

**Образователната система и пазарът на труда в Казахстан:
търсене на баланс в условията на цифрова трансформация**
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**The Education System and Labor Market in Kazakhstan:
Striving for Balance in the Context of Digital Transformation**
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Abstract:

Amid the rapid development of digital technologies and the transformation of key economic sectors, Kazakhstan faces the urgent need to restructure its education system to align with the evolving demands of the labor market. This article examines the current challenges and emerging trends at the intersection of educational policy and labor market dynamics, while assessing the institutional measures undertaken by the state in the context of digitalization. The study aims to identify structural mismatches between the education system and the labor market and to substantiate directions for overcoming these gaps in light of contemporary technological and economic realities. Particular attention is paid to the imbalance between educational program content and employer expectations, the development of digital competencies among graduates, and the potential for implementing flexible learning trajectories. Based on an analysis of strategic documents, statistical data, and expert assessments, the article offers recommendations for enhancing the coherence between educational policy and the priorities of the digital economy.

Keywords: digital transformation, education, labor market, Human capital development, digital skills, structural mismatch, skills gap.

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ВЪВЕДЕНИЕ

The integration of the educational framework and the labor market dynamics in the Republic of Kazakhstan has emerged as one of the most critical structural challenges of national economic policy. As the global economy undergoes a fundamental restructuring driven by the Fourth Industrial Revolution, the traditional determinants of human capital value are being radically redefined. In Kazakhstan, where state-led initiatives and the rapid expansion of technology ecosystems have accelerated the adoption of automated, data-driven technologies, this transition is particularly pronounced. Consequently, the national economy faces an intricate puzzle: how to synchronize an institutionalized, historically rigid academic system with a volatile, highly digitized employment market that demands rapid and fluid skill acquisition.

This structural alignment is no longer a matter of gradual socio-economic evolution, but an urgent prerequisite for national competitiveness. The rapid growth of tech hubs, e-commerce, and automated administrative systems has outpaced the domestic supply of adequately skilled labor, exposing a widening skills gap. At the same time, the country experiences a distinct paradox—high rates of formal tertiary education enrollment alongside persistent underemployment and corporate talent shortages. Achieving equilibrium in this environment requires a multi-layered analysis of how higher education, vocational training, and lifelong learning mechanisms respond to technological disruptions. Examining these interactions reveals both the systemic

barriers within the educational architecture and the strategic interventions necessary to secure Kazakhstan's position in the global digital economy. [1]

ИЗЛОЖЕНИЕ

Digitalization has catalyzed tectonic shifts in Kazakhstan's employment structure. The active development of government technological services, the expansion of international IT parks, and the widespread adoption of digital financial tools have shaped a qualitatively new demand for competencies. Occupations involving routine intellectual and manual labor are visibly fading away, while the value of specialists in data analysis, artificial intelligence, and cybersecurity is growing exponentially. Today, basic digital literacy has ceased to be the exclusive prerogative of specialized technical professionals and has turned into a prerequisite for successful activity in medicine, agriculture, logistics, and pedagogy. The speed at which the economic landscape is transforming significantly exceeds the adaptation rates of labor resources, which creates a noticeable shortage of qualified personnel.

In response to these challenges, relevant ministries have initiated comprehensive reforms aimed at modernizing higher and technical vocational education. Higher education institutions are gradually abandoning rigid theoretical programs in favor of flexible, market-oriented learning trajectories. Initiatives to establish digital universities are being implemented, where data analysis basics are becoming a mandatory component for all majors. In the technical and vocational education sector, emphasis is placed on dual education, designed to train a new generation of specialists for work in automated industries. Nevertheless, the education system faces serious environmental resistance, expressed in an academic lag when approving new programs, a shortage of qualified teachers with real industry experience, and a persistent imbalance in funding and technical equipment between metropolitan and regional educational institutions. [2]

One of the main problems of the modern labor market in Kazakhstan remains a structural imbalance, in which a high level of formal education among the population coexists with a lack of relevant skills. This phenomenon clearly illustrates the mismatch between supply and demand in the market. Despite a high supply of certified specialists, employers continue to report an acute shortage of talent. This applies to both a shortage of complex technical skills and a lack of non-cognitive abilities, such as critical thinking, adaptability, and the ability to work within agile methodologies.

To better understand the scale of these changes, it is advisable to consider the dynamics of demand for various categories of specialists in the labor market under the influence of process automation and digitalization. This shifting landscape requires a systematic evaluation of which professional roles are expanding and which are facing contraction due to technological integration. To illustrate these macroeconomic shifts and highlight the specific competencies now prioritized by employers, a comprehensive breakdown of current employment trends has been structured below. The precise trajectory of workforce demand, along with the core skills required to navigate this transition, is detailed in Table 1.

Table 1. Dynamics of professional demand in the labor market of Kazakhstan

Specialist Category	Market Demand Trend	Core Required Competencies
AI and Big Data Specialists	Explosive Growth	Machine learning, data architecture, Python, SQL
Automated Systems and Robotics Engineers	Steady Growth	Controller programming, Industrial Internet of Things
Service Sector and Basic Administration Workers	Moderate Decline	CRM operational skills, basic proficiency in digital platforms
Routine Information Processing and Accounting Specialists	Critical Decline	Readiness for reskilling, basic digital interaction skills

Solving the problem of structural mismatch requires transitioning to the concept of lifelong learning. In an environment where knowledge becomes obsolete within a few years, a traditional university degree ceases to be a guarantee of employment. The state and business need to jointly develop micro-credential institutions, short-term courses, and professional retraining programs that allow specialists to rapidly pivot their career tracks. An important role in this process is played by strengthening the interaction between the state, academia, and business, where industry partners gain the opportunity to directly influence the content of curricula and provide their facilities for practical training. [3;4]

Qualitative modernization of the learning process itself cannot be imagined without the integration of advanced educational technologies. The use of artificial intelligence-based platforms for building personalized educational trajectories, virtual reality simulators for practicing technical skills, and distance learning formats allows for a significant reduction of barriers in access to high-quality education. This is of strategic importance for overcoming the gap in training quality between large metropolitan areas and rural regions of the country.

To assess the readiness of various levels of the educational system for integration into the digital economy, it is necessary to analyze their current state, key growth points, and barriers preventing rapid adaptation. This multifaceted readiness cannot be viewed as a uniform characteristic; rather, it varies significantly depending on the specific tier of the educational hierarchy, each maintaining its own operational pace and structural constraints. To provide a comprehensive, comparative mapping of how different institutional sectors respond to these technological demands, the key structural parameters, systemic bottlenecks, and core strategic directions have been consolidated for analytical clarity. A detailed overview of these parameters across different educational tiers is presented in Table 2, which outlines the specific institutional vectors determining the country's capacity to build a digitally fluent workforce.

Table 2. Readiness of education system levels for digital transformation

Education Level	Key Integration Points	Main Barriers to Development	Strategic Priority
Higher Education	Joint laboratories with IT companies, flexible courses	Faculty drain to the commercial sector, bureaucracy	Curriculum updates, development of R&D hubs
Technical and Vocational	Dual learning based on digital enterprises	Outdated material base in regions, shortage of masters	College infrastructure modernization, practical training
Lifelong Learning	Corporate programs, micro-credential platforms	Low motivation of adults for reskilling, lack of standards	Creation of a unified online learning and certification ecosystem

ЗАКЛЮЧЕНИЕ

To effectively operationalize this strategic vision, the implementation framework must extend beyond macro-level policies into the specific industrial heartlands of the nation. In regions like the Pavlodar oblast, which serves as a cornerstone of Kazakhstan's heavy industry and metallurgical complex, the pressure of digital transformation is felt with acute immediacy. Traditional manufacturing, mining, and smelting enterprises are increasingly integrating predictive management models, automated supply chains, and industrial artificial intelligence. For these capital-intensive sectors, the skills gap represents a direct threat to operational efficiency and technological modernization. Consequently, regional universities and technical colleges must transition from generic educational models to highly specialized, localized competencies. This requires establishing direct sandboxes and research labs where students work concurrently on real-world industrial data, ensuring that the heavy industry sector is supplied with engineers who are not just digitally literate, but specifically trained in industrial automation and digital twin technologies. [5]

Furthermore, the transformation must simultaneously address the evolving dynamics of consumer-facing and retail sectors, which absorb a massive portion of the domestic workforce. In a digitized market, organizational productivity is deeply tied to human resource optimization and modern motivation systems. As demonstrated by leading retail networks across the country, managing personnel in a digitalized environment requires a shift from rigid administrative control to data-driven, agile performance metrics. The education system must therefore equip future managerial cadres with the tools to design flexible corporate structures, utilize HR analytics, and implement psychological and economic incentive models that align with the expectations of a tech-savvy generation. By balancing the high-tech demands of heavy industry with advanced management methodologies in the retail and service sectors, Kazakhstan can build a resilient, multi-dimensional economic ecosystem.

Ultimately, the structural synchronization of education and employment will serve as the primary engine for sustainable economic diversification. The transition away from a resource-dependent economic model toward a knowledge-driven society relies

entirely on the agility of human capital. By institutionalizing the "Triple Helix" model of continuous collaboration between state bodies, academic institutions, and private enterprises, the country can mitigate the risks of structural unemployment and underemployment. The proactive adaptation of educational content to regional economic profiles will ensure that the ongoing digital modernization does not merely automate existing processes, but actively fosters innovation, creates high-value jobs, and secures Kazakhstan's sovereign competitiveness in the global digital landscape.

ЛИТЕРАТУРА

1. National report «The labor market of Kazakhstan: on the way to digital reality», 2022. <https://iac.enbek.kz/ru/node/1451>
2. National report «The labor market of Kazakhstan: development in a new reality», 2021. <https://iac.enbek.kz/ru/node/1179>
3. Baimuratov U. B., Zhanbayev R. A. & Sagintayeva S.S. The Triple Helix Model for the Conceptual Mechanism of Cooperation between Higher Education and Business: The Regional Aspect. *Ekonomika regiona*. 2020. - №16(4). - pp.1046-1060.
4. Arynova Z.A., Zolotareva S.V., Kaidarova S.E. Interaction of the labour market and the education system in Kazakhstan: challenges of the digital economy. *Bulletin of Toraigyrov University*. -2024 - №1. 2024. – pp.18-33.
5. Arynova Z.A. Interaction of business and the education system in the Republic of Kazakhstan in the context of digitalization of the economy: challenges and directions of adaptation//Materials of the international scientific and practical Internet conference «The impact of globalization processes and digital transformation on the formation of the international economic climate and financial ecosystem», Poltava: Poltava University Economics and Trade. – 2024 - pp.4-6