

## Typing the region's economy for staffing requirements forecasting

*The article considers a method that defines type zones in the region's economy in accordance with the intensity of modernization and innovation diffusion processes. The author substantiates the application of unified approaches to forecasting the professional qualification components of staffing requirements in the type zones in accordance with the nature of structural changes. The article presents the results of typing the economy of Krasnoyarsk Krai and its municipalities. It indicates that the use of this approach enhances the accuracy and relevance of the results of the long-term forecast of personnel demand of the regional economy.*

*Regional economic system, economy typing, segments of the economy, staffing requirements, forecast, structure, standard of employment.*



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### Purpose of the work

Staffing requirements of the regional economic system are difficult to forecast due to the fact that a unified approach can't be used for predicting professional qualification components of staffing requirements by the types of economic activity (TEA), since they are *sharply differentiated* according to modernization rate and diffusion of innovation. There is a great probability of obtaining incorrect results of the forecast, because it is difficult to ensure their accuracy and reliability due to fact that the model of staffing requirements should take into account structural changes of the elements of a market subsystem and the differences in the timing of their emergence.

Therefore, the author considers that the task of enhancing the quality of the staffing requirements forecast results brings forward the necessity of typing the region's economy. *The purpose of typing the region's economy* lies in defining among the TEA the segments, within which it is possible, due to a similar rate of economic transformations, to apply similar approaches to forecasting professional qualification changes in the components of staffing requirements, and also to determine the relationship between the degree of professional qualification changes in staffing requirements, and the intensity of modernization and updating processes in the segments of the economy (by TEA).

### Method of typing

*Structural changes* in the elements of the region's market subsystem, caused by modernization processes and region's transition to innovation development, affect different types of local markets (product market, market of qualified staff, professional education market). The economy witnesses changes in the structure of production and employment by types of economic activity, levels of education, professions and qualifications. Labour markets experience changes in the demand for professions and qualifications, in the requirements to the training of professional staff. The demand for education services (levels of education, professions and qualifications) changes in the sphere of professional education. Violation  $+ -$  of interrelations in structural changes leads to the imbalances of supply and demand in regional markets of products, labour and professional education.

*Time lag* between the emergence of the need for qualified employees in the economy and the possibility of their training by the regional education system complicates the problem of forecasting professional qualification components of staffing requirement, due to the following reasons: firstly, due to the length of professional personnel training process and impossibility of adjusting the already established methods; secondly, due to the differences in the duration periods of professional training for different levels: 4–5 years for institutions of higher professional education (HPE); 3–4 years for secondary vocational education (SVE) institutions; 1–2 years for primary vocational education (PVE) institutions. Since the staffing demand of the economy is satisfied mostly at the expense of professional staff, trained for the labour market by the regional education system, the extent and professional qualification structure of personnel requirement should be known in advance. This will make it possible to train professional staff according to the changing

requirements of the economy to ensure the specified growth rate at an appropriate level of technological development.

*Different rate of the processes* of modernization and upgrading of the region's economy by the types of economic activities leads to simultaneous existence of local markets of different technological levels (traditional, perspective, innovation-based), forming different needs with regard to professional qualification structure of employees. Establishment of relationship between the extent of the changes in the professional qualification structure of staffing requirements and intensity of economic modernization and renovation in *standard economic zones* (segments according to TEA) will, from our point of view, increase the relevance and accuracy of the results of forecasting professional qualification structure of staffing requirements of the regional economy.

Projected *components* of staffing requirements, due to different reasons, with varying degrees of dependence on the pace of economic growth and the level of technological development of the economy, are the following:

- “*for replacement*” – a component, formed due to the necessity of annual replenishment of the number of employees, dismissed for various reasons (retirement, long absence at the workplace, natural loss and other). Professional qualification structure of the component “for replacement” is identical to the existing employment structure (by the levels of training – HPE, SVE, PVE; specialties and professions) and is determined according to the prevailing regulations of employment of young specialists by the types of economic activities [1];

- “*supplementary*” – a component that estimates the increase in the number of professional staff that the region's economy needs in accordance with its strategic guidelines, socio-economic and innovation development programmes, investment policy. The value

of the component is connected with the emergence of new jobs in the economy, the structure (by levels of training, professions and specialties) depends on the scale and nature of influence of investment and innovation factors in economic growth.

Investment projects, approved for implementation in the region, are the key **investment factors** promoting economic growth, changing the size and structure of staffing requirements. Depending on the scale of their impact, investment projects are divided into two categories: significant for individual economic entities and large-scale. *Investment projects (IP) significant for individual economic entities* upgrade the activities of an individual enterprise for increasing its efficiency, but they don't influence the change in the structure of the regional economy and employment due to the lack of inter-sectoral multiplicative effects. IP implementation results in the updating and reconstruction of production assets, enhancement of labour productivity in small and medium business. IP implementation terms don't exceed 1–2 years. *Large-scale IP* have a significant impact on economic modernization and growth in a municipal entity, changing the structure of the economy and employment in the areas of IP implementation and related industries. Consequently, the structure of employment is redistributed (by types of economic activity, levels of training, professions and specialties) due to the emergence of new jobs with modern technological equipment, and the regional structure of professional education also changes (new specialties and professions emerge in the framework of existing spheres of professional training). Krasnoyarsk Krai has such large-scale investment projects as [2] “Integrated development of the Lower Angara area”, “Organization of wood processing in the Kezhemsky District of Krasnoyarsk Krai”, “Expansion of wood processing industry by producing a new type of goods

and the creation of forest infrastructure for the development of new woodlands” etc., they affect several types of economic activity at the same time (manufacturing, energy, transport, construction).

Innovation projects are considered to be **innovation factors** promoting the changes in staffing requirements of the economy. These projects introduce innovations in the economy and contribute to the formation of *new labour markets* due to the emergence of demand for new professions, specialties and qualifications. Innovation projects promote qualitative structural changes in the economy, employment and professional education in the region. Priority directions of innovations development are determined by the strategies for innovation development of Russia up to 2020 [3] and its regions, including Krasnoyarsk Krai [4].

The simultaneous impact of innovation and investment growth factors in the region's economy creates the **segments** (by TEA) of various technological types (traditional, prospective, innovation-driven), the operation of which requires the staff, which is different according to the volume and professional qualification composition, and also the levels and programmes of their training in the system of professional education.

*Segment 1 “Traditional technologies”* unites the types of economic activities, for which modernization processes are the weakest. This segment of economy, due to the fact that the majority of manufacturers use conventional technological developments reflecting the average production level, is characterized by stable demand for traditional professions and qualifications within the existing levels (HPE, SVE, PVE) and training areas (28 enlarged groups of specialties (EGS)). Therefore, the structures of staffing requirements (by TEA, levels of training, 28 EGS) can be determined by the retrospective period and used when making a forecast.

*Segment 2 “Modernization and development”* unites the TEA with the active processes of technological modernization and expansion of the economy. This segment of the economy differs from the previous one by the use of innovative technology possessing technological and economic advantages in comparison with traditional analogous technologies; it has an expanding demand for traditional and new professions and qualifications within the existing training areas (28 EGS). When forecasting the staffing requirements of the component, the “additional” professional qualification structure is determined in accordance with IP staffing.

*Segment 3 “Transitional to innovation economy”* includes TEA with active introduction of innovation technologies that are distinguished by novelty and uniqueness. This part of the economy is characterized by a qualitative change in the demand for professional staff (by levels of training, new specialties and professions) and the formation of new labour markets. When forecasting staffing requirements of the component, the “additional” professional qualification structure is determined by expert assessments, formed by the participants of regional technology platforms, in the framework of which innovation projects are developed and their results are implemented in the economy.

The economy has segments with different requirements concerning the size and composition of professional staff. This fact that provided the basis for applying **different approaches to forecasting** professional-qualification components of staffing requirements, and for *developing a method* of allocating **type zones** in the region’s economy in accordance with the intensity of modernization and innovation diffusion processes.

The following two indices served as the criteria for **typing the region’s economy**:

– the index “*potential of the types of economic activity (TEA potential)*” (formula 1),

which characterizes the intensity and efficiency of modernization and updating by all the types of economic activity of the regional economy. Depending on its values, the types of economic activity in the municipal entity are divided into those forming 1) traditional and 2) potential labour markets;

– the index “*innovativeness of the types of economic activity (TEA innovativeness)*” (formula 2), which characterizes the intensity of innovations diffusion in the region’s economy. In accordance with the values of this index, the third group is allocated: types of economic activity forming new labour markets.

The index of potential for the  $i$ -th type of economic activity ( $I^{plm}_i$ ) is calculated according to the formula:

$$I^{plm}_i = \alpha_1 \times d^{nee}_i + \alpha_2 \times d^{tps}_i + \alpha_3 \times d^{ifa}_i, \quad (1)$$

where  $d^{nee\_in}_i$  represents the rate of increase in the number of people engaged in the  $i$ -th type of economic activity: it reflects the impact of labour market on the scale and dynamics of employment as an indicator of social stability of the region’s development;

$d^{tps}_i$  represents the rate of turnover of goods and services of the  $i$ -th type of economic activity in the regional economy: it characterizes the changes in the scale of branch-wise production, competitiveness of products and/or services of the industry;

$d^{ifa}_i$  represents the rate of investments in fixed capital for the  $i$ -th type of economic activity in the region’s economy: it reflects the rate of modernization by the types of economic activity in the regional economy;

$\alpha_1, \alpha_2, \alpha_3$  – are weighing coefficients reflecting the importance of each parameter included in the index of “*TEA potential*”, they are defined by expert assessments. Depending on the values of the potential index, the structure of *Segment 1* in the region’s economy is determined.

Index of TEA innovativeness ( $I^{inn}_i$ ) is calculated for the types of economic activity according to the formula:

$$I^{inn}_i = \beta_1 \times d^{nee\_in}_i + \beta_2 \times d^{tps\_in}_i + \beta_3 \times d^{inv\_in}_i, \quad (2)$$

where  $d^{nee\_in}_i$  is the rate of increase in the number of people engaged in the development and implementation of innovations in the  $i$ -th type of economic activity among the TEA, forming potential labour markets: it characterizes the penetration of innovations in employment processes for the  $i$ -th type of economic activity, the share of persons engaged in innovation activity has a "new" professional structure;

$d^{tps\_in}_i$  is the rate of turnover of innovation products and services of the  $i$ -th type of economic activity: it characterizes the pace of innovations penetration into production processes, reflects the ability of TEA to form external demand;

$d^{inv\_in}_i$  is the rate of investments in innovation for the  $i$ -th type of economic activity among the TEA, forming potential labour markets: it reflects the innovation activity of the  $i$ -th type of economic activity;

$\beta_1, \beta_2, \beta_3$  are weighing coefficients reflecting the importance of each parameter included in the index of "TEA innovativeness", they are defined by expert assessments. Depending on the values of the innovativeness index, the structure of *Segment 2* and *Segment 3* are determined in the region's economy.

The calculations of indexes "TEA potential" and "TEA innovativeness" for the economy of Krasnoyarsk Krai have been carried out on the basis of statistical data [5, 6], forecast indicators of socio-economic and innovation development of Krasnoyarsk Krai, surveys of employers, representatives of science and education as the expert participants of regional technology platforms.

Algorithm of the region's economy typing contains five steps performed in sequence.

*Stage 1. Calculation of the index "TEA potential" according to the formula ( $I^{plm}$ ) (1).*

*Stage 2. Grouping of the types of economic activity by the value of the indicator "TEA potential":*

a) calculation of the arithmetic mean value of the TEA potential index ( $\bar{I}$ );

b) arrangement of the types of economic activity in the region into two groups in accordance with the arithmetic mean value of the TEA potential index;

c) determination of the boundaries of each TEA group on the basis of calculating meansquare deviations ( $\sigma_1$  and  $\sigma_2$ ), minimum ( $I^{plm}_{min}$ ) and maximum ( $I^{plm}_{max}$ ) values;

d) determination of the segment of the regional economy, to which TEA belongs, in accordance with the rule:

$$\text{If } I^{plm}_j \in \begin{cases} [I^{plm}_{min}, \bar{I}^{plm} + 3\sigma_2) & \text{then } j \in \text{group I -} \\ & \text{Сегмент 1} \\ [I^{plm}_{max} - 3\sigma_2, I^{plm}_{max}] & \text{then } j \in \text{group II -} \\ & \text{Segment 2 +} \\ & \text{Segment 3} \end{cases} \quad (3)$$

Types of economic activity of group I form *Segment 1 "Traditional technologies"*.

*Stage 3. Calculation of the index "TEA innovativeness" is carried out among the types of economic activity from "Group II" by the formula (2).*

*Stage 4. Rearrangement of the types of economic activity by the value of the index "TEA innovativeness" by the allocation of a set of TEA, for which the value of this index exceeds the average level, into a separate group. Types of economic activities that meet this condition, form Segment 3 "Transitional to innovation economy". Segment 2 "Modernization and development" comprises the TEA, for which the value of the index "TEA innovativeness" turned out to be below the average level.*

As a result of the typing, the segments of economy have been allocated that form labour markets with the same set of components and a similar character of structural changes (*tab. 1*). The selected characteristics of economy segments make it possible to use the

Table 1. Characteristics of the components of staffing requirements by the segment of regional economy

Components of staffing requirements	Segment 3 "Transitional to innovation economy"	Segment 2 "Modernization and development"	Segment 1 "Traditional technologies"
"For replacement"; "additional", in connection with the rate of SED	Invariable: - structure of the component by 28 EGS - standards of employment by TEA	Invariable: - structure of the component by 28 EGS - standards of employment by TEA	Invariable: - structure of the component by 28 EGS - standards of employment by TEA
"additional" in connection with the rate of modernization and development of the economy	Structure of the component is redistributed quantitatively by 28 EGS Standards of employment by TEA change in accordance with the index of TEA potential	Structure of the component is redistributed quantitatively by 28 EGS Standards of employment by TEA change in accordance with the index of TEA potential	Component is absent
Including "for the implementation of large-scale IP"	In accordance with the staffing of investment projects (by the results of surveys of employers and/or experts)	In accordance with the requirements for the staffing of IP (by the results of surveys of employers and/or experts)	
"Additional" in connection with the transition to innovation development	Structure of the component can change quantitatively and/or qualitatively Standards of employment by TEA change in accordance with the index of TEA innovativeness	Component is absent	Component is absent
Including "for the implementation of innovation projects"	In accordance with the staffing of a project or by the results of surveys of experts		
Note: SED – socio-economic development; EGS – enlarged group of specialties; TEA – types of economic activities; IP – investment project.			

general rules when defining the professional qualification set of forecast components of staffing requirements within the segment and provide the basis for the application of unified procedures in economy segments for predicting the professional qualification structure of staffing requirements.

*Segment 1 "Traditional technologies"*. The components of staffing requirements – "for replacement", "supplementary", due to the pace of socio-economic development and traditionally existing structure of employment (by TEA, levels of training, 28 EGS) are characterized by constant standards ( $da_{ij}^{1L}$ ) of employment of young specialists with the level of training (L) by the types of economic activity (i) determined according to annual monitoring results [1]. Let us use  $a_{ij}^{1L}$  to denote the number of young specialists with the following characteristics: level of education - L (HPE, SVE, PVE); field of training – j (one of the 28 EGS); type of economic activity

for employment – i. Then the standard of employment of young specialists will be assumed as the share that the value  $a_{ij}^{1L}$  comprises in every thousand of employed young specialists with the level of education L in the i-th TEA [1].

*Segment 2 "Modernization and development"*. During the forecast period, the standards of staffing requirements according to the levels (HPE, SVE, PVE) and training areas (28 EGS) vary in direct proportion to the value of the index "TEA potential" (formula 1) and are adjusted annually according to the results of the young specialists employment monitoring [7].

When determining the professional-qualification structure of the components of staffing requirements, the following rules are used:

- "for replacement" – determined by the existing structure of employment (by 28 EGS) using the vector of normalized coefficients  $\{da_{ij}^{1L}\}$  that remain unchanged throughout the forecast period;

• “*additional*” in connection with the rate of modernization and development of the economy, it is determined by the existing structure of employment and new standards of employment by TEA ( $da_{ij}^{2L}$ ) with subsequent normalization of coefficients according to the equations:

$$da_{ij}^{2L}(t_n) = da_{ij}^{1L}(t_0) \times (1 + I^{plm}_i(t_n) \times d_i^L(t_n))$$

$$da_{ij}^{2L}(t) = da_{ij}^{1L}(t_0) + (da_{ij}^{2L}(t_n) - da_{ij}^{1L}(t_0)) / (t_n - t_0) \times (t - t_0), \quad (4)$$

where  $t_0$ ,  $t_n$ ,  $t$  represent the initial, last and current year of the forecast period, respectively;

$da_{ij}^{2L}$  is the new standard of employment of young specialists with the level of education trained in the field  $j$  in the  $i$ -th TEA from segment 2;

$I^{plm}_i(t_n)$  is the index of potential of the  $i$ -th TEA by the end of the forecast period,  $t_n$ , it is determined on the basis of programmes for socio-economic development, modernization of the region's economy and the forecast of the number of people employed according to TEA;

$d_i^L(t_n)$  is the share of people employed in the  $i$ -th TEA with the level of professional education  $L$  (HPE, SVE, PVE) to the end of the forecast period  $t_n$ ;

• “*For the implementation of large-scale investment projects*” is defined as part of the previous component in accordance with the number of personnel and structure of their professional training, declared in IP, or according to the results of a survey of employers and/or experts.

*Segment 3 “Transitional to innovation economy”*. At the beginning of the forecast period, the standards of professional staffing requirements by the levels (HPE, SVE, PVE) and spheres (28 EGS) of professional training are determined, which by the end of the period vary in direct proportion to the index “*TEA innovativeness*” (formula 2) and annually revised (with regard to “new” professions) according to the results of expert survey.

When determining the components of staffing requirements, the following rules are used (see tab. 1):

– “*for replacement*” – determined by the structure of employment (by 28 EGS) on the basis of the vector of normalized coefficients  $\{da_{ij}^{1L}\}$ ;

– “*additional*” in connection with the rate of modernization and development of the economy, it is determined by the existing structure of employment and the amended standards for the employment of young specialists in accordance with the index of TEA potential on the basis of the formula (4);

– “*additional*” in connection with the transition to innovation development, it is initially determined by the existing structure of employment and the amended standards for the employment of young specialists by TEA, calculated in accordance with the index of TEA innovativeness. The subsequent iterations, by the results of expert survey, admit possible adjustments to the existing structure of professional training. New standards of employment in this segment of the economy are determined on the basis of transforming the standards of employment ( $da_{ij}^{2L}$ ) to the last year of the forecast period ( $t_n$ ) with subsequent normalizing and calculating the even changes in the standard ( $da_{ij}^{3L}$ ) for each step of the forecast period, according to the equations:

$$da_{ij}^{3L}(t_n) = da_{ij}^{2L}(t_n) \times I^{inn}_i(t_n),$$

$$da_{ij}^{3L}(t) = da_{ij}^{2L}(t_0) + (da_{ij}^{3L}(t_n) - da_{ij}^{2L}(t_0)) / (t_n - t_0) \times (t - t_0), \quad (5)$$

where  $da_{ij}^{3L}$  is the standard of employment of young specialists with the level of education, trained in the field  $j$  in the  $i$ -th TEA from Segment 3;

$I^{inn}_i(t_n)$  is the index of innovativeness of the  $i$ -th TEA by the end of the forecast period,  $t_n$ , it is determined on the basis of socio-economic development programmes, the strategy for the modernization and innovation development of the region;

– “for the implementation of innovation projects” – is defined as part of the previous component in accordance with the number of personnel and structure of their professional training, declared in IP or according to the results of expert survey. The issues of changes in the structure of professional training in connection with the emergence of the demand for new professions and specialties is not considered in this article.

**Results obtained**

The composition of the segments (by TEA) of the regional economy up to 2017 (tab. 2) has been determined as a result of typing the Krasnoyarsk Krai economy in 2012 taking into account the forecasts of socio-economic, invest-

ment and innovation development, the results of development of the regional technological platform “Food security of Siberia. Innovation technologies in production, processing and logistics of agricultural products”.

The following documents serves as strategic guidelines for determining the conditions and trends of economic development of Krasnoyarsk Krai:

- strategy for innovation development of Krasnoyarsk Krai for the period up to 2020;
- forecast of the Krasnoyarsk Krai socio-economic development for 2012 and for the planned period of 2013–2014;
- main results of the krai’s socio-economic development in 2011;

Table 2. Composition of the segments of the Krasnoyarsk Krai economy in 2013–2017

Economy segment	Types and sub-types of economic activity (TEA)	Total TEA
Segment 1 “Traditional technologies”	B: Fishing, fish-breeding DA: Production of foodstuffs including drinks and tobacco DB: Textile and clothing manufacture DC: Manufacture of leather, leather articles and shoemaking DD: Woodworking, manufacture of wooden products DE: Pulp and paper production; publishing and printing DF: Manufacture of coke, oil products DG: Chemical production DH: Production of rubber and plastic articles DI: Production of other non-metal mineral commodities DK: Manufacture of machinery and equipment excluding weapons and ammunition DL: Manufacture of electrical equipment, electronic and optical equipment DM: Manufacture of transport vehicles and equipment DN: Other productions H: Hotels and restaurants J: Financial activity L: State management and provision of military security; compulsory social assistance N: Healthcare and provision of social services O: Provision of other public utility services, social services and personal services	19
Segment 2 “Modernization and development”	C: Mining DJ: Metallurgical production and manufacture of finished metal products E: Production and distribution of power, gas and water K: Real estate operations, rent and provision of services	4
Segment 3 “Transitional to innovation economy”	A: Agriculture, hunting and forestry F: Building G: Wholesale and retail trade; repair of vehicles, motorcycles, household appliances and articles of personal use I: Transport and communications M: Education	5



– concept of the long-term target programme “Development of innovation-based activity in Krasnoyarsk Krai for 2012–2014”;

– concept of the long-term target programme “Staffing of the krai's economy for 2012–2014”;

– passport of the regional technological platform “Food security of Siberia. Innovation technologies in production, processing and logistics of agricultural products”;

– supplements to the automated information system for monitoring the socio-economic indicators of Krasnoyarsk Krai municipal entities “Staffing requirements of the enterprises implementing investment and innovation projects in professional qualification perspective”; “Information on the need for qualified workers and specialists (by the organizations of the municipal entity)”; “Aggregate data and the need for qualified workers and specialists”.

The obtained results have been used when forming the forecast of staffing requirements in the Krasnoyarsk Krai economy up to 2017 (*tab. 3*). When making staffing requirements

forecast, it has been considered that every segment of the economy is developing according to the following scenarios:

*Segment 1 “Traditional technologies”*: annual growth rates of GRP – 104.3% (in the prices of 2000); average growth rate of investments in fixed capital by TEA is 101.9%; average growth rate of social labour productivity – 101.4% (in the prices of 2000).

*Segment 2 “Modernization and development”* and *Segment 3 “Transitional to innovation economy”*: average annual GRP growth rate – 106.3% (in the prices of 2000); average growth rate of investments in fixed capital by TEA is 104.9%; average growth rate of social labour productivity – 102.9% (in the prices of 2000).

The definition of professional qualification composition of staffing requirements of the regional economy on the basis of the equations (4, 5), made it possible to establish the necessary structure of professional training (for enlarged groups of specialties) and to define the most demanded groups of professions by education levels (HPE, SVE, PVE) up to 2017 (*tab. 4*).

Table 3. Forecast of the needs of the Krasnoyarsk Krai economy in the qualified staff in 2013–2017, thousand people

Component of staffing requirement in the segment of the economy	2013	2014	2015	2016	2017
<b>“For replacement”, total</b>	<b>55.5</b>	<b>52.1</b>	<b>49.1</b>	<b>51.2</b>	<b>56.8</b>
Segment 1	17.3	14.7	12.8	13.0	17.0
Segment 2	9.1	8.7	9.6	9.5	10.6
Segment 3	29.1	28.7	26.7	28.7	29.2
<b>“Additional” in connection with the rate of socio-economic development, total</b>	<b>20.5</b>	<b>24.3</b>	<b>22.7</b>	<b>22.5</b>	<b>30.7</b>
Segment 1	4.8	4.7	2.3	1.8	4.3
Segment 2	7.2	7.2	7.9	6.8	8.0
Segment 3	8.5	12.4	12.5	13.9	18.4
<b>“Additional” in connection with the rate of modernization and development of the economy, total</b>	<b>2.3</b>	<b>2.4</b>	<b>1.2</b>	<b>0.5</b>	<b>0.4</b>
Segment 2	0.8	1.1	0.4	0.1	0.1
Segment 3	1.5	1.3	0.8	0.4	0.3
<b>Total</b>	<b>78.3</b>	<b>78.8</b>	<b>73.0</b>	<b>74.2</b>	<b>87.9</b>

Table 4. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by HPE) in the Krasnoyarsk Krai economy by 2017, %

EGS code	EGS name	2013	2017
080000	Economics and management	9.5	7.5
050000	Education and pedagogy	7.8	5.8
030000	Humanities	7.0	5.6
230000	Informatics and computer engineering	5.8	5.7
060000	Health care	5.6	4.2
140000	Energy, power engineering and electrical engineering	5.3	7.8
190000	Vehicles	5.1	7.9
260000	Technology of foodstuffs and consumer goods	4.7	5.0
270000	Construction and architecture	3.9	3.8
020000	Natural sciences	3.7	3.3
-	The rest 18 EGS	41.6	43.4
-	<b>Total</b>	<b>100.0</b>	<b>100.0</b>

Table 5. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by SVE) in the Krasnoyarsk Krai economy by 2017, %

EGS code	EGS name	2013	2017
080000	Economics and management	10.2	8.1
190000	Vehicles	7.0	9.5
060000	Health care	7.0	5.1
050000	Education and pedagogy	6.6	4.9
150000	Metallurgy, mechanical engineering and materials processing	6.4	8.0
270000	Construction and architecture	5.8	5.5
260000	Technology of foodstuffs and consumer goods	5.7	6.3
230000	Informatics and computer engineering	5.7	5.4
140000	Energy, power engineering and electrical engineering	5.5	7.7
030000	Humanities	5.4	4.4
-	The rest 18 EGS	34.7	35.1
-	<b>Total</b>	<b>100.0</b>	<b>100.0</b>

Table 6. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by PVE) in the Krasnoyarsk Krai economy by 2017, %

EGS code	EGS name	2013	2017
190000	Vehicles	11.8	13.7
100000	Services sphere	10.5	10.3
080000	Economics and management	10.4	9.8
110000	Agriculture and fishery	7.8	6.9
270000	Construction and architecture	7.4	6.5
140000	Energy, power engineering and electrical engineering	6.0	7.9
150000	Metallurgy, mechanical engineering and materials processing	5.7	5.9
260000	Technology of foodstuffs and consumer goods	5.6	5.5
230000	Informatics and computer engineering	3.9	3.8
050000	Education and pedagogy	3.4	2.5
-	The rest 18 EGS	27.3	27.1
-	<b>Total</b>	<b>100.0</b>	<b>100.0</b>

## Conclusions

Thus, the proposed method of typing the region's economy and the application of standard procedures to determine the professional qualification components of staffing requirements in the segments of

economy enhance the accuracy, reliability and relevance of the results of forecasting staffing requirements of municipalities taking into account structural changes in the economy, employment and professional education in the regional economic system.

## References

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