Assessment of gaps in the demand and supply parameters of professional competencies of engineering personnel in digitalization context

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Abstract. The relevance of the research is determined by the priorities of technological, innovative and digital economy development, which change the needs of business in relation to professional competencies of employees, increase the uncertainty of forecasting the future needs of the economy in labor resources, and increase the supply and demand imbalances in regional labor markets. Based on a comparative analysis of methodological approaches to the analysis and forecast of professional competencies, the article suggests an approach to measuring quantitative and qualitative parameters of gaps in the labor markets of the region. It is proved that the strongest gaps occur in areas with a high concentration of financial and organizational resources that allow achieving significant economic results in the implementation of promising areas of regional development. Based on a step-by-step grouping of professions that are in demand in the labor markets in areas of accelerated development, according to the criteria "vacancy period" and "intensity coefficient per vacancy", professional groups with high levels of gaps are distinguished. Quantitative parameters of gaps are assessed based on comparison of lists of professional competencies acquired in the system of professional education and labor functions, in accordance with professional standards. Qualitative parameters of gaps are set based on a survey of employers. The results of testing the proposed method are presented.

1. Introduction

The high speed of technological changes creates challenges to the system of professional education, which focuses on the development of competence profiles of future specialists with an optimal set of general and professional competencies [1]. Today, the leaders of global development are countries that are able to create breakthrough technologies, form their own production base, and introduce digital technologies, which in turn will lead to an active reduction of jobs with outdated sets of competencies [2]. There is a tendency to increase labor productivity due to the use of new technologies by reducing equipment maintenance costs, equipment downtime, and improving quality indicators [3]. In manufacturing companies, the introduction of digital technologies is complicated by the need to combine technological and information processes. Existing business models lose their stability in the process of such transformations, which requires working out issues of assessment and ensuring sustainability [4]. New tasks require new competencies.

Currently, the economies and labor markets of many countries around the world are subject to structural changes that increase over time. Digital transformation of business, technological progress,
globalization and demographic changes are key factors that determine the behavior of market participants. Labor market management entities around the world, including in Russia, are interested in preliminary assessments of market development. Questions about the availability of labor resources and the balance of supply and demand parameters in the labor markets come to the fore, since they are associated with hopes for stimulating the growth of the world economy.

In this regard, many countries around the world are developing long-term forecasts of labor markets (Lepic and Koucky, 2012, Czech Republic; Dupuy, 2012, Netherlands; Tiainen, 2012, Finland; Lockard and Wolf, 2012, USA; Vogler-Ludwig and Düll, 2013, Germany; Gajdos and Zmukow-Poteralska, 2014, Poland; Maier et al, 2014) [5].

As the content analysis of scientific publications has shown, the problem of ensuring compliance between the existing competencies of employees acquired in the course of training and skills that play a crucial role for successful work is the subject of constant research by international organizations [6]. The purpose of the article is to propose an algorithm for measuring quantitative and qualitative parameters of gaps in the labor markets of the region based on a comparative analysis of methodological approaches to assessing gaps in the demand and supply parameters of professional competencies.

2. Researching experiences, trends and problems
A number of large-scale initiatives of the European Commission, the Organization for Economic Cooperation and Development (OECD) are dedicated to identifying promising competencies and studying the future demand for competencies [7]. OECD member countries, on the basis of interactive seminars with government officials and employers, have adopted the OECD Skills Strategy, focused on timely response to changing needs for competencies on the part of employers [8].

In the countries of the European Union, the project of the European Center for Vocational Education [9] "European skill needs forecasting system" is being successfully implemented [10]. The competency gap assessment model is based on a quarterly study of the labor force [11] (by age group and type of economic activity in accordance with the NACE classifier of economic activities in the EU). Econometric models of employment by economic activity and qualifications are used to forecast promising skills in labor markets in Europe.

The European center for the development of vocational training has created a single database that allows you to compare supply and demand within the existing qualification structure. The use of the database makes it possible to specify the demand for qualifications from enterprises, as well as to evaluate the supply based on a standardized assessment of the results of non-formal education acquired by employees.

In the United States of America, the national JobPro database is used with descriptions of qualification profiles and professional skills. JobPro data contains descriptions of more than 19,000 standard jobs in the main sectors of the American economy (engineering, energy, construction, healthcare, etc.). The leader in predicting the skills and competencies in demand is AST, which has developed a tool for quantifying the gaps (skills gap) between the skills required to perform labor functions, in comparison with the skills that are available to employees in the industry [12]. Assessment of the level of proficiency in qualifications is based on assessment tools and a system of testing applicants for a job.

In Indonesia, the study of gaps in competencies [13] based on the National system of classification of competencies, an expert survey using the Delphi method and self-assessment of university graduates, showed the presence of significant quantitative and qualitative gaps between labor supply and demand. Despite the high demand for qualified personnel, there is a high level of unemployment among graduates of higher educational institutions, as well as among the workforce with a low level of qualifications.

The results of the study allowed us to identify significant gaps in competencies due to a number of factors (non-compliance of curricula with the needs of economic sectors, the presence of a significant
number of unnecessary academic disciplines from the position of employers, lack of practical skills, etc.) and develop a model of competencies that meets the requirements of employers.

In Russia, a number of works by Russian authors are devoted to the study and assessment of gaps in competencies. A significant number of approaches and methods have been developed to predict the future demand of the Russian economy for personnel in order to ensure the demand for human resources: a model for analyzing the forecast needs of the labor market (A. G. Korovkin, 2001); forecast models in the field of educational flows (A. F. Kiselev, 2004); a model of the macroeconomic dynamic system “economy-labor market-professional education” [V. A. Gurtov, E. A. Pitukhin, S. V. Sigova, 2007-2020]; model for forecasting personnel needs in economic sectors for implementing economic development priorities (Z. A. Vasilyeva, I. V. Filimonenko, 2015-2020), etc.

In the Sverdlovsk region, a project to study the gap in competencies based on focus groups for HR managers and a sociological study of the opinions of enterprise managers confirmed the existence of such forms of manifestation of the gap in competencies as: universal acquisition (for example, IT); multiskilling as the main characteristic of the workplace; multicompetence as a requirement for an employee; accelerated depreciation of professional competencies.

Among the main problems that arise when assessing gaps in competencies, there are [14]:

- discrepancy between the needs of employers and the existing professional competencies of employees acquired in the professional education system, both in terms of the list of necessary competencies and their semantic content;
- different significance of competencies for different employers;
- existence of “extra” competencies that are not required by employers.

Currently, the construction of models for predicting popular competencies is considered a problem area of research. Among the urgent tasks of assessing and bridging gaps in competencies are the following:

- develop approaches to the analysis of changes of requirements to competences under the influence of the processes of digitalization of the economy and enhance the development of computing technology, transformation of the business processes of organizations as a result of introduction of technologies of artificial intelligence, globalization of the economy;
- search for methods for translating prospective needs of employers into the content of educational programs;
- comprehensive consideration of the interests of stakeholders (government entities, business, population), process and regulatory features of the education system;
- creation of infrastructure for situational monitoring and proper information support.

Analysis of existing methodological approaches to the formation of the forecast of demand for competencies in Russia has shown that the assessment of demand is a built-in element of complex methods for forecasting the needs of industries and regions in personnel, foresights of future professions, the resource component of forecasts of economic development of the country or region, forecasts of demand for graduates of professional education organizations, market research of additional education services, long-term development plans for corporate universities.

It can be expected that competence forecasting will gradually replace professional needs assessment. However, the replacement process is still quite slow. It is difficult to assess and describe competencies, as well as to assess the level of satisfaction of business needs. In addition, balance models, econometric methods and statistical data, quantitative characteristics of the demographic situation and the potential of the vocational education system are widely used in the development of methods for assessing and predicting the region's needs for professional personnel by industry. However, when assessing the needs for professional competencies, the possibilities of these methods are limited.
However, research is emerging to fill this gap. Among them, we note the assessment of the level of competence development by university graduates based on the method of linear generalization of criteria (A.V. Ptashuk, B. V. Novysh, 2015); the assessment of gaps based on the ontology of competencies (A. A. Tselykh, 2013; T. M. Shamsutdinova, S. V. Prokofieva, 2014; V. Yu. Artemov, 2014) and the theory of fuzzy sets (K. V. Pitelinsky, A. V. Tishkin, 2011; N. V. Raznova, G. F. Yarichina, 2014).

The main difficulty in assessing the qualitative and quantitative parameters of supply and demand is the availability of source data, in particular information about the requirements of employers in industries and fields of activity for job seekers. Thus, there is a need to collect information about the requirements of employers to the competencies of applicants. This problem can be solved by using methods of expert surveys of employers (focus groups, expert panels, the Delphi method, etc.) and content analysis of Internet sites for job search (HeadHunter, Rosrabota, etc.). At the same time, the frequency of information collection is of great importance for improving the accuracy of estimating gaps in the parameters of demand and supply of professional competencies of the workforce.

3. Research methodology
The comparative analysis of approaches to measuring gaps in the labor markets of the region allowed us to propose a methodology for assessing gaps in the parameters of demand and supply of professional competencies of labor resources. The methodology is based on the study of demand and supply of professional competencies in labor markets in areas of "accelerated development" of the economy, followed by measuring gaps in the most popular professions and identifying situations in which gaps in demand and supply are due to non-compliance with the requirements for professional competencies of the labor force.

At the same time, the "accelerated development" zone in the study is understood as a part of the region's economy, allocated as territories with a high concentration of financial and organizational resources that allow achieving significant economic results in the implementation of promising areas of regional development [15].

The algorithm of the proposed method is shown in figure 1.

Stage 1. Determining the list of the most popular professions and grouping them by the scale of demand allows you to identify groups of professions in the zone of accelerated development, the demand for which is massive.

It includes the following intermediate steps:

1.1. Determining the list of professions declared in employment Services; employment Agencies (hh.ru); TOP 50 region; individual entrepreneur.

1.2. Determining the list of mass professions based on:

- intersections of semantic sets of professions formed in the previous step;
- the number of vacancies declared by employers for each profession;
- ABC analysis to identify the most popular professions.

As a result of this stage, the first three columns of table 1 are filled in.

Stage 2. Determining the offer of applicants for the professions in demand. As a result of this stage, columns of table 1, 4, 5, 6 are filled in. The intensity coefficient for vacancy is calculated during the analysis period in accordance with the formula:

$$C_{Intensity} = \frac{Number\ of\ offers\ by\ profession}{Number\ of\ vacancies\ by\ profession}$$ (1)
Area of the accelerated development

Stage 1. Determining the list of the most popular professions

1.1. Determination of the list of professions declared in employment Services; employment agencies (HH.ru); TOP 50 region; investment project

1.2. Determining the list of mass professions based on:
- intersections of semantic sets;
- ABC analysis;
- number of vacancies

Stage 2. Determining the offer of applicants for popular professions:
- the number of applicants for the vacancy

Field of activity | Profession | Demand | Supply | Period fill the vacancy | The coefficient of tension
---|---|---|---|---|---

Step 3. Assessment of gaps

>1 month (long-closed vacancies)

3.1. Duration of filling the vacancy

<1 month (fast-closing vacancies)

>1 (there are fewer applicants than vacancies)

<1 (there are more applicants than vacancies)

Surplus of labor resources by profession (the quantitative gap)

D=Ks-Kd>0

End

Lack of labor resources by profession (the quantitative gap)

D=Ks-Kd<0

End

3.3. Analysis of match between vocational competences FSES and PS

- Set PC FSES - \{d^{pc}\};
- Set LF PS - \{d^{lf}\};
- accordance PC u LF; d_{lf}^{LF}=f(d_{pc}^{PC});
- d_{lf}^{LF}+d_{lp}^{LF}+d_{ll}^{LF}=1;
d_{l}^{1LF}=0,7

Estimation of gaps between qualitative parameters of demand and supply of professional competences of labor resources based on \(d_{l}^{1LF}\) and a survey of experts

The gaps between supply and demand of PC are significant. Expertise of professional competences with representatives of the business zone of accelerated development is required

The gaps between PC supply and demand are not significant. Long-term filling of the vacancy is determined by the workplace parameters (working conditions, salary, infrastructure, etc.)

Expertise of professional competences and reasons for long-term filling of vacancies

Figure 1. Methodology algorithm for assessing gaps in the parameters of supply and demand of professional competences of labor resources.
Table 1. Baseline table for assessing labor market gaps in accelerated development.

| Demand (the number of declared vacancies) | Offer (number of applicants for the vacancy) | Duration of filling the vacancy | Intensity coefficient |
|-------------------------------------------|---------------------------------------------|---------------------------------|-----------------------|
| 3                                         | 4                                           | 5                               | 6=4/3                 |

- **Qualitative gap**: number of offers > number of vacancies
  - **Intensity coefficient** > 1
  - **Duration of filling the vacancy** > 1 month

- **Quantitative gap**: number of offers < number of vacancies
  - **Intensity coefficient** < 1
  - **Duration of filling the vacancy** < 1 month
  - there are no gaps in supply and demand for these professions

Stage 3. Assessment of gaps in the parameters of supply and demand of professional competencies of labor resources for the professions in demand is carried out on the basis of two sequentially performed groupings (according to the criteria of “period of filling a vacancy” and “coefficient of tension”) with the subsequent assessment of structural differences between the sets of professional competencies mastered by students on educational programs (federal state educational standards of higher education and secondary professional education) and labor functions, fixed in professional standards for the groups of analyzed professions.

3.1. Assessment of the gaps between the quantitative parameters of supply and demand based on the criterion “duration of filling a vacancy” allows to divide the entire set of demanded professions in the zone of accelerated development into two parts:

- the first group includes professions for which the period of filling a vacancy does not exceed 1 month (with an average employment period of 6-7 months. Such a relatively short period of filling vacancies allows us to assume that there are no gaps between supply and demand in the studied labor markets relative to this group of professions;
- the second group includes professions with a long period of filling vacancies. There are two groups of reasons for this situation – the lack of labor resources with the necessary professional training or the discrepancy between the parameters of supply and demand, including the professional competencies of labor resources.

3.2. Assessment of the gaps between the quantitative parameters of supply and demand based on the criterion "coefficient of tension", in turn, divides the group of studied professions into two parts in accordance with the ratio of the number of applicants for a vacancy to the number of vacancies in the profession:

- a group for which the intensity coefficient does not exceed 1, is characterized by low demand for a vacancy and corresponds to the situation on the labor market – “lack of labor resources with the necessary professional training”;

...
• a group of professions where there is a high demand for a vacancy (intensity coefficient > 1) with a long period of employment (more than 1 month), in our opinion, characterizes the risky situation in the labor markets that arose as a result of the discrepancy between the parameters of demand and supply of labor resources, including in relation to professional competencies.

Thus, at stage 3.2, a selection is made from the list of popular professions in the zone of accelerated development of a group of professions that are most likely to have gaps in the supply and demand of labor resources due to a mismatch of professional competencies.

3.3. Analysis of compatibility between professional competences according to the federal state educational standards (FSES) and labour functions according to professional standards (PS) on the analyzed professions is based on:

• establishing a correspondence between labor functions (according to the PS) and professional competencies (according to the FSES), taking into account the levels of professional training;
• division of the set of labor functions (LF) and professional competencies (PC) into two parts: the first includes a list of labor functions (LF1) and professional competencies (PC1), between which the correspondence is established; the second part is the lists of LF2 and PS2 that could not be matched;
• calculating specific share of LF1 and LF2 in the total number of job functions (according to PS) and the specific share of PS1 and PS2 in the total number of professional competences (in accordance with FSES):

\[ d_{LF} + d_{LF} = 1; \ d_{PC} + d_{PC} = 1. \]  (2)

3.4. Assessment of the gaps between the qualitative parameters of supply and demand for professional competencies of the labor force is based on the value of the specific share of labor functions (d_{LF}), which correspond to the professional competencies of the labor force in step 3.3:

• if \( d_{LF} > 0.7 \), i.e. more than 70 % of labor functions in the profession are provided with the necessary professional competencies, so the gaps between the parameters of supply and demand are not significant, therefore, the reasons for long-term non-filling of vacancies, given the high demand for them, are due to other reasons (for example, the discrepancy between the parameters of jobs and the requirements of labor resources for working conditions, career opportunities, wages, etc.) or changes in the requirements for labor resources that are not fixed in professional standards;
• if \( d_{LF} < 0.7 \) and discrepancies between the sets of job functions required to fill the vacancy, and a variety of professional competences of labor resources applying for a vacancy (the gaps between the parameters of the demand and supply of professional competencies), significant, significant part of the PC (for FSES) does not allow to effectively perform labor functions in accordance with professional standards.

In the future, to ensure the comparability of supply and demand in the labor markets of the accelerated development zone, it is necessary to conduct an expert survey or foresight sessions with business representatives.

A list of current and future occupations will assess the request of the innovation economy at the moment, and the demand for professionals new, only emerging at the moment, industries, and the area of intersection, where all sources of information about in-demand occupations will form the top professions for high-tech and innovative sectors of the economy [16].

Stage 4. Development of professional competencies clusters in areas of “accelerated development” of the economy (qualitative parameters).
Development of necessary professional competencies clusters in areas of “accelerated development” of the economy (qualitative parameters).

The goal of the stage is to diagnose changes in business needs in relation to professional competencies of labor resources in areas of “accelerated development” of the economy, including foreign economic activity and macro-districts.

*Research methods* – content analysis of strategic documents for the development of territories, scientific publications and reports on the results of research on changes in professional competencies of labor resources [17], an expert survey of business representatives located in the "accelerated development" zones. To study the professional competencies of labor resources, the differentiation of professional competencies for management personnel (based on higher education) and production personnel (based on higher and secondary professional education) was carried out, and the subsequent systematization of competencies by groups (hard skills, digital skills, soft skills) [18; 19]:

- *professional competencies for administrative and managerial personnel* (analogous to professional competencies (PC) in FSES 38.03.02 and 38.04.02) are the necessary knowledge, skills and abilities to implement management functions at different levels of organization management. For example, making management decisions, building business communications, mastering digital management technologies, project management, managing the organization's housing and utilities, etc. Criteria for forming groups of professional competencies are stages of the strategic management cycle (clarification of the mission and core business, setting goals, analyzing the external environment, developing and implementing strategies, monitoring and adjustment);

- *professional competence of production staff* on the basis of higher education (analog PC for GEF engineering specialties) are required to implement control functions at the stages of the production process high-tech organizations. For example, in-depth knowledge of industry specifics and current trends in the industry, the ability to solve professional problems using digital technologies, setting production tasks, developing engineering solutions, applying a systematic approach to designing complex products, implementing high-tech projects and programs, and so on. Criteria for development of groups of professional competencies are stages of the organization's production process: the main process (procurement, processing, Assembly); auxiliary (production of tools, equipment; repair production; production of all types of energy); service (transportation, storage, collection and processing of information);

- *professional competence of production staff* on the basis of secondary professional education (analog PC for FSES for secondary professional education of skilled workers and middle level specialists) are required knowledge, skills, and readiness of their use for the implementation of work functions (in accordance with professional standards to the particular position/profession) at the stages of production processes (main, auxiliary, servicing) of high-tech organization (figure 2).

The study of employers' needs in relation to the professional competencies of the workforce [18; 19] allowed to justify the feasibility of decomposing the selected groups of professional competencies into subgroups of hard skills, soft skills and digital skills. The purpose of this division is a comprehensive assessment of training and capacity development of human resources for the needs of a specific organization through the system of knowledge, abilities and skills focused on performing job functions in accordance with professional training on the use of social skills collective development of digital skills of data processing.

Hard skills (“hard skills”) are technical skills related to the activities performed in the field of formalized technologies: office management, logistics, methodology, management, programming, manufacturing, production, warehousing, etc. Since these skills are stable, highly visible, measurable, and identifiable with specific structures, they are included in the list of requirements set out in job descriptions and are relatively easy to evaluate.
Soft skills (“soft skills” or “flexible skills”) allow the workforce to be successful regardless of the specifics of the activity. Traditionally, social skills include: ability to persuade, find an approach to people, lead, interpersonal communication, negotiation processes, teamwork, personal development, time management, erudition, creativity, etc. They are not related to a specific specialty.

Stage 4. Formation of clusters of professional competencies in areas of "accelerated development" of the economy

Differentiation of professional competencies (PC) of employees in accordance with foreign economic activity on the basis of labor functions and professional standards

PC for administrative and managerial personnel (based on the HE)
PC for production personnel (based on HE)
PC for production personnel (based on the SPE)

Systematization of professional competencies of employees in accordance with foreign economic activity by groups: hard skills, digital skills, soft skills

PC for administrative and managerial personnel (based on the HE)
PC for production personnel (based on the HE)
PC for production personnel (based on the SPE)

Hard skills (AMP/HE)
Hard skills (PP/HE)
Hard skills (PP/SPE)

Digital skills (AMP/HE)
Digital skills (PP/HE)
Digital skills (PP/SPE)

Soft skills (AMP/HE)
Soft skills (PP/HE)
Soft skills (PP/SPE)

Forming a sample (database) of enterprises from "accelerated development" zones by economic and spatial characteristics

A survey of employers from the areas of "accelerated development" with respect to the priority and perspective of professional competences of labour resources

Necessary changes in the professional competencies of the workforce

End

Figure 2. Algorithm of Stage 4. Development of professional competencies clusters in areas of “accelerated development” of the economy (qualitative parameters).

*Digital skills* in connection with total computerization and digitalization.
The research made it possible to develop a questionnaire that measures the need to change professional competencies for performing labor functions in the economy (according to foreign economic activity).

Enlarged stages of development of professional competencies clusters in the areas of "accelerated development" of the economy is presented in figure 2. The result is clusters of professional competences of labor resources in the areas of "accelerated development" of the economy, including foreign trade and macroregional

4. Research Results
1. Results of comparison of the professional standard 21.03.01 “Oil and Gas business” and the professional standard 19.005 “Drilling supervisor in the oil and gas industry” for labor functions for the level 6 (Bachelor Degree).

The analysis uses a list of competencies in accordance with the Federal state educational standard in of 21.03.01 “Oil and Gas Business” and educational program in the profile 21.03.01.31 "Drilling of oil and gas wells", implemented at the Institute of oil and gas of the Siberian Federal University. The specific share of LF1 in the total number of job functions (according to PS) and the specific share of PC1 to the total number of professional competences (in accordance with FSES) presented in tables 2-3.

| Group of competencies | Total number of competencies in accordance with the Federal State Educational Standard of Higher Education 03.21.01 “Oil and Gas Business” | Number of competencies from the Federal State Educational Standard used in the professional standard (Bachelor Degree) |
|-----------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Universal             | 8                                                                                               | -                                                                                               |
| General professional  | 7                                                                                               | -                                                                                               |
| Professional          | 11                                                                | -                                                                                               |
| Additional professional (AP) | 5                                                                 | 5                                                                                               |
| Total competencies    | 26 (no AP)                                                                        | - (no AP)                                                                         |
| Spec. share of competencies from the Federal state educational standard used in professional standards (Bachelor Degree) | 31 (with AP) | 5 (with AP) |

Thus, the results of the analysis showed that 16% of the professional competencies of the Federal State Educational Standard in the direction 03.21.01 “Oil and Gas Business” provides the level of performance of labor functions in the profession “Drilling supervisor in the oil and gas industry” for Bachelor Degree by 67% (figure 3).

At the same time, the share of professional competencies (competencies under the Federal state educational standard for higher education) involved in the development of labor functions is 16% (figure 3).
Results of comparison of professional competencies between FSES HE in the direction 21.03.01 “Oil and gas business” and PS 19.005 “Drilling supervisor in the oil and gas industry”

FSES HE 21.03.01 (level 6-bachelor's degree):

\[ d_{1}^{PC} = 0.16; \quad d_{2}^{PC} = 0.84; \]

PS 19.005 (level 6-bachelor's degree):

\[ d_{1}^{LF} = 0.67; \quad d_{2}^{LF} = 33 \text{ (LF - labour function)} \]

Table 3. The results of calculating the specific share of LF1 in the total number of labor functions PS 19.005 “Drilling supervisor in the oil and gas industry” (level 6 of Bachelor Degree).

| General labor function | Number of LF in accordance with PS | Number of LF in accordance with professional competencies of FSES 21.03.01 “Oil and Gas Business” | Number of labor actions (LA) in accordance with professional competencies of FSES 21.03.01 “Oil and Gas Business” |
|------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1. Technological control and well drilling management | 6 | 4 | 34 | 25 |
| **Total LF** | **6** | **4** | **34** | **25** |

For PS 19.005 (level 6-bachelor's degree):

\[ d_{1}^{LF} = 0.67; \quad d_{2}^{LF} = 33 \text{ (LF - labour function)} \]

2. At the stage of an expert survey of business representatives whose enterprises are located in the zones of accelerated economic development of the Krasnoyarsk region, preliminary results were obtained on the development of lists of professional competencies.

2.1. Changes in the professional competencies of management personnel are identified, including:

- the hard skills group currently has the most in-demand business competencies related to the search, processing and analysis of information, including the processing of information expressed in numbers and formulas: the ability to use specialized information for professional purposes; identify and assess risks, take measures to reduce them; find a compromise between the speed of decision-making and the reliability of the result; develop alternatives for solving complex problems; operate with the concepts of quantity and space, recognize mathematical expressions presented in verbal or numerical form; work with models, including creating and changing them; work with numerical methods; the ability to search for information in various sources and determine their reliability, build causal chains with the necessary degree of detail,
identify, distinguish and classify factors by degree of importance, contradictions, similarities, etc. In the next 3-5 years, the list of required competencies of this group will include legal literacy, financial literacy, scientific and technological literacy;

• in the digital skills group there are currently competencies related to information technology: the ability to use software necessary for professional activities; interpret the results of data analysis; formulate tasks for information technology specialists; search for information in various sources and verify its reliability; comply with the norms of behavior on the Internet. In the next 3-5 years, the list of necessary competencies of this group will include: the ability to achieve the goals set in the task in a technologically rich environment; find a suitable software application; navigate information security issues; use digital economy tools (big data, business intelligence systems, etc.);

• in the soft skills group there are currently socio-emotional and personal competencies, including: the ability to accept changes, including working conditions; selectively and consciously focus on tasks; overcome fear and self-doubt before making decisions; correct and respectful communication with others; the ability to maintain the goals of their activities, despite unsuccessful attempts to solve problems; use tools of motivation, leadership and power to solve management tasks; delegate authority; take and distribute responsibility, coordinate team work, and so on. In the next 3-5 years, the list of competencies of this group will include the ability to self-education and continuous learning; critical thinking; empathy; creative thinking; commitment to a healthy lifestyle, etc.

2.2. Changes in the professional competencies of production personnel are highlighted:

• in the hard skills group there are currently knowledge of the technological process; compliance with labor protection standards and rules; ability to prepare and maintain the workplace; ability to use professional documentation; perform oral and written communications; evaluate the effectiveness of professional tasks, etc. In the next 3-5 years, the list of necessary competencies of this group will include the ability to search, analyze and interpret information necessary for use in professional activities; to solve problems, to evaluate risks and make decisions in unusual situations; to work with numerical information, understand the patterns and dependencies, etc.;

• in the group digital skills there are currently the ability to use information and communication technologies in professional activities; the ability to search for information in the Internet, respecting the rules of information security; to justify the selection of the software to solve tasks of professional activity [20];

• in the soft skills group there are currently the ability to independently cope with unexpected difficulties, learn from others, plan their activities, resolve conflicts, etc. In the next 3-5 years, the list of necessary competencies of this group will include: the ability to work in a team, effectively interact with colleagues, management, and clients; to cooperate and interact, maintain relationships as a team member; to plan and implement their own professional and personal development.

5. Conclusion
The proposed methodology is aimed at improving tools for studying changes in the demand and supply needs of professional competencies of labor resources, identifying the reasons for the existence of gaps and determining the directions of their leveling in order to ensure a balance in the parameters of labor markets.

The method was tested on example the Krasnoyarsk region and allows to select the most popular profession in the area of “accelerated development”, to assess for them, the existence of gaps between demand and supply of professional competencies and clarify business needs to prevent points of risk
in the region's labour markets during the implementation of the priorities of socio-economic development as well as form mechanisms for managing risk points in regional labor markets.

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