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Article

Modern Concepts Of Higher And Professional Education Integration In Providing Qualified Personnel For Regional Economic Sectors

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Abstract: The article systematizes modern conceptual approaches to the integration of higher and professional education in providing regional economic sectors with qualified personnel. The economic content of the concepts of the skills ecosystem, skills needs anticipation, lifelong learning and flexible educational trajectories, competency-based education, dual and work-based learning, the regional innovation ecosystem, and digital analytics of skills is revealed. Their role in coordinating the demand and supply of personnel in the regional labour market, increasing the alignment of educational programmes with sectoral specialization, and strengthening the efficiency of human-capital utilization is substantiated. As the author's own approach, it is proposed to organize the integration of higher and professional education around the chain "forecasting regional demand – competency mapping – integrated educational trajectory – joint training with the employer – outcome monitoring."

Keywords: regional economy, human capital, higher education, professional education, integration, skills ecosystem, competency, skills needs anticipation, dual education, labour market, qualified personnel.

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1. Introduction

Global technological change, the digitalization of production processes, the transition to a green economy, and the growing complexity of the services sector are rapidly transforming the composition of professional competencies demanded by the labour market. This process is especially important for the regional economy, because the pace of development of territorial sectors and the effectiveness of investment projects are directly linked to the qualification level of local labour resources. The International Labour Organization interprets skills needs anticipation as a strategic process aimed at aligning the education and training system with current and future labour demand [1].

In the traditional model, higher education and professional education were regarded as separate segments: the former forming high-level theoretical and analytical competencies, the latter forming practical skills oriented toward a specific occupation or job. In the modern economy, the institutional boundaries between these two segments are softening, and the need for a unified skills system is intensifying through mutual recognition of modules, credit transfer, short programmes, micro-credentials, dual education, work-based learning, and continuous retraining. UNESCO's work on establishing clear and flexible transition pathways between technical and vocational education and higher education links this to the growing demand for higher-level skills in the labour market and the need for lifelong retraining [2].

In this respect, the task of providing regional economic sectors with personnel is determined not by increasing the number of educational institutions or the volume of graduates, but by the structural specialization of the territorial economy and the capacity to continuously transform future competency demand into educational supply. The purpose of the article is to systematize modern concepts of higher and professional education integration from the standpoint of the regional economy and to combine them into a single conceptual mechanism aimed at improving regional personnel provision.

Relevance of the Topic

The uneven formation of regions' economic potential means that the demand for personnel is also not uniform across territories. In regions with high industrial specialization, demand is dominated by engineering, automation and technical-service competencies; in agrarian regions, by agrotechnology, logistics and processing; and in tourism-oriented regions, by service, language and digital-marketing competencies. Consequently, alongside centralized standards, the education system needs mechanisms flexible enough to adapt to the sectoral structure of the regional economy.

The OECD's "Skills Outlook 2025" report emphasizes the need to develop connected and flexible trajectories that facilitate movement between professional and academic tracks within the skills system, modular qualifications, and mechanisms for recognizing prior learning outcomes [3]. This approach elevates the integration of higher and professional education from organizational cooperation within the education sphere to the level of an economic institution that ensures the mobility of regional human capital.

The relevance of the topic is further underscored by the fact that, under conditions where the content of new jobs is changing rapidly, updating educational programmes based solely on the existing occupational classifier produces lag effects. The International Labour Organization and the OECD note that systematic forecasting of future skills needs is necessary for the education system to respond strategically and to prevent skills demand–supply mismatches [4]. For this reason, modern concepts of integration must link forecasting, educational design, employer participation and outcome monitoring within a single system.

The theoretical foundations of higher and professional education integration form at the intersection of human capital theory, institutional economics, labour market segmentation, innovation systems, and lifelong learning concepts. In the human capital approach, resources spent on education are regarded as an investment that raises labour productivity and incomes. Integration allows the effectiveness of this investment to be increased by linking educational outcomes across different levels.

A study prepared for UNESCO by Simon Field and Ava Guez substantiates the development of pathways from technical and vocational education to post-secondary and higher education by reference to labour-market demand for higher-level qualifications and the need for retraining and upskilling [2]. The authors regard the transparency and interconnection of educational pathways as an important condition for system flexibility.

UNESCO's Strategy for Technical and Vocational Education and Training (TVET) 2022–2029 evaluates professional education as a system that links education with the world of work, prioritizing the strengthening of STEM, entrepreneurship, digital and green skills, and the development of higher-level professional education and work-based learning in the transition to a digital, green and inclusive economy [5]. The 2024–2026 Medium-Term Strategy of UNESCO-UNEVOC, in turn, sets out the formation of flexible educational trajectories and the transformation of TVET institutions into institutions responsive to the demands of a digital, green and inclusive economy [6].

The concept of skills forecasting constitutes the informational foundation of educational integration. According to the ILO, skills needs anticipation encompasses identifying current and future labour-market demand, analysing the supply and demand of skills, forecasting, and developing sector-appropriate strategies [1]. This concept makes it possible to determine, on an evidence-based footing, which programmes should be combined, which modules should be updated, and which competencies should be prioritized within the integration of higher and professional education.

UNESCO-UNEVOC's Bridging Innovation and Learning in TVET (BILT) initiative identifies the recognition of new qualifications and competencies, their flexible incorporation into curricula, and their application in the teaching process as an important direction of innovative TVET [7]. This approach theoretically supports the need for the continuous updating of educational content for regional sectors.[8]

2. Research Methodology

2.1. Research Design and Theoretical Basis

The study is designed as a qualitative theoretical-conceptual investigation. Its object is the interaction between higher and professional education in providing regional economic sectors with qualified personnel, and its subject is the set of modern conceptual approaches through which this interaction is organized and aligned with labour-market demand. [9] Since the aim of the article is to systematize existing concepts and combine them into a single mechanism, rather than to measure the effect of a particular policy instrument, the research design follows the logic of conceptual framework analysis: concepts are identified in the source base, deconstructed into their constituent elements, categorized, and then integrated and synthesized into a coherent framework [10].

The theoretical and methodological basis of the study is formed by human capital theory, institutional economics, labour market segmentation theory, the innovation systems approach and the concept of lifelong learning discussed in the literature review. Human capital theory provides the criterion for assessing the economic effectiveness of integration – the return on educational investment expressed in employment and productivity; institutional economics explains integration through rules, organizations and coordination mechanisms; and the segmentation and innovation-systems approaches frame the territorial and sectoral differentiation of personnel demand.

2.2. Information Base and Selection of Sources

The information base of the study consists of analytical reports, strategic documents and methodological guides of international organizations that shape the global agenda in skills policy: the International Labour Organization (ILO), the Organisation for Economic Co-operation and Development (OECD), UNESCO and the UNESCO International Centre for Technical and Vocational Education and Training (UNESCO-UNEVOC), as well as a joint publication of the ILO, the European Training Foundation (ETF) and Cedefop [11].

Sources were selected on the basis of three criteria. First, institutional authority: the document is issued by an international organization whose mandate covers education, skills development or the labour market. Second, thematic relevance: the document directly addresses at least one of six thematic areas – skills needs anticipation, pathways between professional and higher education, lifelong learning, qualification frameworks, work-based learning and the skills ecosystem. Third, currency: preference was given to documents published in 2016–2025 and to current materials of the UNESCO-UNEVOC knowledge platform, which reflect the influence of digital and green transitions on skills demand. Documents of this type were chosen because they generalize the experience of a large number of countries and serve as reference frameworks for national education and employment policies.[12]

2.3. Analytical Framework

To make heterogeneous concepts comparable, an analytical matrix with four classification criteria was developed: (1) the purpose of the concept – the problem of personnel provision it is intended to solve; (2) the object of integration – what exactly is being integrated: actors, labour-market information, educational content, qualifications, learning environments or data; (3) the mechanism linking the concept to the labour market – the institutional arrangements and instruments through which demand signals are transmitted to the education system; and (4) the regional economic effect – the expected outcome for sectoral personnel provision and the use of human capital in the territory. In condensed form, these criteria are reflected in the columns of Table 1.[13]

The regional dimension of the analysis was operationalized through the sectoral specialization of the territorial economy. Three stylized types of regions – industrial, agrarian and tourism-oriented – were used as reference cases to interpret how the same concept leads to different competency priorities depending on the economic profile of a territory.

2.4. Research Methods and Their Application

Each of the methods employed was applied at a specific point of the analysis.

Document analysis [11] was used to extract the key provisions, definitions and recommended instruments from each source and to code them according to the criteria of

the analytical matrix.

Systemic analysis made it possible to regard the integration of higher and professional education as a system of interacting actors – higher education institutions, professional education institutions, enterprises and territorial governing bodies – and to determine the function of each concept within this system and the links between the concepts.

Comparative analysis was used to juxtapose the concepts according to the matrix criteria and to identify convergences and differences in how the ILO, the OECD and UNESCO treat the same issues; its results are summarized in Table 1.

Institutional analysis examined the rules and organizational forms through which integration is implemented – regional and sectoral skills councils, qualification frameworks, the recognition of credits and prior learning, and dual-education arrangements – as well as the distribution of roles and responsibilities among participants.

Conceptual synthesis combined the complementary concepts into a single framework by identifying the question each concept answers within the personnel-provision system: which competencies are needed, who cooperates, what is taught, how learners move between educational levels, where competencies are reinforced in the work environment, how knowledge is converted into innovation, and how outcomes are monitored.

Logical modelling was applied to arrange the concepts into the stages of the regional personnel-provision cycle, linking each stage to its main task, the concept applied and a resulting indicator (Table 2), and on this basis to construct the generalized conceptual chain with a feedback loop.

The indicator method was used to develop the system of indicators for evaluating integration effectiveness (Table 3). Indicators were selected according to three requirements: a direct link to regional labour-market outcomes rather than to the volume of educational activities; measurability; and the potential availability of data from administrative statistics, graduate employment tracking and employer surveys.

2.5. Stages of the Research

The research was carried out in five consecutive stages. At the first stage, the source base was formed and the thematic areas of analysis were defined. At the second stage, the provisions of the selected documents were coded and distributed across the analytical matrix. At the third stage, comparative and institutional analysis made it possible to identify seven key concepts and to characterize each of them by its main content, integration mechanism and regional economic outcome (Table 1). At the fourth stage, logical modelling was used to map the concepts onto the stages of the regional personnel-provision cycle and to construct the conceptual chain with feedback (Table 2). At the fifth stage, a system of indicators for evaluating integration effectiveness was developed (Table 3), and conclusions and recommendations were formulated.

2.6. Reliability and Limitations of the Study

The reliability of the conclusions was supported in two ways. First, the positions of different international organizations on the same issues were compared, and the conclusions were based on the provisions on which these sources converge (source triangulation). Second, the internal logical consistency of the model was checked: each stage of the cycle must have a defined task, an applied concept and a measurable resulting indicator, and the results of the monitoring stage must feed back into the forecasting stage and the revision of curricula. The practical interpretability of the model was illustrated with the example of a regional machine-building cluster.[14]

The study has a number of limitations. It is theoretical in nature, and the proposed model and indicator system have not yet been tested on empirical data from specific regions. In addition, the source base is limited to documents of international organizations, which generalize international experience but do not fully reflect the national legislation and institutional environment of individual countries. These limitations define the directions for further research: empirical verification of the model using regional labour-market statistics, graduate employment data and employer surveys, and adaptation of the indicator system to the national context.

3. Analysis and Results

The theoretical analysis conducted showed that the modern content of higher and professional education integration can be expressed through seven interconnected concepts. Each performs a distinct function within the personnel-training system, but the highest effect for the regional economy is formed when these concepts are applied within a single ecosystem.

The skills ecosystem concept interprets integration not as a contract or joint activity between two types of education, but as a sustainable network of actors shaping human capital in a territory. In it, higher education institutions participate as centres of scientific and higher-level competencies, professional education institutions as providers of practical and mid-level competencies, and enterprises as sources of demand and work-based learning. The territorial governing body ensures the coordination of information and resources among these participants.

Table 1. Modern Concepts of Higher and Professional Education Integration

Concept	Main Content	Integration Mechanism	Regional Economic Outcome
Skills ecosystem	Interconnection of education, employer, government and labour-market institutions	Regional skills council, cluster, sectoral councils	Coordination of personnel supply and sectoral demand
Skills needs anticipation	Forecasting current and future competency demand	Labour-market information, vacancies, employer surveys, scenarios	Advance identification of personnel shortages
Flexible educational trajectories	Vertical/horizontal movement between professional and academic tracks	Credit recognition, modules, micro-credentials, recognition of prior learning	Human-capital mobility
Competency-based education	Emphasis on outcomes and practical competency rather than instructional time	General competency profile and assessment	Faster adaptation of graduates to the workplace
Dual and work-based learning	Combining education and production processes	Enterprise-based practice, mentor–apprentice practical training, joint modules	Higher share of personnel with work experience
Innovation ecosystem	Integration of education–science–production	Laboratory, technopark, joint project	Strengthened sectoral innovation potential
Digital analytics of skills	Tracking competency dynamics based on data	Digital platform, analytics, AI-based forecasting	Faster and more accurate decision-making

The skills needs anticipation concept forms the informational core of this ecosystem. The ILO shows that the use of labour-market information serves decisions such as revising educational programmes, attracting students to specific fields, and assessing the availability of a qualified workforce for investment [8]. At the regional level, this approach requires forecasting personnel needs by sector over a 3–5-year horizon and linking admission parameters to the forecast.

The flexible educational trajectories concept institutionally supports the transition of a professional-education graduate to higher education, or a higher-education student's mastery of a specific practical qualification module on a professional-education basis. The OECD's 2025 report emphasizes that modular qualification documents and the

recognition of prior learning outcomes strengthen horizontal and vertical mobility [3]. This serves to reduce the cost and time of retraining in the regional labour market.

In competency-based integration, the binding element is not the formal correspondence of curricula but the matrix of competencies a graduate must acquire. For example, for a regional machine-building cluster, digital CNC machine-tool operation and maintenance competencies in professional education, and automation, production management, and engineering-analysis competencies in higher education, can be coordinated within a single technological chain.

The dual and work-based learning concept reduces the skills demand–supply mismatch by shaping educational outcomes within the production environment. The UNESCO strategy includes work-based learning and mentor–apprentice-based practical training among the key instruments for forming youth employment and labour-market-relevant skills [5]. From a regional standpoint, dual education increases enterprises' responsibility in the personnel-training process and serves as a rapid information channel for educational institutions on technological change.

The innovation ecosystem concept links the integration of higher and professional education not only to personnel training but also to technology transfer and sectoral modernization. By combining scientific laboratories in higher education institutions and practical workshops in professional education institutions on the basis of enterprise orders, students participate in solving real technological problems. This creates a multiplier effect between personnel training and innovative activity.

The digital analytics of skills concept elevates integration to a data-driven governance stage. By combining data on vacancies, wages, graduate employment, employer evaluations, educational outcomes, and regional investment projects on a single analytical platform, it becomes possible to systematically track which competencies are experiencing growing demand. The ILO identifies the joint development of data, methods, and institutional mechanisms as a core condition of the skills needs anticipation system [1].

Table 2. Integrating Modern Concepts into the Regional Personnel-Provision Cycle

Stage	Main Task	Concept Applied	Resulting Indicator
1. Diagnostics	Identifying personnel shortages by sector and occupation	Skills needs anticipation, labour-market information	Demand–supply gap
2. Competency mapping	Compiling knowledge and skills profiles by occupation	Competency-based approach	Competency-match index
3. Educational design	Linking higher- and professional-education modules	Flexible educational trajectories	Share of mutually recognized modules
4. Joint training	Practical training with employer participation	Dual education and work-based learning	Share of enterprise-based training
5. Innovative activity	Joint projects on sectoral problems	Innovation ecosystem	Joint projects and solutions
6. Monitoring	Tracking employment and employer evaluation	Digital analytics of skills	Employment, matching employment, employer satisfaction

The cycle proposed in Table 2 transforms integration from a one-off organizational decision into a governance process with continuous feedback. At the diagnostic stage, personnel needs are identified on the basis of the sectoral structure and investment plans of the territorial economy. Demand is then expressed not in occupational titles but in the language of competencies. This allows recurring, complementary, and missing modules to be identified within professional- and higher-education programmes.

Mutual recognition of modules is important in integrated educational design. If a

practical competency acquired in professional education is retaught in higher education, time and resources are lost. Conversely, if the educational trajectory is shortened through the recognition of credits or competencies, an individual's opportunity to enter the labour market and subsequently move to higher qualifications expands. UNESCO-UNEVOC identifies national qualification frameworks as an important instrument for developing integrated skills and lifelong learning [9].

From the standpoint of the regional economy, it is not advisable to limit the evaluation of integration effectiveness to graduates' overall employment. Indicators such as a graduate's employment close to their field of specialization, time to employment, employer satisfaction with competencies, the speed of filling vacancies in the region, and staff turnover are important. These indicators link educational outcomes to regional economic outcomes.

Table 3. Proposed Indicators for Evaluating Integration Effectiveness

Direction	Indicator	Economic Content
Demand alignment	Share of graduates employed in jobs matching their specialization	Alignment of educational supply with sectoral demand
Speed	Average time to employment after graduation	Efficiency of labour-market transition
Employer evaluation	Competency-satisfaction index	Quality of preparation
Depth of integration	Share of joint/recognized modules	Linkage of HEI–VET curricula
Practice	Volume of training completed at the enterprise	Level of work-based learning
Regional effect	Coefficient of filling vacancies in scarce occupations	Reduction of regional personnel shortage
Adaptability	Participation in retraining and micro-credential programmes	Workforce adaptation to structural change

The proposed system of indicators makes it possible to evaluate the integration of higher and professional education not only by educational-process outcomes but also by regional labour-market effectiveness. For example, an increase in the number of joint modules is not in itself a positive result; it becomes an economic effect only when it is accompanied by a rise in graduates' employment in matching jobs and employer satisfaction.[12]

Another common feature of modern concepts is that education is regarded not as a one-time qualification but as a portfolio of competencies renewed throughout one's working life. As the content of occupations changes under digital and green transformation, educational institutions are required to expand short, modular programmes that can be mastered concurrently with employment. UNESCO-UNEVOC's 2024–2026 strategy likewise identifies flexible educational trajectories as an important condition for adapting to digital, green and inclusive societies [6].

Thus, the modern concepts of higher and professional education integration are not mutually competing but complementary approaches. Skills needs anticipation determines which competencies are needed; the skills ecosystem determines who cooperates; the competency-based approach shapes what is taught; flexible educational trajectories ensure movement between educational levels; dual education reinforces competency in the work environment; the innovation ecosystem converts knowledge into technology and innovation; and digital analytics of skills continuously monitors outcomes.[13]

In the regional economy, the problem of personnel provision is often reduced to the simplified interpretation that “the education system is not training enough personnel.” In reality, the problem may relate to structural alignment rather than quantity. It is possible for a surplus of graduates in one field to coexist with a shortage of specific technological competencies in a given region. For this reason, integration policy should be based on a balance of competencies rather than a mechanical alignment of admission quotas.[14]

Here, territorial sectoral councils or regional skills councils may serve as the institutional linking mechanism. It is advisable to include territorial administration, major employers, sectoral associations, higher and professional education institutions, and employment authorities in their composition. The council's task would consist of interpreting labour-market information, identifying priority competencies, and coordinating joint programmes and practice bases.

At the same time, the institutional deepening of integration must be balanced against the autonomy of educational institutions and quality assurance. Excessive adaptation to the employer's current needs may narrow fundamental knowledge, while reliance on purely academic content, conversely, may lead to a shortage of practical competencies. Modern concepts envisage reconciling these two poles through flexible modules and outcome-based qualifications.[15]

Based on the research findings, the conceptual model of integration for the regional economy can be formed on the basis of a five-stage chain: "forecasting regional demand → competency mapping → integrated educational trajectory → joint training with the employer → monitoring employment and sectoral outcomes." The feedback mechanism of this chain consists of returning monitoring results to the subsequent forecast and curricula.

4. Conclusions and Recommendations

The research results show that modern concepts of higher and professional education integration carry a broader meaning for providing regional economic sectors with personnel than mere cooperation between individual educational institutions. Integration should be interpreted as an economic mechanism that links regional labour-market information, qualifications, educational trajectories, employer participation, and outcome monitoring within a single skills ecosystem.

First, it is advisable to introduce a system of skills needs anticipation at the territorial level, forecasting medium-term personnel needs by sector and occupation at the level of competencies. Second, it is necessary to expand flexible trajectories between higher- and professional-education programmes based on the mutual recognition of credits and competencies. Third, the participation of sectoral enterprises in shaping curricula, dual education, and evaluating outcomes should be institutionalized.

Fourth, it is proposed to form a digital skills-analytics mechanism by combining vacancies, graduates, wages, investment projects, and competency requirements on a regional personnel-balance digital platform. Fifth, it is advisable to evaluate integration effectiveness not by the number of joint activities but through employment in matching jobs, speed of employment, employer satisfaction, the filling of scarce vacancies, and retraining outcomes.

Overall, developing higher and professional education integration on the basis of the conceptual chain "skills needs anticipation – skills ecosystem – flexible educational trajectories – work-based learning – digital monitoring" makes it possible to reduce the structural mismatch between personnel demand and supply in the regional economy, increase the intersectoral mobility of human capital, and strengthen the personnel-provision base of regional economic growth.

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