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## Trends in the Development of Human Capital in the Digitalization of the Economy

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**Abstract:** The digitalization of the economy has a huge impact on all socio-economic processes in general, with globalization and the active development of innovative technologies such as blockchain, artificial intelligence and cloud services, the digital economy has become an integral characteristic of the global and national economic system. The scale of the development of the digital economy in the world is difficult to assess accurately, as of 2019, the digital economy was estimated by the Boston Consulting Group at \$ 2,3 trillion, for a group of 20 countries it was 4.1% of total GDP, and Oxford Economics estimated digital commerce at \$ 20,4 billion, accounting for approximately 13,8% of global sales.

The growth rate of digitalization in the Russian Federation is much lower than in the United States, Japan and China, an indirect confirmation of this - the Russian Federation accounts for 1,8% of world GDP, while the productivity of supercomputers is only 0,32%, and for the development of digital economy, it is necessary to develop the national IT sector, stimulate the creation and implementation of innovative technologies in all social and economic spheres of activity, both on a national scale and at the level of the regions of the Russian Federation. The main idea of the development strategy focused on the implementation of the digital economy is the advanced formation of the basic industries of the new technological order and the speedy withdrawal of the Russian economy to a new long wave of development of production and productive forces associated with it.

**Keywords:** economics, ecology, recreation, biodiversity, monitoring, digitalization, human capital, cluster, innovation, investment.

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### INTRODUCTION

For the development of the digital economy, it is necessary to develop the national IT sector, stimulate the creation and implementation of innovative technologies in all production, economic and social sectors of the country, at present, the main tasks of the development of society are both ensuring economic growth and improving the quality of life, this can be achieved by the basis for the formation of a new economic model that stimulates the development of the digital economy [1,11].

Ensuring a technological and economic breakthrough is not possible without solving such problems as the growth of production volumes and the level of development of human capital; in their solution, an important place belongs to the education system, employer organizations and state and regional authorities. The considered circumstances determine the choice of the research topic, its relevance and national economic and scientific significance, and the degree of development of the problem that defines the concept of the digital economy has many interpretations, many scientists position it as the only way in the development of the state, others believe that the traditional economy will not change dramatically. Despite the myths and illusions, it is obvious that the new stage of economic development cannot be ignored, many fundamental issues, including those related to the processes of human capital development, production and consumption of educational services, the development of an effective mechanism for regulating the relationship between employers and educational organizations, are quite relevant for the scientific community, but have not yet been fully resolved [2,15].

The theoretical foundations of the formation of human capital in socio-economic development are set forth in the fundamental works of prominent representatives of economic science: G. Becker, J. Kendrick, and others; works of domestic scientists: N.A. Buranshina, A.V. Koritsky, M.M. and others, general issues of methodological support for the formation of human capital in the region are the object of research by domestic and foreign economists, such as O.V. Bondarenko, V.I. Gurova, E.V. Erokhin, and others, and the improvement of state regulation of the interaction of the education system and employing organizations in their works was proposed by M.G. Averkin, D.Yu. Bottaeva L.A., the study of the formation, accumulation and development of

human capital in the socio-economic development of the region is the subject of the works of E.A. Alpeeva, E.A. Bessonova, among the works of domestic scientists dealing with the problems of information support for the balance of interaction between the higher education system and employing organizations, one can single out A.A. Borisov, A.Z. Gilmanov, V.V. Yudanov and others [3,12].

#### **METHODOLOGY**

However, insufficient attention has been paid to the tasks of ensuring a balanced interaction between the education system and employing organizations using the mechanisms of state regulation in the context of the digitalization of the economy in socio-economic development, therefore, it is necessary to develop the following goals and objectives of the study, consisting in the generalization and development of theoretical provisions and the development of methodological recommendations on managing the development of human capital in the context of the digitalization of the economy, namely:

- substantiate a conceptual model of the interaction of factors for the development of human capital in the context of the digitalization of the economy;
- to form a methodological approach to assessing human capital to identify structural imbalances in the labor market;
- to develop a mechanism for managing the employment of graduates of the education system for the qualitative and quantitative harmonization of the labor market;
- introduce a system for monitoring the employment and career trajectories of graduates of educational institutions in the region to promptly correct local "failures" in ensuring the employment of graduates;
- to propose a toolkit for state regulation of the interaction between the education system and the world of work in the context of the digitalization of the economy;

Studies of the institutional and infrastructural environments for managing the formation and development of human capital in interaction with the labor market in the context of digitalization, taking into account organizational and economic relations related to the process of human capital management in socio-economic development, served as a theoretical, methodological and methodological main study of domestic and foreign scientists in the field of human capital development, research of mechanisms and tools for establishing a balance between the release of specialists by the education system and the prospective need for them in the economy in the context of intensive digitalization [4,13].

The implementation of the research goal will be achieved through the analysis of the higher education and labor markets in the Russian Federation, as well as the use of general economic methods - dialectical, abstraction, analysis, induction, modeling, as well as statistical methods, comparison method, etc. the territorial body of the Federal State Statistics Service, the Committee for Labor and Employment of the Region's Population, the Committee for Education and Science of the region, reporting documents of higher educational institutions of the region in the public domain. The study used statistical compilations and newsletters of the Higher School of Economics, materials of scientific conferences, articles in scientific journals, materials of the Internet, in the development of the scientific hypothesis of the study, in the scientific assumption that one of the significant dominants of the technological and economic breakthrough of the Russian Federation in the era of digitalization is development of human capital, and special attention in this should be focused on creating a mechanism for state regulation of the balanced development of the education system and the labor market in the region [5,10].

The scientific novelty of the research results lies in the development of a set of theoretical and methodological provisions aimed at ensuring a balanced development of the education system and harmonization of the labor market using mechanisms of state regulation of human capital in the context of the digitalization of the regional economy; the most significant new scientific results include:

- substantiated a conceptual model of the interaction of factors for the development of human capital in the context of the digitalization of the regional economy, which implies the integration of three main elements (education system, employers' organizations and regional government bodies) on the basis of a digital personnel platform of the region, which will effectively manage supply and demand in the labor markets and education of the region, as well as synchronize information flows within the regional socio-economic system and eliminate digital inequality in the structure of human capital;
- a methodological approach to assessing human capital was formed, which is characterized by the inclusion of qualitative characteristics of the demand for formed human capital, which made it possible to identify a structural imbalance in the regional education and labor markets in order to harmonize their development in the digital economy;
- a mechanism for managing the employment of graduates of the education system has been developed, which is distinguished by a set of economic levers and incentives for the influence of the methodological center on qualifications, taking into account the tasks of the digital economy in the qualification requirements for human resources, which will ensure the demand for human resources by solving the problems of matching the qualitative and quantitative characteristics of its structural elements to the conjuncture labor market;
- a system for monitoring employment and career trajectories of graduates of educational institutions in the region is proposed, which includes the subject, object, subject and tools of the system (including an electronic

information and educational platform) for monitoring the effectiveness of human capital development, which will make it possible to assess the contribution of educational organizations to the development of human capital, and also carry out operational correction of local "failures" in ensuring the employment of graduates;

- developed a toolkit for state regulation of the interaction between the education system and the world of work in the context of the digitalization of the economy, including the information field of human capital development, the scheme of interaction of factors of the labor market and the sphere of education, characterized by the use of professional standards as one of the main tools for regulating the balance of output of specialists and their employment, which will synchronize the high-quality structure of human capital to ensure digitalization;

- determined the theoretical significance of the study in substantiating the provisions that expand the understanding of the role of human capital in socio-economic development in the context of digitalization;

- development of proposals to ensure the balanced development of the education system and the harmonization of the labor market using mechanisms of state regulation, including within the framework of information support for the system of higher educational institutions;

- development of an organizational and economic mechanism for preliminary and current analysis of employment and career trajectories of graduates of educational organizations.

The practical significance of the study lies in the fact that the conclusions and recommendations contained in the work, addressed to the executive authorities, professional educational organizations, non-state institutions, professional associations, can be used to improve management relations between the education system and employing organizations in the region [6,11]. The results of the research in terms of information support for the employment of graduates of the education system can be used by educational organizations, as well as by bodies exercising powers in the field of education and science, labor and employment of the population for strategic planning and the prompt solution of their tasks. Theoretical and experimental provisions of the work are included in the educational and methodological support of disciplines and in programs of additional professional education for improving the qualifications of workers in the higher education system.

## RESULTS

The theoretical foundations for the development of human capital in the context of the digitalization of the economy, based on the socio-economic policy of the state, is one of the key areas of the country's strategic development, which includes a consistent improvement in the quality and standard of living of the population based on increasing the competitiveness of the national economy and its entry into the trajectory of sustainable development with subsequent restoration of the economic and political role of the Russian Federation in the world community. A separate role in the social and economic policy of the regions in the context of the digitalization of the economy is played by the development of human capital as an effective resource that is used for the social and economic development of society and the state on the basis of its qualitative and quantitative growth in all areas and structures of society and the state:

- Providing an infrastructure basis for digitalization processes, creating a global competitive infrastructure for transmission, processing and storage of data, mainly based on domestic developments;

- Ensuring the training of highly qualified personnel for the digital economy;

- Ensuring information security based on domestic developments in the transfer, processing and storage of data, which guarantees the protection of the interests of the individual, business and the state;

- Creation of end-to-end digital technologies mainly based on domestic developments;

- Ensuring the sustainability of the functioning of the digital infrastructure.

The field of education ensures the development of human capital in a new digital environment and forms new key competencies of the digital economy, in addition, by acquiring new knowledge, a person constantly improves his intellectual abilities, skills, memory, improves his discipline, improves personal character traits (ability to work, punctuality, organization) [7,13].

Conceptual foundations for the development of human capital, over time, more and more attention is being paid to the economic development of politics and is due to the fact that the spatial difference in the standard of living of the population is too great, the main goal of economic policy is to improve and support the socio-economic development of the Russian Federation.

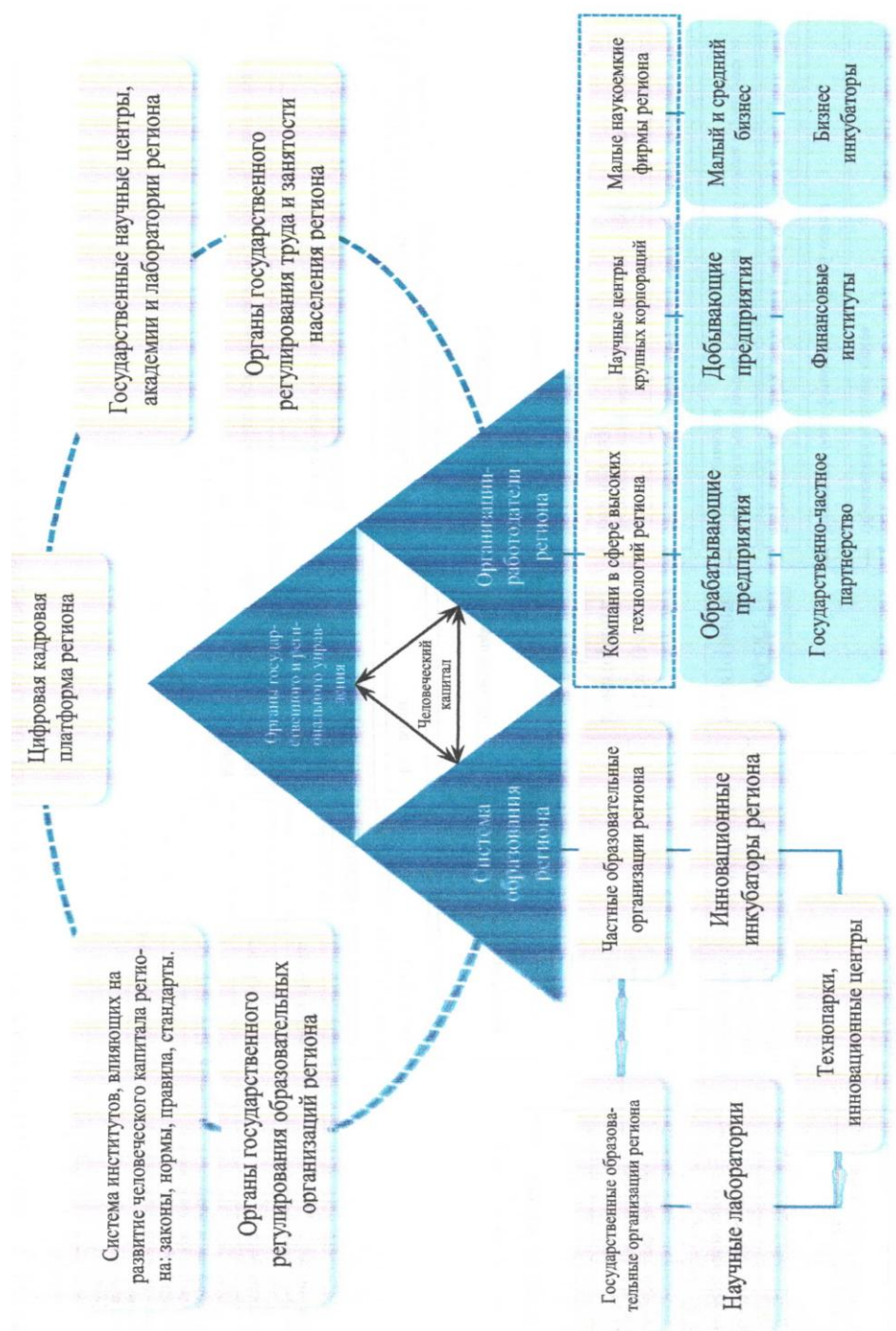
When implementing existing laws and regulations with modern management methods, it is far from always possible to take into account significant differences in the socio-economic development of the region, territorial natural conditions and the settlement of the population in general, it is for these reasons that it is impossible to build development priorities and effectively use its resource potential, therefore, the analysis of foreign experience in solving such problems arouses certain interest and it becomes possible to use it in domestic practice.

The analysis of regional economic policy allows us to draw a number of conclusions, using administrative measures and economic measures in a market economy, the state can influence market relations, business development in the regions and contributes to the solution of socio-economic problems. When planning and

developing target programs, the indicators are priority areas that depend on the territorial structure of the economy and regional problems that require the concentration of attention of the state and the regional governing body [8,11].

Within the framework of the implementation of regional economic policy, the current instrument is public-private partnership, which allows attracting and investing private capital, thus, an analysis of foreign and domestic experience in implementing state regional economic policy shows that, first of all, it is necessary to determine the priorities of the socio-economic development of individual regions, then use effective measures and mechanisms of state support for the development of the region.

The socio-economic policy of the state in the context of the digital economy is one of the key areas of the country's strategic development, which includes a consistent improvement in the quality and standard of living of the population based on increasing the competitiveness of the national economy and its entry into the trajectory of sustainable development with the subsequent restoration of the economic and political role of Russia in the world community.



**Fig.1: Conceptual model of interaction of human capital development factors in the context of digitalization of the economy.**

A separate role in the social and economic policy of the regions in the context of the digitalization of the economy is played by the development of human capital as an effective resource that is used for the social and economic development of society and the state on the basis of its qualitative and quantitative growth in all areas and structures of society and the state [9,15].

## DISCUSSIONS

Industrialized countries adopted regional policy as a set of measures used by the state to stimulate economic development, while implementing the policy, economic instruments were used:

- a) planning and forecasting;
- b) fiscal system;
- c) various economic regulators.

The use of economic instruments in different countries largely depended on the level of development of the state's economy, the features of the organization of the economy, the nature of solving socio-economic problems, but with all the variety of economic instruments, some of them were constantly used by different countries, which made it possible to conclude that the experience of foreign strategies was adopted and mechanisms of regional policy in the Russian Federation, namely:

- an extensive legislative base in matters of regional development of the region;
- complete absence of subsidies by individuals;
- special attention to the issues of infrastructure development;
- inclusion in state plans of social and economic development of a separate region of the country.

The field of education ensures the development of human capital in a new digital environment and forms new key competencies of the digital economy. In addition, acquiring new knowledge, a person constantly improves his intellectual abilities, skills, memory, increases his discipline, improves personal qualities of character (ability to work, punctuality, organization). Thus, in the field of education, not only the main component of human capital is formed - knowledge, but also other characteristics (spiritual, cultural, physical) [1,4,12].

The study analyzed the main scientific theories and concepts on the role of the education system in the development of human capital in the digital environment, as a result of which the following was revealed:

- the education system is the main tool for the development of human capital in the framework of eliminating the digital inequality, while simultaneously solving a number of social, economic, and cultural problems. On the basis of the competencies acquired in the course of training by students, educational institutions manage to form a qualified human resource for the new digital economy;
- the education system works in the interests of training competent specialists and adapting graduates to the conditions of the digital economy. The level of development of the education system in the region and the country as a whole has a primary impact on the indicators of socio-economic development and the well-being of the nation;
- the costs of developing the education system are accompanied by the economic growth of the region, and attracted investments are one of the factors in the development of human capital.

The education system needs to form and implement requirements for key competencies of the digital economy for each level of education, the proposed conceptual model of the interaction of human capital development factors in the context of the digitalization of the economy reflects the nature and structure of the interaction of regional government bodies with the education system and employers' organizations [1,15].

The main element of the interaction model is a digital personnel platform, which will effectively manage the demand and supply of employers and education in the region, as well as synchronize information flows within the regional socio-economic system and eliminate the digital inequality in the structure of human capital. algorithmic relations between meso-level authorities, the education system, organizations, employers and other significant participants in the development of human capital in the region, united by a single information environment, leading to a decrease in transaction costs due to the use of a digital technology package and changes in the labor and employment regulation system. The introduction of a digital personnel platform at the regional level is a step towards harmonizing the interaction of the regional labor market and education. To do this, it is necessary to ensure, within the framework of the digital personnel platform, the implementation of the following mechanisms: predicting the need for personnel in promising and demanded professions, practice-oriented (dual) education, training engineering personnel for high-tech industries, independent assessment of the quality of personnel training, monitoring the employment of graduates, in conditions digitalization of the economy [1,14].

Currently, not only the implementation of development plans of organizations depends on the solution of personnel issues, but also the development of the economy not only of the region, but also of the state as a whole. In the digital economy, the priority is to determine the demand for specialists in the labor market and the

needs of organizations for workers with certain (including digital) competencies, the main source of personnel for the digital economy is the higher education system, requires improving methodological approaches to assessing the formed human capital through the inclusion of qualitative characteristics of its relevance, for which a methodological approach to assessing human capital has been developed, the algorithm of which includes the following stages:

- Analysis of indicators of socio-economic development of the region and employers' enterprises to assess the quality of life and to determine the factors that form the demand for human capital.
- Assessment of the activity of the education system in the region according to the criteria for admission, contingent, graduation of specialists to model the supply on the regional labor market.
- Revealing the imbalance of demand and supply of human capital by type of economic activity and in the professional and qualification context.

Thus, a methodological approach to assessing the human capital of the region has been formed, which is characterized by the inclusion of qualitative characteristics of the demand for formed human capital, which will reveal the structural imbalance in the labor market. In order to ensure the demand for graduates of the regional education system through the processes of planning, coordination and control of their employment, it is proposed to create a regional methodological center for qualifications as an infrastructural element of the national qualifications system [7,14].

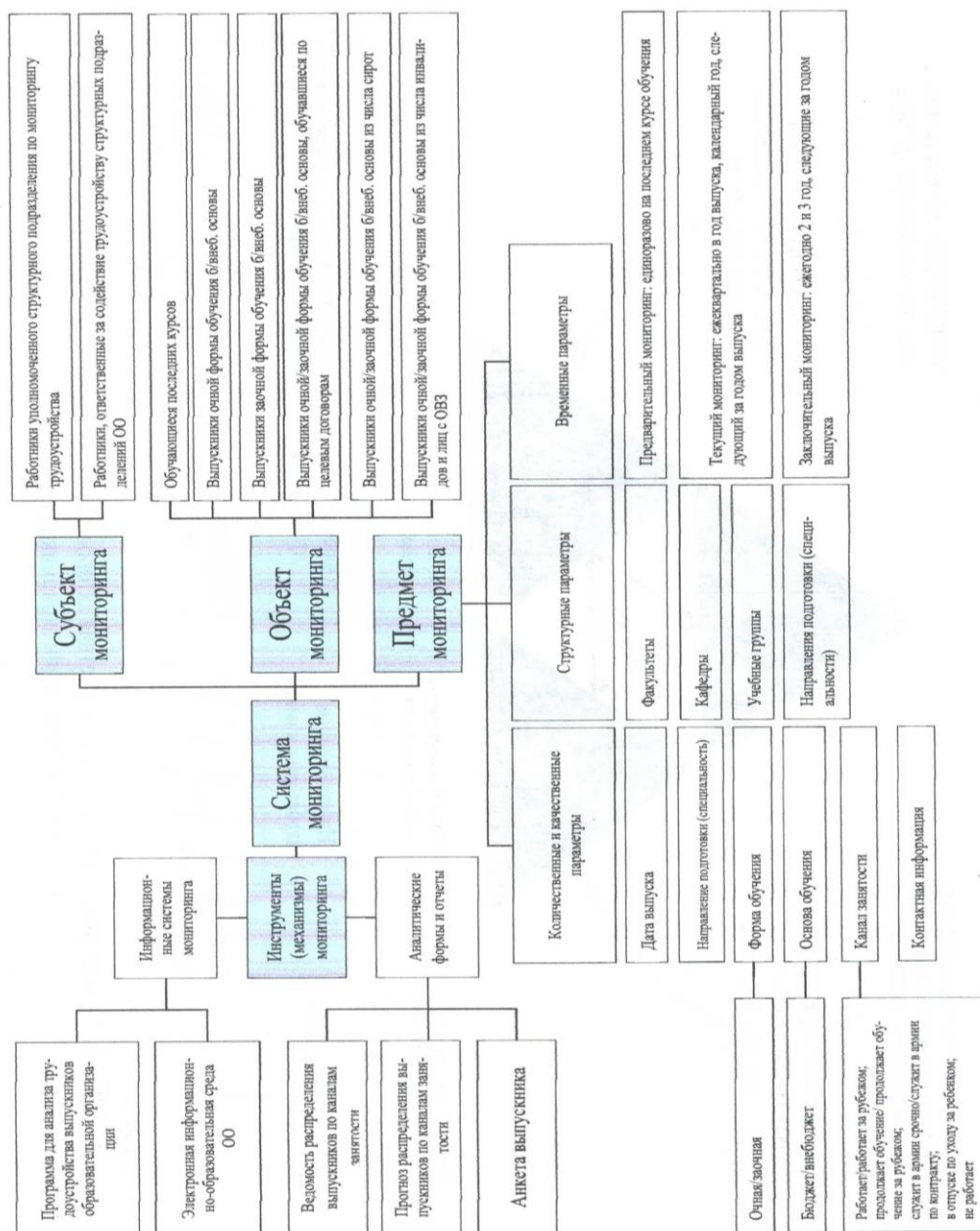
The main tasks of the regional methodological center for qualifications are:

- monitoring the main parameters of the qualifications system in the region, providing relevant information to the coordinating body - the Interdepartmental Commission on Professional Qualifications, for generalization and analysis;
- development of expert capacity;
- formation of proposals for the regions on professional qualifications;
- introduction of methodological documents, normative and methodological documents on qualifications, advice on professional qualifications at the regional level;
- use of best practices, analysis and use of the best regional practices in the development of the qualifications system;
- strengthening horizontal links with neighboring regions on the development of a system of professional qualifications.

Employment of graduates of the regional education system is one of the key tasks of sustainable development of the regional economic complex, on the one hand, the level of employment of graduates is an indicator of the effectiveness of the existing system of training in the region and the spending of budgetary funds.

The flexibility of the regional methodological center for qualifications is ensured by mechanisms that provide ample opportunities to choose the ways and means of mastering qualifications, including the possibility of gradual mastering of qualifications and recognition of non-formal learning, on-the-job training, expanding the range of qualifications.

The regional methodological center for qualifications will allow to correlate qualifications of different levels and types based on a set of common and agreed descriptors (descriptions), which will ensure the transparency of qualifications and will create new trajectories of transition from education to work and remove obstacles to learning through the introduction of new assessment systems. On the other hand, this is one of the criteria for the social openness of society, professional and social mobility of young people (figure 2)



**Fig.2: Elements of the system for monitoring the employment and career of graduates of educational institutions**

The position of youth in the labor market is due to the following factors:

- firstly, young people make up about 35% of the working-age population in Russia;
- secondly, youth is the future of the country, and it is on it that the further innovative development of the state and regions depends.

In the regions of Russia, there is a situation of imbalance between the labor market and the market of educational services, where more than 50% of the population have a job that is not related to the received specialty, of which specialists with higher education account for 21-22%.

Monitoring the employment of graduates of educational organizations is an effective way of organizing feedback with graduates of an educational organization of both higher and secondary or additional professional education and allows you to diagnose problems in time and make decisions to eliminate them. Organization of monitoring using digital technologies helps to improve the efficiency of human capital development management.

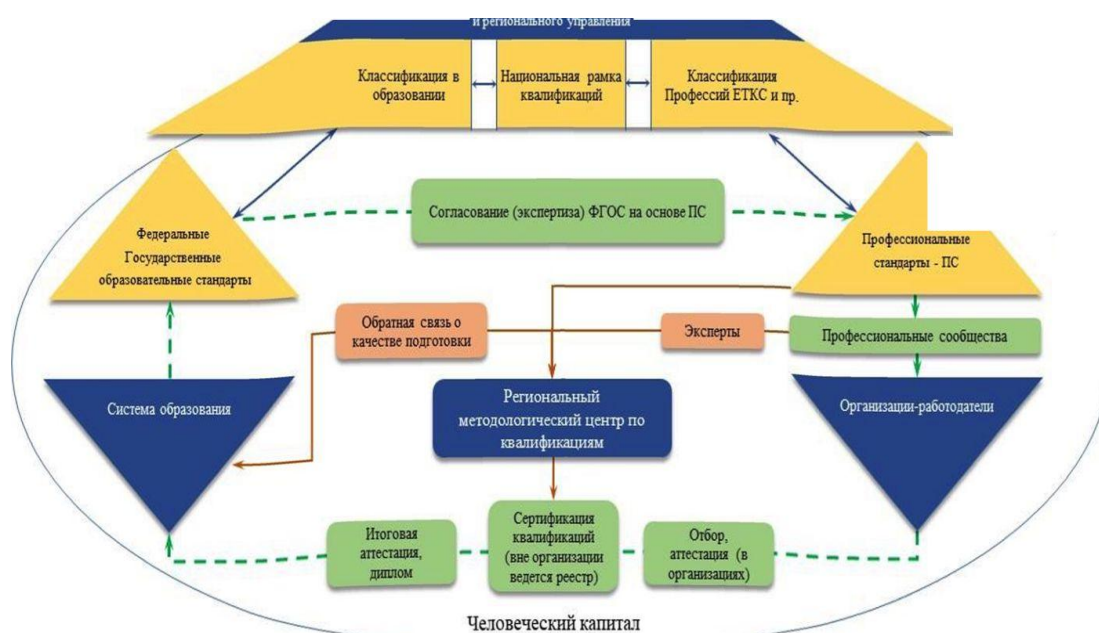
For the instrumental support of the collection, processing and storage of information arising at all stages of employment and career of graduates of an educational organization, a unified automated information system (UAIS) "Program for the analysis of employment of graduates of an educational organization".

The implementation of the UAIS analysis of the employment and career of graduates made it possible to increase the efficiency of collecting information from the structural divisions of the university on employment issues, to simplify and accelerate the exchange of data with external users as part of the implementation of the mechanism for managing the employment of graduates of the regional education system (the rate of data exchange increased 48 times), to identify and prevent “weak” spots in the overall employment picture [8,14].

The introduction of a system for monitoring employment and career trajectories of graduates of educational institutions in the region will allow to reliably assess the contribution of educational institutions to the development of human capital in the region, as well as to quickly correct local “failures” in ensuring the employment of graduates and their demand in the regional labor market. Toolkit for state regulation of the interaction between the education system of the region and the world of work in the context of the digitalization of the economy.

To synchronize the qualitative structure of human capital, information support for the management of the education system and state regulation of educational activities, a toolkit for state regulation of interaction between the education system of the region and employing organizations using digital technologies is required. The flagship element is the information system for the registration of educational organizations and their students (federal interdepartmental accounting system), combining data on students for basic educational and additional programs [5,9].

To improve state regulation of interaction between the education system of the region and employers' organizations in the context of the digitalization of the economy through the implementation of the NQS, a scheme has been developed for the interaction of factors of the labor market and the education sector (Fig.3).



**Fig.3: Scheme of interaction of factors of the labor market and education in the digital environment of the region**

A single information space in the study is understood as a complex of information and statistical programs that allow tracking the entire "life" cycle of a student - from an applicant to a graduate.

A digital personnel platform that synthesizes the information flows of the National Qualifications System (NQS) and the regional labor market and education, which can be implemented within the framework of the regional methodological center for qualifications. In the context of the digitalization of the economy, professional standards are a priority channel of communication between educational organizations and employers in terms of requirements for the qualifications of employees. The study found that the existing qualifications framework that regulates the national qualifications market, which manifests itself in the level of demand and supply of skills, for staffing the development of the digital economy, firstly, is not finalized, and secondly, it is implemented only in certain regions of the country [6,10].

The implementation of the interaction between the education system of the region and employers' organizations, regulated at the state level, in accordance with the presented scheme will allow synchronizing the qualitative structure of the region's human capital.

New economic and technological conditions require the creation and implementation of approaches to assist citizens in mastering the key competencies of the digital economy, ensuring mass digital literacy and personalizing education.



## CONCLUSION

As a result of the study, we made the following conclusions.:

The main factors for the development of human capital at the regional level in the context of the digitalization of the economy are the education system, employing organizations and government bodies. To solve the problem of the national project "Personnel for the digital economy" to ensure the comprehensive development of a person in a new digital environment, a conceptual model of interaction of these actors based on a digital personnel platform has been substantiated, which will synchronize in the long term supply and demand in the labor and education markets of the region and harmonize the digital divide.

The analysis of the main indicators of the socio-economic development of the region, the quantitative and qualitative assessment of the human capital of the constituent entity of the Federation, the requests of potential consumers of the educational services market, the structural dynamics of higher education organizations, as well as the analysis of the structure of expenditures of the consolidated budgets of the OECD countries on higher education made it possible to identify the problem area of human capital region. In the work, a methodological approach to assessing the human capital of a region is formed, which is characterized by the inclusion of qualitative characteristics of the demand for formed human capital, which made it possible to identify a structural imbalance in the regional labor market.

Monitoring the employment and career of graduates of the regional education system allows you to anticipate the manifestation of problem areas for ensuring youth employment and take the necessary organizational measures, for this purpose, a functional model of the process of monitoring the employment of graduates has been developed, a system for monitoring employment and career trajectories of graduates of educational organizations in the region is proposed, which makes it possible to assess the contribution of educational organizations in the development of human capital in the region, as well as to promptly correct local "failures" in ensuring the employment of graduates.

A mechanism for managing the employment of graduates of the regional education system has been developed, based on the activities of the regional methodological center for qualifications, taking into account the tasks of the digital economy in the qualification requirements for human resources. This will ensure the compliance of the qualitative and quantitative characteristics of the structural elements of human capital with the labor market situation in the region and the demand for human resources, based on the analysis of the tasks of the current national program "Digital Economy of the Russian Federation", created to ensure the relationship between business, government, expert and scientific communities to increase competitiveness Russia at the global level and technologies for the implementation of the Regional standard of staffing for industrial growth for the implementation of mechanisms for predicting the need for personnel in promising and in-demand professions, for solving the problems of the Federal project "Human Resources for the Digital Economy": "To motivate companies to create jobs and train their employees and other citizens in the key competencies of the digital economy" in the dissertation work, a toolkit for state management of interaction between the education system of the region and the world of work based on digital technologies is proposed, including: the information field for the development of human capital in the region, the scheme of interaction labor market and education factors.

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