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ECONOMIC ASPECTS OF INTEGRATION OF TECHNICAL AND VOCATIONAL EDUCATION STANDARDS IN THE TRAINING OF ENGINEERING STAFF

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ABSTRACT

Research objective. The purpose of this study is to analyze the economic aspects of integrating technical and vocational education standards into the system of higher and postgraduate education, as well as to identify prospects and problems related to the training of engineering personnel. The research is aimed at determining the impact of such standards on improving the competencies and professional training of graduates in accordance with the requirements of the modern labor market.

Research methodology. The methodological basis of the study is economic, statistical and comparative analysis. To obtain data, quantitative and qualitative methods were used, including document analysis, statistical methods and comparative case studies, allowing us to consider the experience of implementing educational standards in different countries, on the basis of which an assessment of the effectiveness of educational standards and their impact on the professional training of engineering personnel was carried out.

Originality / research value. The study presents an original approach to the analysis of the economic aspects of implementing technical and vocational education standards into higher and postgraduate education systems. The contribution of the research is to identify promising areas and possible risks associated with the integration of such standards, which is especially important in the context of digitalization and technological development. The value of the work lies in the possibility of using its results to develop recommendations for improving the training of engineering personnel in Kazakhstan and other developing countries.

Research findings. The study showed that the integration of technical and vocational education standards helps to improve the level of qualification of engineering personnel, their readiness to solve modern problems in the manufacturing and construction industries. It was also found that digitalization and technological equipment of universities help to attract additional funding and improve the material and technical base for training specialists.

Keywords: integration, education standards, engineering personnel, technology, labor market, sustainable development

INTRODUCTION

The study of the economic aspects of integrating technical and vocational education standards into the system of higher and postgraduate education is pertinent for a number of reasons:

– in modern conditions of rapid technological development and changing labor market requirements, there is a need to train qualified engineering personnel capable of adapting to new challenges;

– integration of educational standards contributes to improving the quality of specialist training, ensuring their compliance with the current needs of the economy, increasing the competitiveness of graduates in the labour market and helping to reduce the gap between theory and practice;

– in the context of globalization and technological change, it is also important to consider the economic benefits associated with the efficient use of educational institutions' resources and the introduction of modern teaching methods. The sustainable development of engineering education requires an analysis of challenges such as lack of funding, changes in legislation and industry needs, as well as prospects related to the adaptation of educational standards to new economic realities.

The study of this topic is relevant and necessary for the formation of an effective system of engineering personnel training, contributing to innovative development and economic progress of the country.

The objective of this study is to examine the economic implications of integrating technical and vocational education standards into higher and postgraduate education, and to identify the challenges and opportunities associated with engineering training.

The practical significance of the study lies in:

– formation of strategies for universities to improve educational programs;

– recommendations for the state on financing engineering training;

– development of methods for forecasting labor market needs in engineering specialties.

The methods of problem solving are:

1) Development of a model of integration of TVET and higher education - creation of a modular system of engineering training, where students take vocational education courses in parallel with university studies.

2) Assessment of economic efficiency of investments in engineering education - conducting regression analysis between investments in educational programs, R&D and employment rate of graduates.

3) Using AI to adapt educational standards - development of an AI-based system that analyzes labor market trends and adapts educational programs.

Integration of technical and professional education standards into the system of engineering training has a positive impact on the economic efficiency of the educational process and the quality of specialists' training, expressed in the increase of their competitiveness in the labor market, reduction of costs for adapting graduates to production conditions and increase of engineering personnel contribution to the technological development of the economy.

Literature review. Vocational education can be defined as an educational and training program designed to equip individuals with the specific skills and knowledge required for employment in a given field. Investment in vocational education can exert a considerable positive influence on economic growth and development. It is thus recommended that policymakers and stakeholders accord priority to vocational education in their economic development plans and strategies [1]. Technicians are instrumental in fostering innovation by enhancing firms' absorptive capacity, or their ability to utilize novel technologies effectively, and by proposing incremental enhancements to existing technology (Lewis, P, 2019) [2], (Mason, G, 2019) [3].

There is a paucity of detailed knowledge concerning the manner in which the organization of education and training affects the development and diffusion of innovations (Lund, H., and A. Karlsen, 2019) [4]. The input of highly skilled engineers and scientists is of considerable importance in the identification of new technologies, thus contributing to the potential absorptive capacity of the organization. However, once this knowledge has been identified, a firm's technical experts play an essential role in its ability to successfully apply it in the workplace, thereby contributing to the realised absorptive capacity of the firm (Jones and Grimshaw, 2016), (Porto Gómez, I., J.M. Zabala-Iturriagagoitia, and U. Aguirre Larrakoetxea, 2018), (Mason, G., A. Rincon-Aznar, and F. Venturini, 2019), (Rupietta, C., and U. Backes-Gellner, 2019) [5].

Vocational education plays a key role in preparing professionals with the necessary skills and knowledge to succeed in the technical and innovation sectors. Investment in vocational education contributes significantly to economic growth and innovation capacity, so it is important that policymakers and stakeholders give it special attention when designing economic development strategies. Technical professionals not only support and adapt technologies, but also enhance the absorptive capacity of firms, allowing for the effective adoption and improvement of new technologies.

Thus, vocational education not only improves the qualifications of workers, but also creates the basis for sustainable innovative development, ensuring the implementation of scientific and technological achievements in everyday practice.

THE MAIN PART OF THE RESEARCH

Integration of technical and vocational education (TVET) standards in engineering training has significant economic implications:

– firstly, it contributes to increasing the efficiency of educational processes by optimizing curricula, reducing the costs of retraining specialists after graduation;

– secondly, the introduction of these standards enhances the compliance of graduates' competencies with the labor market requirements, leading to the growth of their employment and, consequently, to the increase in the level of income and tax revenues.

In the contemporary era, higher education institutions (HEIs) have begun to proactively integrate novel pedagogical approaches, including innovative educational degree programs (DP), cutting-edge educational technologies, and revised curricula that align with the evolving demands of the labour market. The changes that occur in a rapidly evolving world have an unambiguous effect on the higher education system. It is imperative that HEIs demonstrate flexibility and adaptability in order to meet the demands of the contemporary era, while also addressing the challenges associated with their integration into the regional economy [6].

In 2020, the Atlas of New Professions and Competencies in the Republic of Kazakhstan was approved, which is included in the program for increasing the population's income until 2025 and is the basis for forecasting the labour market and professional standards. On the basis of the Atlas, higher education institutions can develop EPs taking into account the requirements of the future labour market. For example, based on the Regional Atlas of new professions and competences of Pavlodar region, Toraigyrov University has developed 2 innovative education degree programs “6B07151 Mechanical Engineering and Reverse Engineering” and “6B07141 Industrial Robotics and Automation” in 2022 [7]..

Caspian University of Technology and Engineering has developed STEAM training oriented innovative educational degree program 7M01088 (1) to meet regional educational needs. In general, 55 innovative DPs are included in the Register in the field of education Engineering, Manufacturing and Construction, of which 11 DPs are included in 2022 [8].

It is noteworthy that, with regard to the distribution of innovative DPs across different fields of education, the engineering, manufacturing and construction sectors are allocated the largest number of DPs (58, representing 22.75% of the total). (Figure 1) [9].

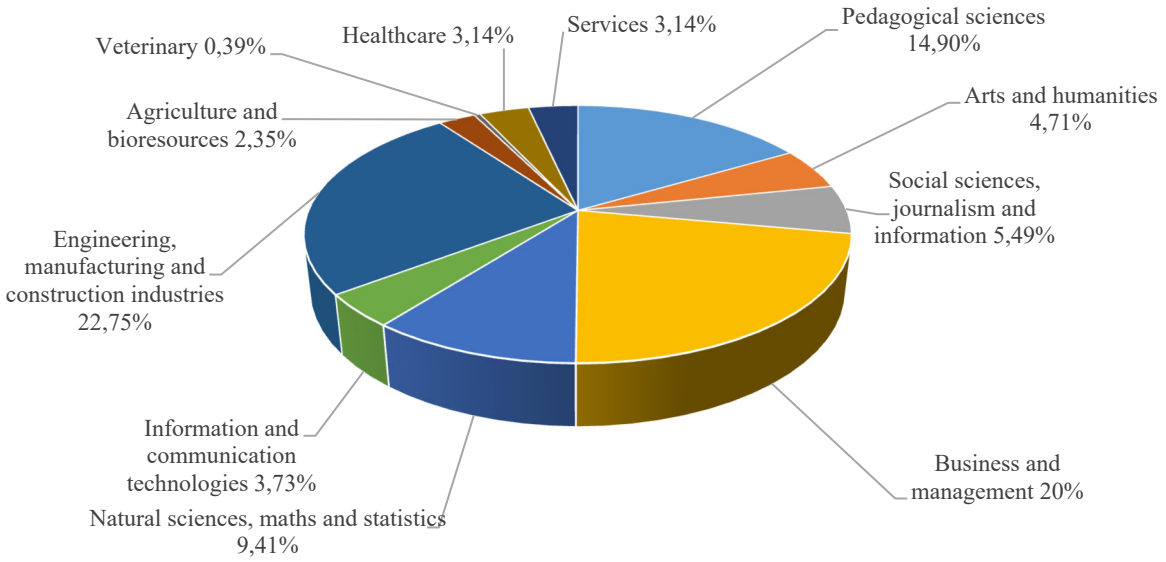

Figure 1 – Distribution by field of education of innovative DPs, %

Note – Compiled from the following source: [9]

A total of 43 innovative DPs have been developed by 14 higher and postgraduate education organizations (HPEO) on the basis of the Atlas of new professions in the sectors of Mechanical Engineering, Oil and

Gas, Construction, Mining and Metallurgical Complex, and Energy. These profiles cover the trends of new professions:

- the latest technologies and structural materials in mechanical engineering;
- development of highly efficient energy storage systems;
- increasing demand for digitalization of the construction industry;
- the growing popularity of green building;
- increasing the number of power plants based on renewable energy sources;
- solving problems using 3D modeling;
- increasing the level of automation and robotization of production;
- the growing need for intensive retraining of personnel in the oil industry of Kazakhstan.

In consequence, new professions related to the engineering, manufacturing and construction industries are being developed in accordance with the new innovative DPs.

In light of the advent of novel educational degree programs that are responsive to the demands of the labour market, Kazakhstani higher education institutions (HEIs) are well-positioned to secure financial resources from a range of sources, with the objective of enhancing the digitalization and technological sophistication of their educational processes, provided that such initiatives are not in contravention of the extant legislation. Concurrently, the utilization of specific methods for supplementary revenue generation by HEIs is contingent upon the existence of bureaucratic impediments, which serve to obfuscate their implementation (Table 1) [10].

Table 1 – Comparative analysis by types of state universities among technical specialities in Kazakhstan

Name of the HEI	Republican budget funds in the total budget of the university	Extra-budgetary funds
Akhmet Baitursynuly Kostanay Regional University	62,8%	37,2%
Abylkas Saginov Karaganda Technical University	49,0%	51,0%
Rudny Industrial University	49,3%	50,7%
Karaganda Idustrial University	55,6%	44,4%
Atyrau Oil and Gas University	56,8%	43,2%
Satbayev University	85,0%	15,0%
Yessenov University	20,8%	79,2%
Note – Compiled from the following source: [10]		

The traditional education system is mainly based on standardized teaching methods, while modern education should focus on how students can apply their knowledge to overcome obstacles and develop careers. Following an innovative path and improving learning processes using technological infrastructure, it is possible to train future specialists with developed tactical and creative thinking.

Higher and postgraduate education in Kazakhstan is rapidly expanding. In accordance with the State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020-2025, the main directions of modernization of higher education include:

- implementation of programs based on a professional competence approach, taking into account the social order, to create an innovative international educational system;
- provision of multi-level higher education and creation of modern university complexes;
- transition to new learning models (optimization of teaching methods, active use of open education technologies);
- deepening integration and interdisciplinary programs, linking them with advanced technologies and a practice-oriented educational process;
- an individual approach to the organization of the educational process, taking into account the personal capabilities and needs of the student within the conditions determined by the university;
- openness and rationality of the university's organizational structure;
- improving the competitiveness of educational institutions in the educational services market (including the development of effective image policy and marketing strategies);

- improving the management of the university based on the principles of openness and democratization, as well as the formation of a high corporate culture;

- further internationalization of education in universities through academic mobility of students and teachers, attracting international students and innovative teaching experience;

- improving the status of university science, including the expansion of the processes of commercialization of scientific achievements, the integration of university science, business environment and industry [11].

Microsoft forecasts that by 2025, the demand for such roles will reach 190 million. Of these, 149 million will be related to shortages such as software developers, cloud computing specialists, data analysts, machine learning and artificial intelligence, cybersecurity and identity security specialists. The projected shortfall is comparable to 25% of the current total employment across OECD countries (Figure 2) [12].

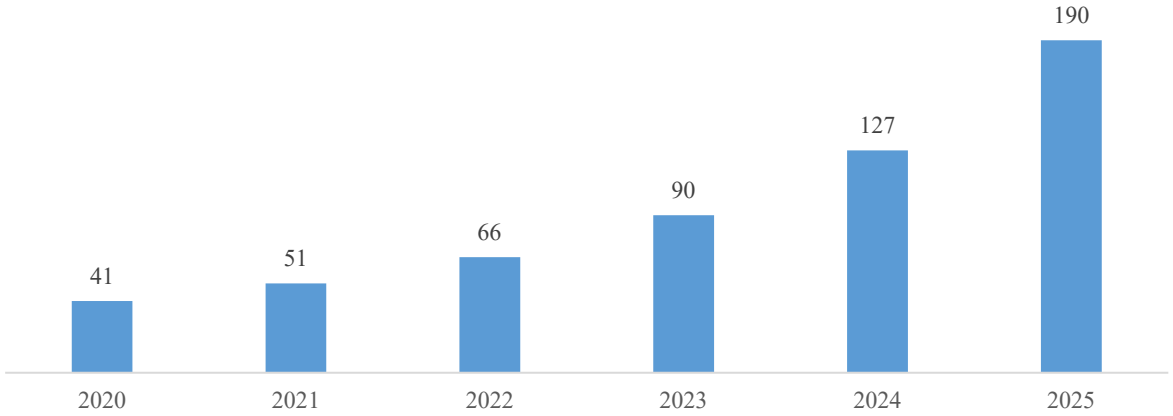

Figure 2 – Forecast of job growth in digital occupations (million)
Note – Compiled from the following source: [12]

It is therefore anticipated that there will be a significant demand at the global level for both “classic” ICT specialists and those with expertise in new digital professions.

Economic aspects of integration of technical and vocational education standards in engineering training are directly related to the dynamics of research and development (R&D) growth. Investments R&D provide the foundation for the implementation of contemporary educational technologies and standards that align with the demands of digital and technological advancement. This contributes to improving the quality of engineering personnel training, providing them with the necessary knowledge and skills to work effectively with advanced technologies and innovations in the industrial sector (Table 2) [13].

Table 2 – R&D and revenue growth rates of the world's largest corporations spending on R&D from 2018-2022

Year	R&D		R&D revenue		Intensity
	Billions of US dollars	Growth (%)	Billions of US dollars	Growth (%)	Increase (%)
01.01.2019	774		19770		3,9
01.01.2020	840	8,6	19746	-0,1	4,3
01.01.2021	905	7,7	18795	-4,8	4,8
01.01.2022	1040	14,9	22809	21,4	4,6
01.01.2023	1117	7,4	24613	7,9	4,5
Note – Compiled from the following source: [13]					

The increased investment in research and development (R&D) and the robust revenue growth observed between 2022 and 2023 underscore the pivotal role of innovation in enhancing profitability (Table 3).

Table 3 – Analysis of the calculations performed

Year	R&D revenue (USD billion)	R&D growth rate (%)	Intensity change	Change in income growth rate (%)
01.01.2019	19770	-	-	-
01.01.2020	19746	8,527132	-0,121396	0,4
01.01.2021	18795	7,738095	-4,816165	0,5
01.01.2022	22809	14,917127	21,356744	-0,2
01.01.2023	24613	7,403846	7,909159	-0,1
Note – Compiled on the basis of calculations				

An analysis of the indicators by year showed the following:

The growth of R&D revenue is illustrated in the following table, which shows an 8.6% increase in 2020 and a further 7.7% increase in 2021. The most notable increase is observed in 2022 (14.9%), after which growth declines to 7.4% in 2023.

The growth of revenue generated by research and development (R&D) activities exhibited a decline in both 2020 and 2021. Specifically, R&D revenue decreased by 0.1% and 4.8%, respectively, during these two years. There was a notable increase of 21.4% in 2022, followed by a further 7.9% in 2023, which suggests the successful implementation of R&D initiatives.

3) Changes in intensity (R&D to revenue ratio) – the intensity increased from 3.9% in 2019 to 4.8% in 2021, before decreasing slightly to 4.5% in 2023. This change shows the optimization of R&D expenditure with the growth of revenue in recent years.

Major corporations, including Amazon, Google, Microsoft and other technology leaders, are increasing their investments in research and development on an annual basis. This trend indicates a global necessity for innovation and novel technological solutions, which in turn create new requirements for the qualifications of engineers and other specialists working in high-tech sectors. In light of Kazakhstan's pursuit of economic modernization, it is crucial to consider the global trends pertaining to educational standards and professional training programs.

The incorporation of contemporary standards into the technical and professional curricula of Kazakhstani universities enables the training of specialists who are equipped with the requisite skills to work with the latest technologies. This approach ensures that the graduates of these institutions are able to meet the international standards that are required in the modern workplace. Consequently, the conditions are established for the training of competitive engineering personnel capable of contributing to the development of high-tech industries in Kazakhstan. Consequently, the rising level of R&D and revenue on a global scale underscores the necessity for pertinent educational reforms in Kazakhstan, with a particular focus on the training of personnel with contemporary technical and engineering competencies.

Investments in R&D and human resources are strategically important for sustainable growth and competitiveness of companies. If the shortage of qualified personnel is not addressed in a timely manner, the economy will lose about 8.5 trillion USD in revenue (Figure 3) [14].

Thus, the growth in R&D funding contributes to the expansion of opportunities for educational institutions, including the purchase of modern equipment, the development of innovative educational programs and the involvement of new technologies, keeping educational standards relevant. In a globally competitive environment, such changes provide graduates not only with fundamental knowledge, but also with the practical skills necessary for successful adaptation in high-tech industries, such as manufacturing and construction industries.

Consequently, the accelerated growth rate of R&D is conducive to the cost-effectiveness of integrating educational standards, which in turn serves to enhance the level of engineering training and contribute to the sustainable development of technical professions in the context of digitalization.

The analysis has shown that the use of modern educational standards contributes to the growth of engineers' labor productivity, which is expressed in the reduction of labor costs and increase in the efficiency of production processes, creating a positive effect at the macroeconomic level, contributing to the development of high-tech industries and increasing GDP through technological progress and innovation.

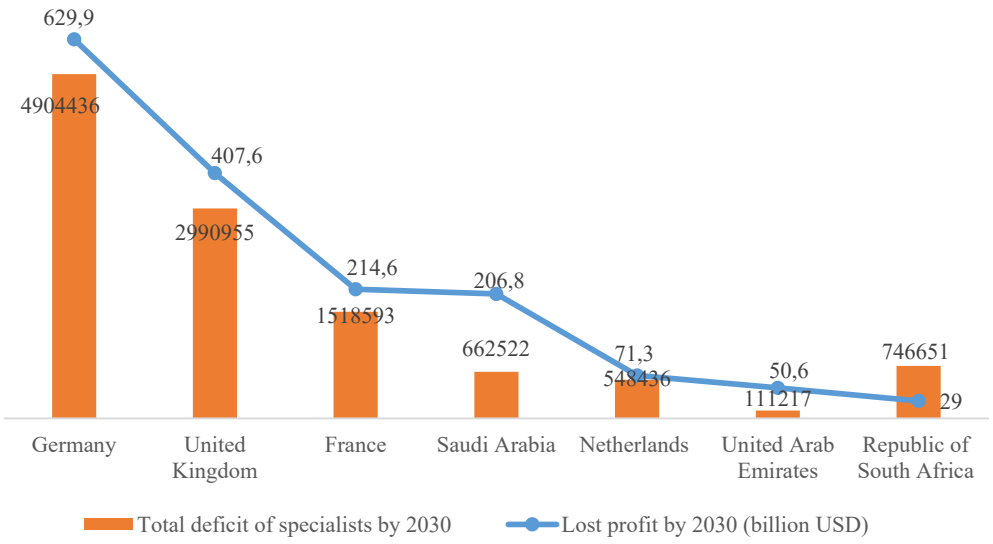

Figure 3 – Business losses due to lack of qualified personnel
Note – Compiled from the following source: [14]

The economic interpretation of the obtained data indicates that standardization in engineering education is not only an educational, but also an economically sound tool for the development of professional potential and growth of competitiveness of the national economy.

CONCLUSION

The study confirmed the significance of integration of technical and professional education standards in engineering training in Kazakhstan. The analysis has shown that the introduction of innovative EP contributes to the improvement of engineering education quality, ensuring its compliance with modern requirements of the labor market and digital transformation of the economy.

Based on the data of the "Atlas of New Professions and Competencies", Kazakhstani universities adapt curricula and create new EPs focused on key industry trends: digitalization, robotization, application of new materials, development of renewable energy and automation of production processes. As a result, the range of in-demand engineering specialties capable of ensuring the country's technological development is expanding.

Economic analysis has shown that investment in R&D has a direct impact on the training of highly qualified personnel. The growth of R&D funding on a global scale contributes to strengthening the competitive position of companies and increasing revenues from innovation activities. In Kazakhstan, this trend confirms the need for active implementation of new educational standards and technologies, contributing to the training of engineering personnel meeting international requirements.

The comparative analysis of HEIs financing has shown that the high share of extra-budgetary funds in the budget of some universities contributes to their greater flexibility in the implementation of innovative OPs. However, bureaucratic barriers limit the possibility of attracting additional sources of funding, requiring the improvement of public-private partnership mechanisms in education.

The projected global deficit of specialists in digital professions and the growing demand for personnel with skills to work with advanced technologies indicate the need for accelerated adaptation of educational programs. Without timely modernization of the engineering education system, Kazakhstan may face a shortage of qualified personnel, which will negatively affect the economic growth and competitiveness of the country.

Thus, the integration of modern standards of technical and professional education into the training of engineering personnel is a strategic direction contributing to the improvement of engineering training, accelerated digitalization of industry and sustainable development of high-tech sectors of the economy of Kazakhstan.

The economic aspects of integrating technical and professional education standards in engineering training are reflected in a number of recommendations aimed at enhancing the quality and demand for innovative educational degree programs (Figure 4).

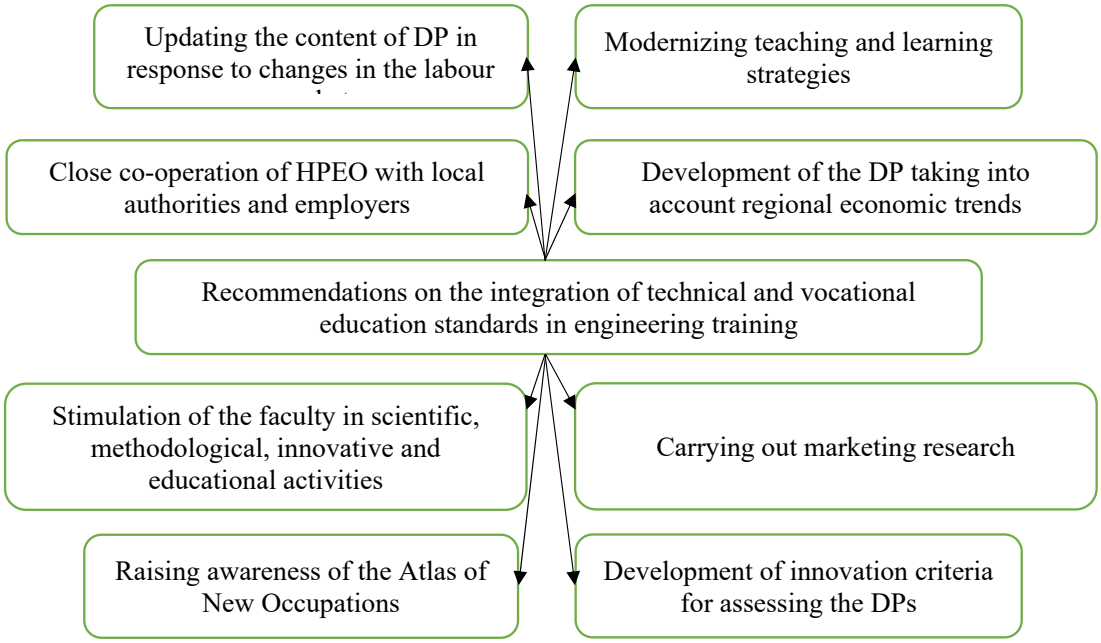

Figure 4 – Recommendations on the integration of technical and vocational education standards in engineering training

Note – Compiled by the authors

As illustrated in Figure 4, the authors' recommendations for integrating technical and vocational education standards into engineering training include the following:

1) Close co-operation of HPEO with local authorities and employers. Effective integration of standards into personnel training requires a deep understanding of market needs, which is possible only through close co-operation of HEIs with government agencies and private employers. This ensures timely updating of the educational programs and makes the educational process more cost-effective, as it better prepares specialists for modern requirements.

2) Development of the DP taking into account regional economic trends. The economic feasibility of the programs is strengthened when they are focused on the actual needs of specific regions of Kazakhstan and take into account the Atlas of New Professions and Competencies, allowing HEIs to train locally demanded personnel, contributing to sustainable economic growth of the regions.

3) Updating the content of DP in response to changes in the labour market. The economic benefits of DPs become more apparent when they adapt in a timely manner to the demands of employers and the evolving needs of industries. This enables graduates to secure employment more rapidly and facilitates the recruitment of professionals with pertinent skills by employers, thereby enhancing overall economic performance.

4) Modernizing teaching and learning strategies. The revision of educational methods and the development of skills at the interface of sciences allow the integration of standards, providing a deeper and more interdisciplinary education. The introduction of active learning methods promotes the growth of practical skills, thereby enhancing the qualification of future engineers and their economic value.

5) The objective is to provide incentives for faculty members to engage in scientific, methodological, innovative, and educational activities. Faculty in research and innovation enhances the quality of training and maintains the relevance of educational standards, which is particularly important in an economic context, attracting funding and stimulating research developments.

6) Carrying out marketing research. In order to evaluate the efficacy of the integration of novel educational standards and identify cost-effective innovations, it is essential to conduct periodic market research to assist higher education institutions (HEIs) in making well-informed decisions regarding the feasibility of introducing specific innovations, thereby reducing economic risks.

7) Raising awareness of the Atlas of New Occupations. It is recommended that all DP participants, comprising students, teachers and employers, be informed about new professions and competencies. This will facilitate the timely implementation of the necessary changes in the DP, which is oriented towards promising professions, thereby strengthening the economic effect of educational activities.

8) Development of innovation criteria for assessing the DPs. Creation of a conceptual apparatus and clear criteria for inclusion of programs in the Register of educational programs allows assessing the economic and innovative significance of educational standards, contributing to effective resource management and support for the most promising programs.

The implementation of these measures facilitates the cost-effective integration of educational standards, thereby enhancing the competitiveness of engineering personnel and establishing a foundation for sustainable economic development through professional training that aligns with contemporary requirements.

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ТЕХНИКАЛЫҚ ЖӘНЕ КӘСІПТІК БІЛІМ БЕРУ СТАНДАРТТАРЫН ИНЖЕНЕРЛІК КАДРЛАРДЫ ДАЙЫНДАУДА ИНТЕГРАЦИЯЛАУДЫҢ ЭКОНОМИКАЛЫҚ АСПЕКТІЛЕРІ

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АҢДАТПА

Зерттеудің мақсаты. Бұл зерттеудің мақсаты техникалық және кәсіптік білім беру стандарттарын жоғары және жоғары оқу орнынан кейінгі білім беру жүйесіне интеграциялаудың экономикалық аспектілерін талдау, сондай-ақ инженерлік кадрларды даярлаудағы перспективалар мен міндеттерді анықтау, олардың әсерін анықтау болып табылады. қазіргі еңбек нарығының қажеттіліктеріне бағытталған түлектердің құзыреттері мен кәсіби дайындығын арттыру бойынша осындай стандарттар.

Зерттеу әдіснамасы. Зерттеудің әдіснамалық негізі экономикалық-статистикалық және салыстырмалы талдау болып табылады. Мәліметтерді алу үшін сандық және сапалық әдістер, соның ішінде құжаттарды талдау, статистикалық әдістер және салыстырмалы жағдайлық зерттеулер қолданылды, бұл әртүрлі елдердегі білім беру стандарттарын енгізу тәжірибесін қарастыруға мүмкіндік берді, олардың негізінде білім беру стандарттарының тиімділігі мен олардың әсері. инженерлік кадрлардың кәсіби дайындығы бойынша баға берілді.

Зерттеудің өзіндік ерекшелігі / құндылығы. Зерттеу жоғары және жоғары оқу орнынан кейінгі білім беру жүйесіне техникалық және кәсіптік білім беру стандарттарын енгізудің экономикалық аспектілерін талдаудың өзіндік тәсілін ұсынады. Зерттеудің үлесі цифрландыру және технологиялық даму жағдайында ерекше маңызды болып табылатын осындай стандарттарды біріктірумен байланысты перспективалы бағыттар мен ықтимал тәуекелдерді анықтау болып табылады. Жұмыстың құндылығы оның нәтижелерін Қазақстанда және басқа дамушы елдерде инженерлік кадрларды даярлауды жақсарту бойынша ұсыныстар әзірлеу үшін пайдалану мүмкіндігінде.

Зерттеу нәтижелері. Зерттеу техникалық және кәсіптік білім беру стандарттарының интеграциясы инженерлік кадрлардың біліктілік деңгейін және олардың өндеуші және құрылыс салаларындағы заманауи мәселелерді шешуге дайындығын арттыруға көмектесетінін көрсетті. Сондай-ақ жоғары оқу орындарын цифрландыру және технологиялық жарақтандыру мамандарды даярлау үшін қосымша қаржы тартуға және материалдық-техникалық базаны жақсартуға ықпал ететіні анықталды.

Түйін сөздер: интеграция, білім беру стандарттары, инженерлік кадрлар, технологиялар, зертханалық нарық, Sustanavle дамуы

ЭКОНОМИЧЕСКИЕ АСПЕКТЫ ИНТЕГРАЦИИ СТАНДАРТОВ ТЕХНИЧЕСКОГО И ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ В ПОДГОТОВКЕ ИНЖЕНЕРНЫХ КАДРОВ

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АННОТАЦИЯ

Цель исследования является анализ экономических аспектов интеграции стандартов технического и профессионального образования в систему высшего и послевузовского образования, а также выявление перспектив и проблем, связанных с подготовкой инженерных кадров. Исследование направлено на определение влияния таких стандартов на повышение компетенций и профессиональной подготовки выпускников в соответствии с требованиями современного рынка труда.

Методология исследования является экономический, статистический и сравнительный анализ. Для получения данных были использованы количественные и качественные методы, включая анализ документов, статистические методы и сравнительные тематические исследования, позволяющие рассмотреть опыт внедрения образовательных стандартов в разных странах, на основе которого была проведена оценка эффективности образовательных стандартов и их влияния на профессиональную подготовку инженерных кадров. приведено в исполнение.

Оригинальность/исследовательская ценность. В исследовании представлен оригинальный подход к анализу экономических аспектов внедрения стандартов технического и профессионального образования в системы высшего и послевузовского образования. Вклад исследования заключается в выявлении перспективных направлений и возможных рисков, связанных с интеграцией таких стандартов, что особенно важно в контексте цифровизации и технологического развития. Ценность работы заключается в возможности использования ее результатов для разработки рекомендаций по совершенствованию подготовки инженерных кадров в Казахстане и других развивающихся странах.

Результаты исследования. Исследование показало, что интеграция стандартов технического и профессионального образования способствует повышению уровня квалификации инженерных кадров, их готовности решать современные задачи в обрабатывающей и строительной отраслях. Также было установлено, что цифровизация и технологическое оснащение вузов помогают привлечь дополнительное финансирование и улучшить материально-техническую базу для подготовки специалистов.

Ключевые слова: интеграция, образовательные стандарты, инженерные кадры, технологии, рынок труда, устойчивое развитие

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