestyles, active longevity, and disease prevention. Indicators of drug addiction, chronic alcoholism, and alcohol psychoses are used in calculating the composite human resource quality index as measures of the population's health status. In 2024, the republican program «Active Longevity» for 2025–2030 was adopted, with a target of increasing the share of citizens over 65 years old involved in active longevity programs to 25% by 2030 [11].

A comparative analysis of the Republic of Tatarstan with other constituent entities of the Volga Federal District based on the composite human resource quality index revealed that the republic is among the group of leading regions. The high educational level of the population, the developed professional training infrastructure, and the attention of regional authorities to environmental issues and rational use of natural resources positively influence the overall assessment.

The Republic of Tatarstan ranks first in the Volga Federal District in the eco-sustainability index, reflecting substantial investments in environmental protection. The regions that invest most in environmental protection and rational use of natural

resources are the Republic of Tatarstan, Perm Krai, the Republic of Bashkortostan, Samara Oblast, and Nizhny Novgorod Oblast. This trend is explained by the fact that these regions are major industrial areas requiring greater expenditure on environmental measures.

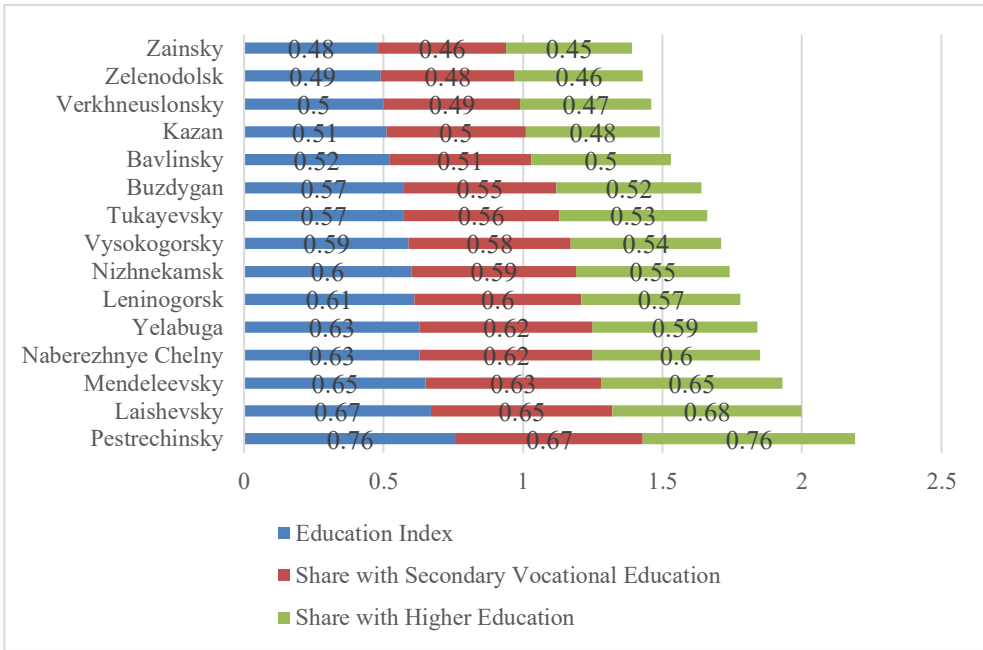
In terms of the number of people whose quality of life improved due to the elimination of unauthorized landfills within city boundaries, the Republic of Tatarstan holds a leading position alongside Nizhny Novgorod Oblast and Orenburg Oblast. In the educational level index, based on the share of employed population with secondary vocational and higher education, the leading districts of Tatarstan are Verkhneuslonsky District, Laishevsky District, and the city of Kazan.

The analysis identified areas requiring additional attention from regional policy. These include the development of the creative potential of the population, increasing adaptability to the conditions of the digital economy, and forming continuous education skills. The republican strategy for socio-economic development includes projects aimed at addressing these identified objectives.

Among the key policy documents, the following stand out: «Creative Industries of Tatarstan», aimed at developing the creative potential of the population; «Learning Region», focused on building a continuous education system; and «Active Longevity», centered on preserving health and extending the active lives of the population [12]. Within the framework of Tatarstan's Strategy goal related to health preservation and longevity extension, the development of healthy lifestyle models, effective advocacy approaches, and programs for the prevention of alcoholism, drug addiction, and tobacco use are envisaged [12].

An ambivalence in the impact of human resources on socio-economic development has been identified: on one hand, the growth of the educational level and qualifications of the population stimulates economic growth, innovation activity, and social stability; on the other hand, it may intensify social inequality and contribute to the outmigration of highly qualified personnel to more developed regions. Analysis of trends in the educational characteristics of the employed population of the Republic of Tatarstan for the period 2015–2023 demonstrates a sustained positive trend of growth in the qualification level of the region's labor resources. Figure 2 presents the leading districts of the Republic of Tatarstan by educational level index.

Fig. 2: Leading Districts of the Republic of Tatarstan by Educational Level Index



Source: compiled by the author based on data from the 2015 Microcensus and the 2020 All-Russian Population Census

As follows from Figure 2, the leading positions in the educational level index are held by the cities of Kazan and Naberezhnye Chelny, as well as Mendelevsky, Leninogorsky, and Bugulma districts. Over the analyzed period, a positive trend of growth in the educational level of the employed population is observed in all considered districts, reflecting positive structural shifts in the quality of human resources in the region and aligning with the target benchmarks of the Strategy for Socio-Economic Development of the Republic of Tatarstan until 2030. The mechanism of influence of human resource quality on the regional economy is mediated by the state of social infrastructure, accessibility of educational services, quality of medical care, and conditions for professional fulfillment.

Conclusion

The social infrastructure of the Republic of Tatarstan creates a favorable environment for forming the quality of human resources. The developed network of educational organizations, the healthcare system, and professional training programs ensure a high level of education, qualification, and health status of the population. The proposed system of human resource quality indicators enables a comprehensive assessment of human potential both within the region by districts and for comparing regions with one another.

A comparative analysis with 14 regions of the Volga Federal District showed that the Republic of Tatarstan is among the leading regions in human resource quality. Its strengths include a high educational level (leaders – Verkhneuslonsky District with 43.2% of employed persons with higher education, the city of Kazan with 41.8%, and Laishevsky District with 38.5%), significant investments in eco-sustainability (first place in the VFD in the eco-sustainability index), and attention to public health matters.

Further improvement is required in the areas of creative potential development, digital adaptability, and continuous learning. A promising direction for future research is an in-depth analysis of the interaction mechanisms between social infrastructure elements and qualitative characteristics of human resources using econometric models, as well as the expansion of the indicator set to include measures of digital literacy, resilience to information overload, and AI-augmented thinking.

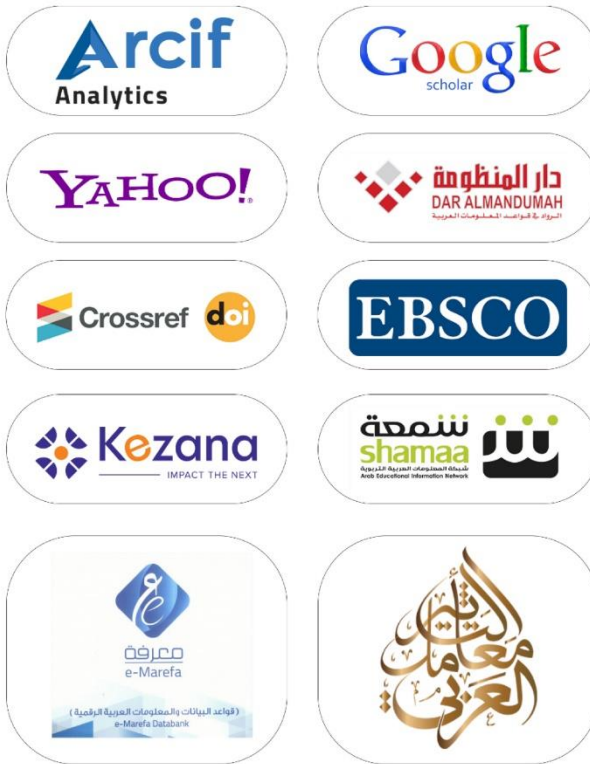
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2025	2024	2023	2022	2021	العام
0.5978	0.3068	0.3759	0.1954	0.2692	معامل أرسيف
1.59	1.55	1.25	1.73	1.60	معامل التأثير العربي