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Methodology for assessing labour resources and employment of the region taking into account digital challenges

The paper is aimed at developing a methodology for assessing labour resources and employment of the region, which allows to determine the degree of balance of changes in the labour resources of the region in the conditions of development of the digital economy and new forms of employment for the subsequent development of measures to reduce economic losses caused by the asymmetric development of the labour market and employment. The developed algorithms for implementing the methodology and assessing risks affecting labour resources can be used by regional structures that manage the region's economy in the process of developing and making decisions on its sustainable development. To achieve the purpose of this study, methods of morphological analysis were used to identify key features of the labour resources, contributing to its socio-economic and innovative development. It is suggested to apply statistical analysis to explore the dependence of the region's digital development on changes in the external environment caused by risk events, and to identify the role of digitalization of the region's manpower for ensuring sustainable economic development. In addition, widely accepted methods for data collection and comparative analysis (such as the analogy method, content analysis and expert analysis), along with the modelling method, are used. New forms of labour and employment emerged due to the development of information and communication technologies are outside the limits of national regulation. Existing approaches and methods for analyzing labour resources and estimating unemployment at the national and regional levels no longer provide a real picture, as an individual's geographic location no longer directly determines their work or employment in a particular region. This highlights the relevance of research on the methodology for analyzing regional labour resources and employment, taking into account new forms of employment and the risks associated with the replacement of human labour by robots and human intelligence by artificial intelligence.

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The transition to a new technological order, based on the wide use of digital technologies in production and services, radically changes the labour process, social and labour relations and the nature of employment.

The emergence of new forms of employment leads to the following challenges for the economy of regions and the country as a whole:

- exclusion of employees with non-standard employment from the scope of the social protection system. For instance, without access to corporate medical facilities, medical examinations and with no guarantees of a steady income, such citizens turn to public health facilities when problems arise. As a result, the burden of providing them with social protection falls on the shoulders of the state, and in particular, regions and municipalities;
- loss of income for the pension and health insurance systems, since the self-employed people are exempt from mandatory insurance contributions and make them on a voluntary basis. A serious imbalance in the pension system arises as a result of the violation of the basic principle of the current pension insurance system, namely the principle of intergenerational solidarity ("each subsequent generation feeds the previous one");
- the spread of platform-based employment, along with work performed remotely on behalf of employers from different regions or countries, leaves open the question of which

region receives added value (at basic prices) generated by labour — a key factor in determining both GRP and GDP. This creates an imbalance between budget revenues and expenditures. Regional taxes and shares of federal taxes are allocated to the budget of the employer's region, while the region itself bears no social burden, such as the need to provide free healthcare, education, transportation infrastructure for personal vehicles or the expenses for maintaining public order. On the other hand, regions that are donors of remote workforce bear the entire social burden and corresponding budget expenditures, without receiving any economic dividends in the form of taxes. If the employer is located abroad, the problem is further exacerbated by the virtual drain of intellectual resources [1–6].

The following types of imbalances in regional development are identified, caused by the asymmetric development of the labour market and non-standard forms of employment:

- qualification (the imbalance between the current supply and demand for employees with specific professions or skills);
- virtual migration (the imbalance of interregional/international inflow and outflow of virtual workforce);
- technological challenges, caused by the development of robotics and artificial intelligence and leading to the disappearance and emergence of new jobs;

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- socio-economic challenges (the imbalance in the income and expenditures of the Social Fund of the Russian Federation, the imbalance in the income and expenditures of regional budgets [7–9]).

It is suggested to consider the outlined imbalances as risks. They will pose a threat for regions if the imbalance or deviation from a certain reference point exceeds a certain level and leads to tangible negative socio-economic consequences. These might include: a shortage of labour with the necessary skills upon further use of digital technologies; increased unemployment, increased costs for medicine and health care, growing scarcity of funds for pensions and health care; a decrease in GRP due to the outflow of intellectual labour while maintaining regional per capita expenses, and a decrease in tax revenues.

To address these issues, a risk-based assessment of a region’s labour resources and employment is proposed. This approach will promote the sustainable socio-economic and innovative development of regions in the context of digitalization and the development of non-standard forms of employment. This assessment follows a balance-sheet approach, which involves preparing a labour resource balance and adjusting it to account for the imbalances in the creation and distribution of manpower caused by digitalization and the emergence of new forms of employment [10, 11]. In this way, it is possible to determine potential economic losses associated with identified risk areas and promptly develop measures to ensure sustainable, risk-adjusted development of regions. Main provisions of the methodology are shown in Table 1.

The algorithm for applying the developed methodology for evaluating labour resources and employment in a region is as follows.

1. Identification of factors influencing the building and distributing labour resources in a region.

2. Collection of statistical data and independent research findings:

- current demographic statistics;
- data from sample surveys of enterprises and individual entrepreneurs conducted by state statistical agencies in the following areas: labour force, ongoing investment projects and expected changes in labour demand;
- data from consolidated reports of the Ministry of Internal Affairs of the Russian Federation on the number of migrant workers;
- data from administrative sources of information (the Federal Tax Service data platform on the number of self-employed individuals, the unified digital platform “Work in Russia”, etc.);
- data from recruiting agencies and labour market platforms on the current labour supply and demand;
- data from independent research on platform-based employment, other non-standard forms of employment, virtual migration, self-employed individuals’ actions (payment of voluntary pension and health insurance contributions, purchase of voluntary health insurance policies).

3. Drawing up a traditional balance of labour resources.

4. Labour distribution by types of employment (traditional, self-employed, platform-based, unregistered employment).

5. Establishing acceptable levels for qualification, innovation, virtual migration and socio-economic risks.

6. Analysis of the labour resource development balance by risk types (qualification, innovation, virtual migration and socio-economic risks).

7. Drawing up a forecast balance taking into account the expected workforce structure and staffing needs of a region.

Table 1. Basic provisions of the methodology for evaluating labour resources and employment in a region

Characteristics of the methodology	Description
Employment types under evaluation	Standard or traditional employment refers to working for a single employer at a fixed workplace provided by the employer, on predetermined days and hours, under a permanent or fixed-term employment contract. Non-standard employment refers to work where the employee independently determines working days, hours and the workplace location, often under short-term contracts and with an unlimited number of employers
Relevance of the methodology	Preventing economic losses of a region caused by the transformation of employment in the context of digitalization and virtual migration of manpower resources
Purpose of the methodology	Evaluating the balance in changes in a region’s labour resources in the context of evolving digital economy and new forms of employment to work out measures to reduce economic losses caused by the asymmetric development of the labour market and employment
Approach to labour resource assessment	Balance-sheet
Methods applied	Morphological analysis, statistical analysis, widely accepted methods for data collection and comparative analysis (a survey, interviews, analogy method, content analysis, expert analysis), modeling method, decomposition method for developing a risk assessment algorithm



Table 2. Methodology for assessing risks affecting the development of labour resources and employment in a region [12, 13]

Risk types	Risk source	Risk assessment	Features
Qualification	Exceeding the acceptable proportion of unemployed individuals with relevant professional qualifications within the total unemployed population, by occupations	The excess number of unemployed with relevant professional qualifications, multiplied by the minimum wage or by the unit costs of retraining	Regional expenditures on unemployment benefits, social support for families (child payments), and retraining programs
Innovation	The deviation between the current and expected number of people employed by types of economic activity	Probable shortage of labour force with required skills by types of economic activity, multiplied by GRP per capita	Regional GRP losses caused by the lack of employees with the right skills
Virtual migration	Negative balance of virtual migration (negative difference between the number of individuals from other regions undertaking job assignments and those employed remotely outside the region)	Negative balance of virtual migration multiplied by the difference between GRP per capita and the average income of an intellectual emigrant	Regional GRP losses caused by the outflow of virtual intellectual labour resources
Socio-economic	The reluctance of people with precarious jobs (without employment contracts) to voluntarily make insurance contributions for pension and health care	The number of self-employed individuals who do not make voluntary insurance contributions for pension and health care, multiplied by the average per capita expenditures of the region on social support and protection	Additional expenditures of the region and state extra-budgetary funds for social support and protection of citizens

8. Measuring economic losses in a region according to identified risk types (Table 2).

9. Development of measures to ensure sustainable risk-adjusted development of a region.

The algorithms for assessing the risks outlined in Table 2 are shown in Fig. 1–4.

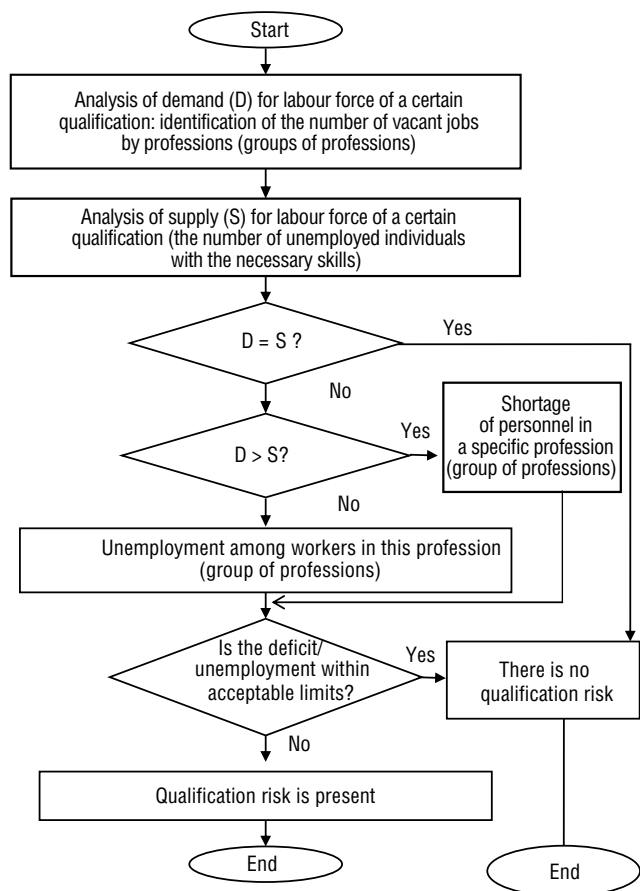


Fig. 1. The algorithm for assessing qualification-related risks

They include:

- the algorithm for assessing qualification risk;
- the algorithm for assessing socio-economic risk;
- the algorithm for assessing the risk related to virtual migration.

The algorithm for analyzing the supply and demand for labour with specific skills helps identify the stage at which qualification risk emerges. Next, the socio-economic risk is assessed as part of the proposed methodology (Fig. 2).

The socio-economic risk assessment algorithm should necessarily include the determination of the current structure of labour resources at the regional level. It is important to conduct the assessment with consideration of industry-specific employment trends. It is necessary to determine whether there is an inflow or outflow of labour by specific types of economic activity in order to determine the staffing needs in the region [14, 15].

The next stage entails assessing technological risk (Fig. 3).

The use of the developed methodology will ensure sustainable balanced development of regions in the context of digitalization,

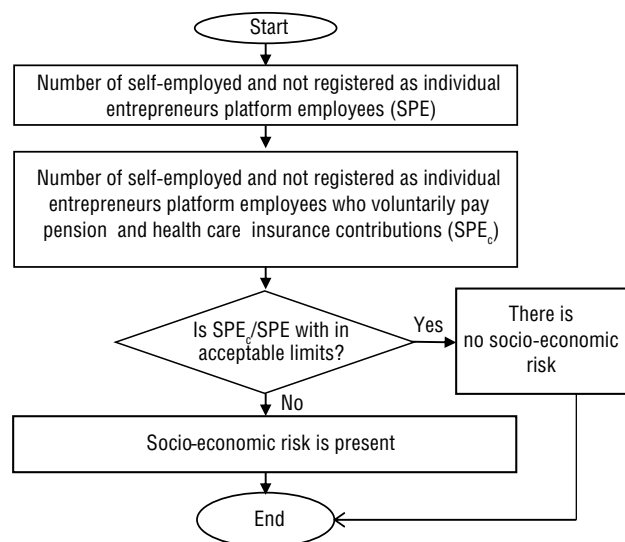


Fig. 2. The algorithm for assessing socio-economic risk

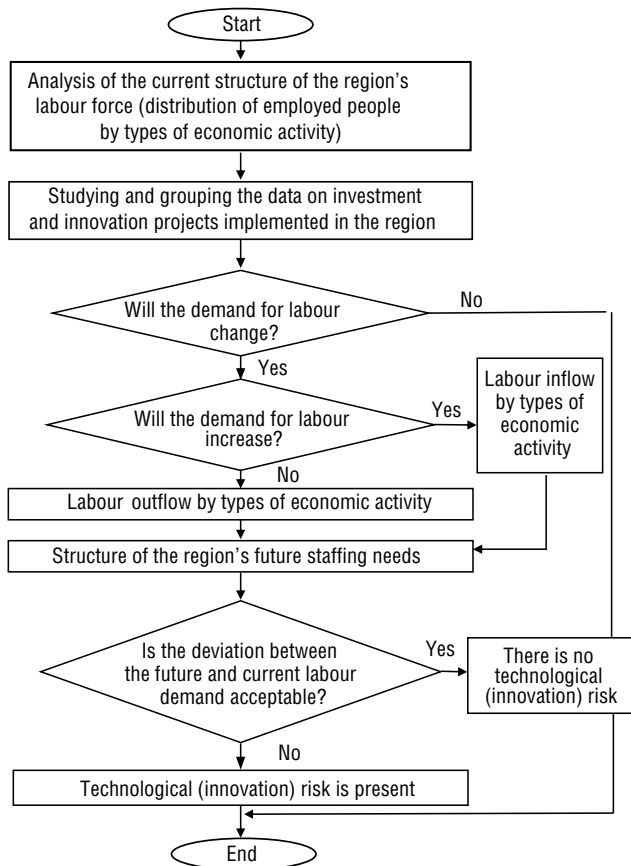


Fig. 3. The algorithm for assessing technological risk

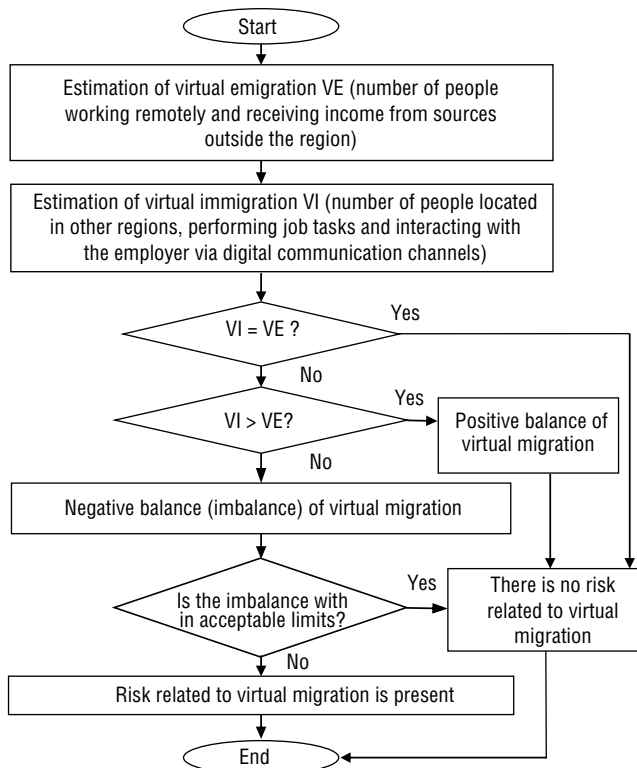


Fig. 4. The algorithm for assessing the risk of virtual migration

accompanied by a transformation of the quantity, composition and type of manpower, as well as the development of new forms of employment.

Currently, neither the world scientific community nor the authorities have developed a unified comprehensive approach to the sustainable development of the digital labour market and the regulation of migration processes in the evolving digital economy. Interregional, non-standard (flexible) labour migration driven by the rise of platform employment has been largely unexplored. This gap formed the basis of the methodology developed in this study, which was further tested with the collection and comprehensive assessment of empirical data.

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Разработка методики оценки трудовых ресурсов и занятости в регионе с учетом цифровых вызовов

Научное исследование направлено на разработку методики оценки трудовых ресурсов и занятости региона, позволяющей определить степень сбалансированности изменения трудовых ресурсов региона в условиях развития цифровой экономики и новых форм занятости для последующей выработки мероприятий по снижению экономических потерь, вызванных асимметричным развитием рынка труда и занятости. Разработанные алгоритмы реализации методики и оценки рисков, влияющих на трудовые ресурсы региона, могут быть использованы региональными структурами, обеспечивающими управление экономикой региона, в процессе разработки и принятия решений по его устойчивому развитию. Для достижения цели исследования будут использованы методы морфологического анализа для выделения ключевых характеристик трудовых ресурсов региона, способствующие социально-экономическому и инновационному развитию региона. С помощью методов статистического анализа предложено исследовать зависимость цифрового развития региона от изменений внешней среды, являющихся следствием реализации рисков событий, и выявить роль цифровизации трудовых ресурсов региона в обеспечении устойчивого экономического развития. Кроме того, предполагается использовать общепризнанные методы сбора и сравнительного анализа данных (метод аналогий, методы контентного, экспертного анализа), метод моделирования. Новые формы труда и занятости, возможные благодаря информационно-коммуникативным технологиям, оказываются за пределами национального регулирования. Прежние подходы и методы анализа трудовых ресурсов, оценки безработицы в масштабах страны и ее регионов уже не дают реальной картины, поскольку географическое местоположение человека автоматически не определяет его труд и занятость в конкретном регионе. Это делает актуальными исследования в области методологии анализа трудовых ресурсов регионов и занятости, учитывающие новые формы занятости и риски, связанные с заменой людей роботами, а человеческого интеллекта — искусственным.

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Ключевые слова: территориальное планирование, персонал организации, технологический уклад, процесс труда

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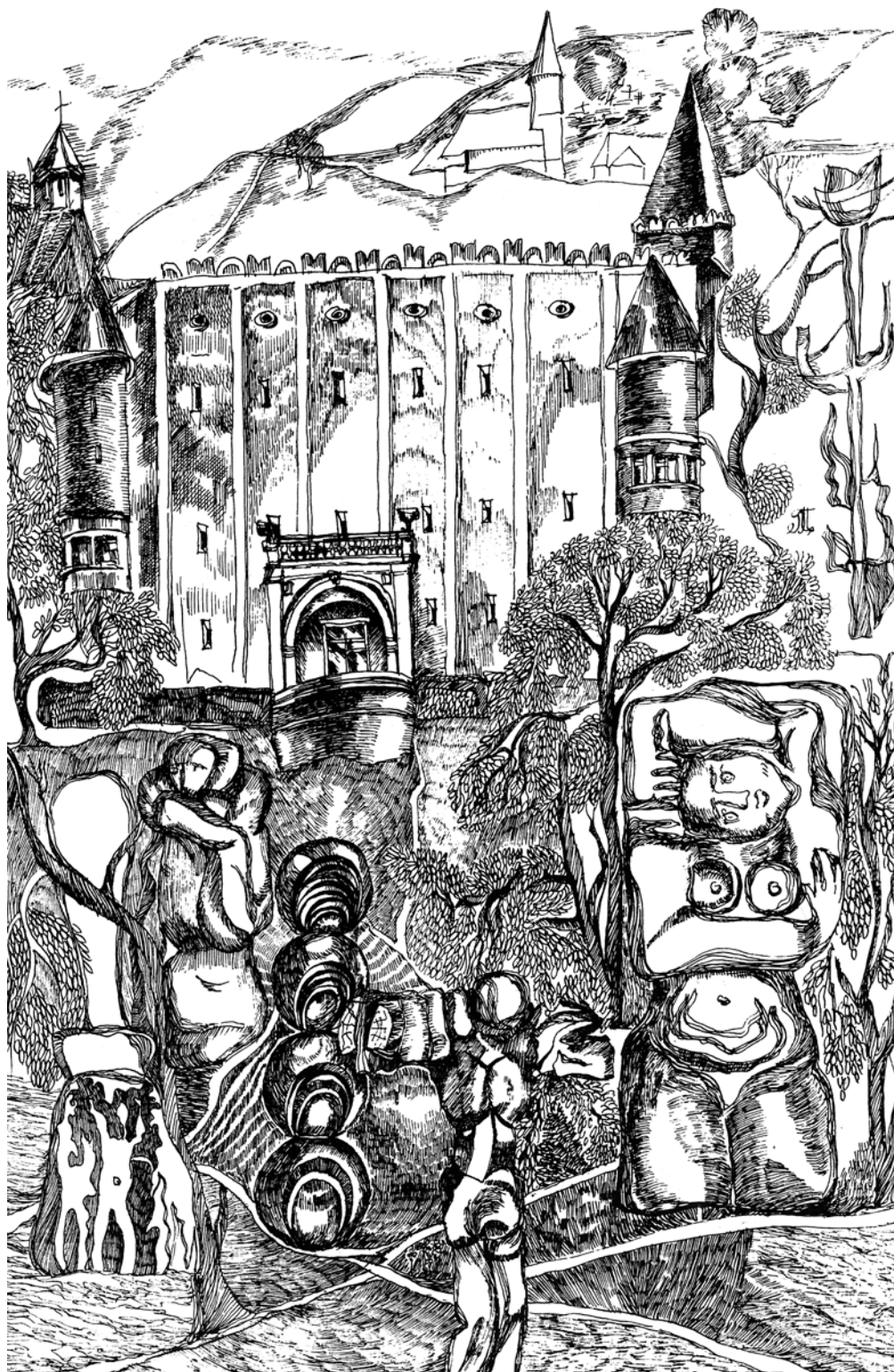
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