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Digital technologies as a catalyst for training high-demand specialists: New opportunities for education and the labour market

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Abstract. In an era of rapid technological advancement, digital technologies and artificial intelligence (AI) are transforming professional education by offering innovative solutions for the training of highly skilled specialists. This article sought to explore the role of digitalisation as a key driver in shaping modern educational systems, enhancing learning efficiency, and aligning graduate competencies with labour market demands. This study aimed to analyse the impact of digital technologies on professional training and their potential to bridge the gap between education and employment. The research examined the integration of AI-driven learning platforms, virtual and augmented reality, adaptive learning systems, and big data analytics into professional training programmes. It also evaluated the extent to which these technologies contribute to the development of skills that meet the evolving needs of the industry. Additionally, the study highlighted the benefits of digital tools in improving accessibility, personalisation, and the overall quality of education. It addressed the role of digitalisation in fostering lifelong learning, reskilling, and upskilling to ensure continuous workforce development. However, the study also acknowledged key challenges, including infrastructure development, digital literacy, and the need for regulatory frameworks. The findings emphasised

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that digital transformation in education plays a crucial role in shaping a future-ready workforce, equipping specialists with the competencies required for success in an increasingly digital economy

Keywords: information and communication technologies; personal computer; website; artificial intelligence; professional education; adaptive learning; digital transformation

■ INTRODUCTION

The rapid development of digital technologies and artificial intelligence (AI) is reshaping the global education landscape, offering unprecedented opportunities to enhance professional training and workforce development. As industries evolve in response to technological advancements, the demand for specialists equipped with digital competencies continues to grow. Traditional education models, often characterised by rigid curricula and standardised teaching methods, struggle to keep pace with the dynamic needs of the labour market. Consequently, there is an increasing need to integrate digital solutions that facilitate flexible, personalised, and competency-based learning approaches.

Digital technologies are transforming education and the labour market, creating new opportunities and challenges. The rise of digital skills has led to the emergence of new professions and the need for adaptable, interdisciplinary competencies (Liventsova *et al.*, 2018). According to N. Shmidt (2024), key competencies in demand include collaboration, leadership, emotional intelligence, self-development, adaptability, and digital skills. As noted by S. Nestulya & S. Shara (2023), the COVID-19 pandemic has accelerated the shift towards remote work and education, necessitating a rethinking of the global labour market. Digital transformation is driving demand for a new type of IT specialist, requiring higher education to adapt to these evolving labour market needs (Nadezhdina *et al.*, 2024).

According to G. Nurmukhanbetova (2020), new technologies have the potential to eliminate many jobs, but will also generate new ones. The main driver of job creation is expected to be the service sector. The development of new transversal skills in the digital era is emphasised, taking into account generational characteristics, as well as the emergence of new opportunities across a range of professions. Digital nomads are primarily characterised by their mobility and constant connectivity to the Internet. In the face of contemporary challenges, such as the COVID-19 pandemic and the global social isolation it induced, there is a pressing need to reconsider the global labour market and embrace emerging opportunities for remote work, including within the education system.

The relevance of the current study lies in the fact that the dynamics of the traditional methodological approach to the educational process, in light of global trends, determine the growing priority of the competency-based approach (Liubarets *et al.*, 2024). Educational institutions must adapt their approaches to training specialists, emphasising flexibility and digital competencies to meet future labour market demands. However, as noted by A. Yu-

riev (2020), while digital technologies have made teaching and learning more engaging and efficient, the potential drawbacks of their use in education should not be overlooked. Overall, the integration of digital technologies into education and the workplace is essential for preparing specialists to meet the demands of the modern labour market (Riznyk & Riznyk, 2024).

This article examined how digital technologies serve as a catalyst for transforming professional education, ensuring that graduates possess the skills required to succeed in the contemporary workforce. The integration of AI-powered learning systems, virtual and augmented reality (VR/AR), big data analytics, and adaptive educational platforms has the potential to bridge the gap between theoretical knowledge and practical application. Digitalisation enables personalised learning pathways, real-time performance monitoring, and data-informed decisionmaking, fostering a more efficient and student-centred educational environment. Furthermore, the study highlighted how digital tools contribute to improving access to education, reducing geographical and economic barriers, and expanding opportunities for lifelong learning. However, despite these benefits, the transition to digitalised professional education presents several challenges, including infrastructural constraints, digital literacy gaps, and the need for regulatory frameworks to ensure the effective and ethical implementation of emerging technologies. By analysing the impact of digitalisation on professional education, this study aimed to provide insights into how digital technologies can support the development of a highly skilled and adaptable workforce. The discussion was focused on key innovations, their practical applications, and the potential implications for the future of education and employment.

■ MATERIALS AND METHODS

To explore the integration of digital technologies and intelligent systems within the education sector, a comprehensive review of scholarly literature, policy documents, and industry reports was conducted. The study focused on examining global trends in digital education and their applicability to the educational framework of the Kyrgyz Republic. The insights gained from these sources were used to formulate original findings and practical recommendations aimed at improving the training of high-demand specialists.

The research methodology encompassed data collection, systematic processing, and synthesis of scientific materials, complemented by logical reasoning and statistical analysis techniques. A combination of qualitative and quantitative approaches was employed to assess the effectiveness of digital learning tools. Additionally, the study

relied on statistical data sourced from the National Statistical Committee of the Kyrgyz Republic (NSC KR, n.d.) to support analytical assessments and conclusions, ensuring evidence-based recommendations for educational policy and workforce development.

The study also incorporated a systematic analysis of existing educational frameworks and models of digital technology integration from various international contexts. This comparative approach enabled the identification of best practices and potential adaptations suited to the Kyrgyz Republic’s educational landscape. The analysis focused on identifying key success factors, potential barriers, and the overall impact of digital technologies on educational outcomes, thereby providing a more comprehensive understanding of how digital transformation can be strategically implemented to enhance professional training and meet the evolving demands of the labour market.

RESULTS

The use of digital technologies to enhance the efficiency of enterprises is becoming increasingly vital in today’s rapidly evolving business environment. Digital tools, such as automation, data analytics, and cloud computing, enable businesses to streamline operations, improve decisionmaking processes, and optimise resource management. These advancements lead to greater productivity, cost reduction, and the ability to adapt swiftly to market changes. However, to fully harness these technological opportunities, there is a growing need to prepare specialists with digital skills. Workers must be equipped with the knowledge and expertise to operate advanced technologies, manage digital platforms, and implement innovative solutions. As the demand for digitally skilled professionals continues to rise, it is crucial for educational systems and training programmes to prioritise digital literacy, ensuring a workforce capable of driving business success and innovation in the digital age.

The analysis of the availability of dedicated websites across different regions in the Kyrgyz Republic from 2018 to 2022 demonstrates notable trends in the digital presence of various entities. Overall, the total number of entities with their own websites has shown a steady increase from 1,915 in 2018 to 2,501 in 2022 (NSC KR, n.d.). This growth indicates a positive trend towards digitalisation, reflecting the broader adoption of online platforms by institutions and organisations across the country. Looking at the regional distribution, Bishkek City consistently recorded the highest number of entities with websites, increasing from 1,260 in 2018 to 1,493 in 2022. This rise aligns with the capital’s central role in the country’s economic and administrative activities, suggesting a higher level of digital engagement in urban areas. Other regions also demonstrate varying trends. For example, Chüy Region, with a steady increase from 171 in 2018 to 243 in 2022, indicates robust growth in the number of organisations going online. Osh Region, which showed a notable rise from 35 units in 2018 to 103 in 2022, reflects a similar pattern, albeit from a lower starting point. In contrast, the Jalal-Abad Region experienced a more fluctuating trajectory, reaching 150 units in 2022 after variable changes in previous years.

Regions such as Batken Region and Naryn Region have exhibited some fluctuations in the number of entities with websites; however, both show overall growth, reaching 122 and 70 units in 2022, respectively. Talas Region displayed a more gradual rise, from 63 units in 2018 to 78 in 2022 (Fig. 1). Overall, while the trend towards digitalisation in the Kyrgyz Republic appears to be advancing, urban centres such as Bishkek and Osh continue to dominate in terms of digital presence. Smaller regions also exhibit growth, though the pace and scale vary. The data suggests that expanding digital literacy and infrastructure in rural areas could further accelerate the adoption of online platforms across the country.

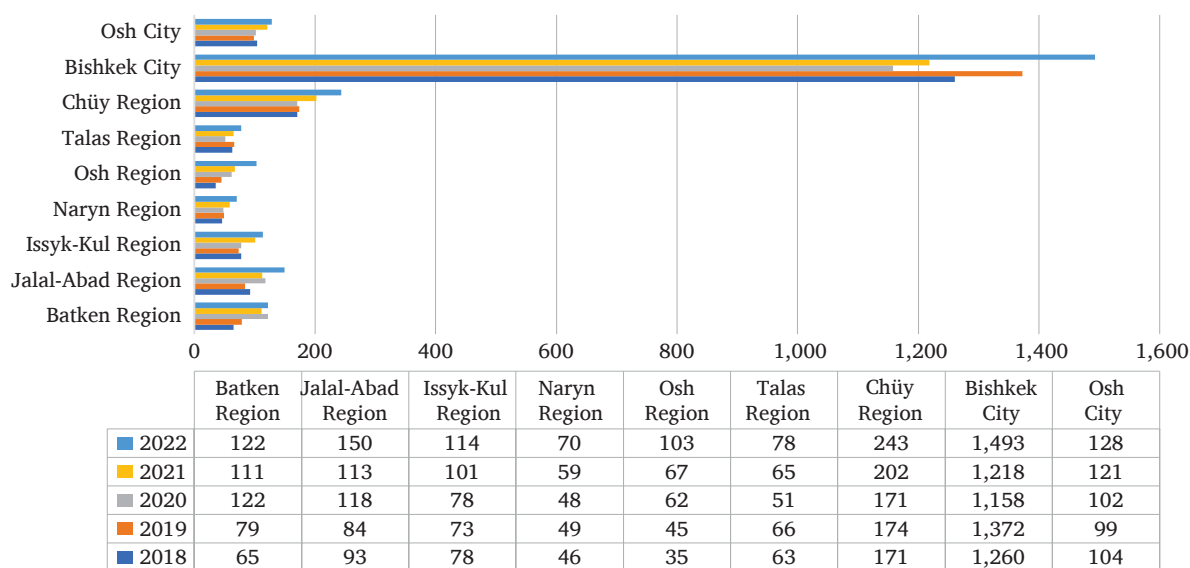


Figure 1. Availability of own website in the Kyrgyz Republic, units

Source: compiled by the authors based on data from NSC KR (n.d.)

The analysis of the number of enterprises and organisations using information and communication technologies (ICT) in the Kyrgyz Republic from 2018 to 2022 reveals a general upward trend in the adoption of ICT. The total number of ICT-utilising enterprises increased from 12,152 in 2018 to 12,258 in 2022, demonstrating steady growth in technology adoption across the country (NSC KR, n.d.). Examining regional trends, Bishkek City consistently recorded the highest number of ICT users, with some fluctuations in the data. The figure rose from 4,356 units in 2018 to 4,764 in 2019, declined in 2021 to 3,883, and then increased again to 4,313 in 2022. Despite the dip in 2021, Bishkek remains the leading region for ICT usage, reflecting the capital's greater access to technology and infrastructure. Other regions also exhibit positive growth. Osh City showed a gradual rise, an increase from 1,197 units in 2018 to 1,165 in 2022. However, the data

indicate fluctuations during the observed period, particularly in 2020.

Chüy Region also maintains a high level of ICT adoption, with figures rising from 1,706 units in 2018 to 1,575 in 2022, although this reflects a slight overall decrease, especially in the final year. Similarly, the Talas Region experienced notable growth, from 480 units in 2018 to 661 in 2022, indicating a positive trend in ICT uptake in this region. Jalal-Abad Region also showed steady growth, peaking at 1,313 in 2021 before slightly decreasing to 1,289 in 2022. Other regions, such as Issyk-Kul, Naryn, and Batken, demonstrated growth in ICT usage, albeit with some year-to-year variation. For example, the Issyk-Kul Region peaked at 776 units in 2021 but declined to 746 in 2022, while the Naryn Region experienced a modest decline between 2020 and 2022. Batken Region, however, showed consistent growth, reaching 710 units in 2022 (Fig. 2).

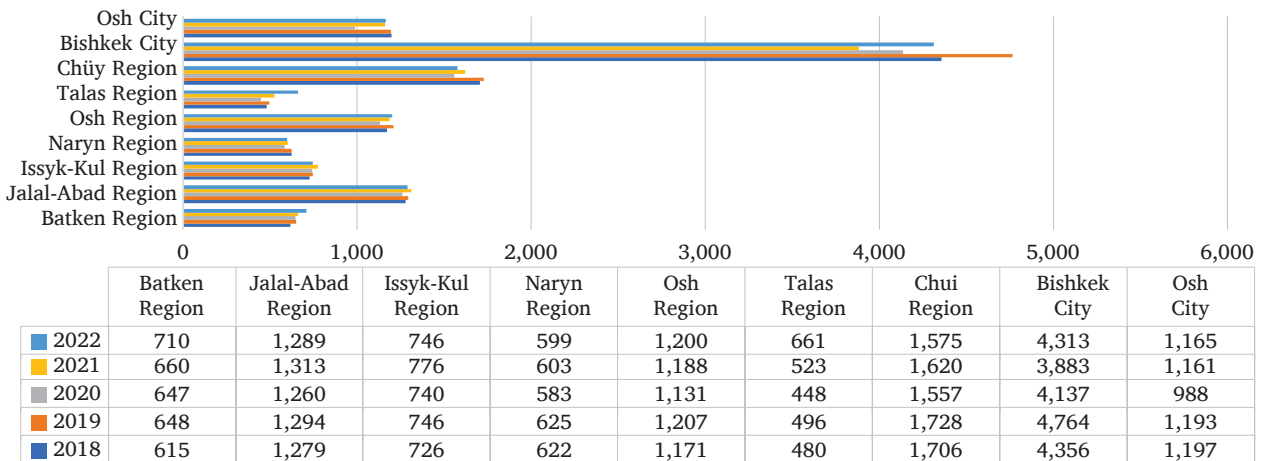


Figure 2. Number of enterprises and organisations using ICT in the Kyrgyz Republic, units

Source: compiled by the authors based on data from NSC KR (n.d.)

In conclusion, there is a clear trend of increasing ICT adoption by enterprises and organisations across the Kyrgyz Republic. While urban centres such as Bishkek and Osh continue to lead, other regions – particularly Talas, Chüy, and Jalal-Abad – are showing encouraging growth, suggesting a widening access to ICT nationwide. However, further investment in infrastructure and digital literacy is necessary to accelerate ICT adoption in less developed areas. The analysis of new job creation by the economic sector in the Kyrgyz Republic from 2018 to 2023 reveals significant variation across industries. Overall, the total number of newly created jobs increased by 13.7%, rising from 96,013 in 2018 to 109,168 in 2023, indicating positive employment trends across the economy (NSC KR, n.d.).

Information and communication. The number of new jobs in this sector fluctuated, with a sharp decline in 2020 (310 jobs), likely attributable to the pandemic. However, by 2023, the sector experienced a strong recovery, reaching 735 new jobs – an increase of 115.4% over the period. Financial and insurance activities. This sector experienced

exceptional growth, particularly in 2022 and 2023. The number of new jobs increased significantly, rising from 244 in 2018 to 809 in 2023, reflecting a growth rate of 231.6% (Fig. 3). This expansion may be attributed to the growing digitalisation of financial services and the expansion of financial institutions.

Real estate activities. The real estate sector exhibited considerable fluctuation, with a notable peak in 2021 (3,089 jobs). By 2023, the sector had generated 3,434 new jobs, representing a growth rate of 157.2%. This trend suggests recovery and continued growth in real estate, possibly driven by increased demand for housing and property-related services.

Professional, scientific and technical activities. This sector displayed variability in job creation, with a significant spike in 2021 (1,702 jobs). However, by 2023, the number of new jobs had declined to 864, resulting in a total growth of 96.1% over the period. The downturn in 2020 and 2022 may reflect global disruptions and shifting demand for specific professional services.

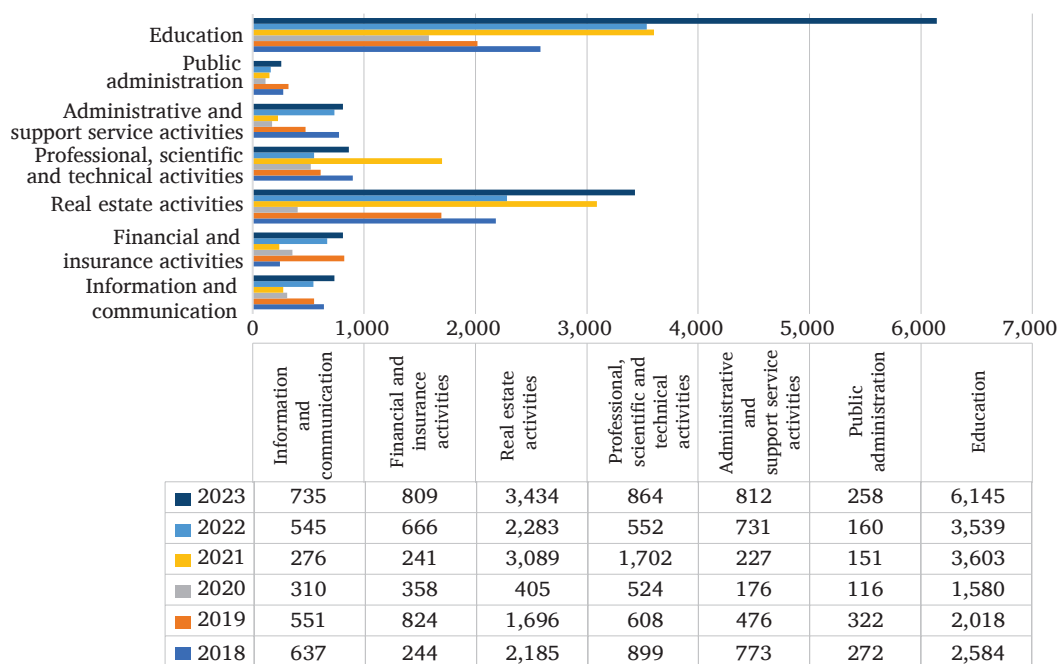


Figure 3. Number of new jobs created by type of economic activity in the Kyrgyz Republic, units
 Source: compiled by the authors based on data from NSC KR (n.d.)

Administrative and support service activities. Employment in this sector experienced moderate growth, with new jobs increasing from 773 in 2018 to 812 in 2023 – equivalent to a growth rate of 5%. Fluctuations in 2020 and 2022 are likely linked to the effects of the COVID19 pandemic and subsequent economic recovery.

The number of new jobs in public administration declined slightly in 2020 and 2022 but remained relatively stable overall. In 2023, 258 jobs were created, indicating a growth rate of 5.1%, and suggesting a slower recovery in the public sector compared with other areas. The education sector recorded the highest growth in job creation, rising from 2,584 jobs in 2018 to 6,145 in 2023 – a growth rate of 137.8%. This rapid expansion may be linked to increasing demand for online learning, the introduction of new educational programmes, and the broader development of the education sector.

In the following sectors, the use of digital technologies is especially prominent due to the nature of their services, the need for operational efficiency, and the increasing reliance on technological innovations. These sectors are inherently reliant on digital tools, underpinned by ongoing advancements in IT infrastructure, communication networks and software development. The widespread adoption of cloud computing, mobile technologies and digital platforms is essential for day-to-day operations, data transmission and content delivery.

The financial sector has undergone rapid digital transformation, characterised by the adoption of online banking, mobile payment systems, blockchain technology and fintech innovations. Digital technologies have transformed customer service, transaction processing, risk management, and financial analysis, enabling businesses to provide faster

and more secure services. Digital technologies are also increasingly utilised in the real estate sector through online property listings, virtual tours and AI-driven tools for property valuation and management. Platforms offering digital solutions for property transactions and administration have become essential, streamlining processes and enhancing accessibility for both buyers and sellers. This sector extensively incorporates digital tools, such as advanced software, data analytics, artificial intelligence (AI), and machine learning to support research, development, consultancy and a range of technical services. The integration of digital technologies improves the accuracy, efficiency and reach of professional services across engineering, architecture, scientific research and legal advisory.

In administrative and support services, digital technologies – including cloud-based tools, automation software and project management platforms – have optimised workflows, improved communication, and increased operational efficiency. These technologies also support remote working solutions, which are becoming increasingly integral to the contemporary workplace. The public sector has progressively adopted digital technologies to improve governance, increase transparency and deliver services more efficiently. E-government platforms, digital citizen services and data-driven decision-making represent key areas in which technology is modernising public administration processes. Digital technologies are also widely used in education through online learning platforms, digital classrooms and e-learning tools. The shift towards digital education, particularly in response to the COVID-19 pandemic, has accelerated the adoption of virtual learning environments (VLEs), educational applications, and online course delivery, enhancing accessibility and flexibility in educational

provision. Overall, these sectors have acknowledged the necessity of digital transformation to remain competitive, boost productivity and respond to the changing needs of consumers, students and employees. In conclusion, the data illustrate the dynamic nature of job creation in the Kyrgyz Republic, with certain sectors, such as financial and insurance activities, demonstrating exceptional expansion. The education sector also stands out due to its substantial job creation, reflecting the country's commitment to broadening educational opportunities. Despite some fluctuations, the job market is showing signs of recovery, and the digital transformation across various sectors is likely a contributing factor to this growth in employment.

The integration of digital technologies into professional education has introduced a range of innovative tools and approaches that are redefining the way students acquire skills and prepare for employment. These innovations not only improve learning outcomes but also ensure that graduates develop competencies aligned with the evolving needs of the labour market. Below are some of the key technological advancements, their practical applications, and the potential implications for the future of education and employment.

1. Artificial intelligence and adaptive learning systems

Practical application. AI-powered adaptive learning platforms analyse students' progress, learning styles and areas of difficulty to personalise educational content. These systems provide real-time feedback, recommend tailored study plans, and conduct automated assessments. AI-powered chatbots and virtual tutors further enhance the learning experience by offering immediate support.

Implications. By tailoring education to individual needs, AI-driven systems enhance learning outcomes, increase student engagement and reduce dropout rates. Additionally, AI enables educators to focus on fostering critical thinking and problem-solving skills rather than relying on rote memorisation.

2. Virtual reality (VR) and augmented reality (AR) in training

Practical application. VR and AR create immersive learning environments in which students can rehearse real-world scenarios in a risk-free setting. For instance, medical students can conduct virtual surgeries, engineers can simulate complex machinery operations, and mechanics can explore three-dimensional models of automotive systems.

Implications. These technologies improve practical skill acquisition, bridge the gap between theoretical knowledge and practical application, and reduce training costs in industries requiring hands-on experience.

3. Blockchain for credentialing and certification

Practical application. Blockchain technology guarantees the security and transparency of academic records and certifications. Digital diplomas and micro-credentials stored on decentralised ledgers prevent fraud, enable instant verification by employers, and support lifelong learning by allowing individuals to accumulate and demonstrate their skills.

Implications. This innovation increases trust in academic credentials, streamlines recruitment processes and reinforces the shift towards skills-based hiring, where verified competencies are prioritised over traditional qualifications.

4. Big Data and learning analytics

Practical application. Educational institutions utilise big data analytics to monitor student engagement, forecast learning outcomes, and optimise curriculum design. By examining large volumes of data, educators can identify at-risk students, enhance course efficacy, and adapt teaching strategies accordingly.

Implications. Data-driven decision-making improves the efficiency of educational systems, facilitates early intervention for struggling learners and ensures that curricula remain responsive to labour market developments.

5. Online learning platforms and microlearning

Practical application. Platforms such as Coursera, Udacity and LinkedIn Learning offer on-demand courses aligned with industry requirements. Microlearning – brief, targeted lessons delivered via mobile applications – allows learners to gain specific skills rapidly and efficiently.

Implications. These adaptable learning formats enable continuous upskilling and reskilling, promoting lifelong learning and enhancing workforce agility in the face of technological change.

6. Internet of Things (IoT) in smart learning environments

Practical application: IoT-enabled smart classrooms employ connected devices – such as interactive whiteboards, wearable technology and real-time monitoring systems – to create interactive, data-driven learning experiences. Smart attendance systems, biometric authentication and AI-powered classroom management tools further streamline educational operations.

Implications. IoT improves classroom efficiency, fosters student engagement, and facilitates personalised learning through the collection and analysis of real-time data.

■ DISCUSSION

Certain scholars highlight critical issues in the development of education in developing nations, including the enhancement of knowledge acquisition and learning competencies, the effective planning and management of budgets, and the broad adoption of online academic qualifications. As noted by M. Zaki Ewiss (2020), these factors are essential for advancing distance education and mitigating geographical disparities between countries. Furthermore, some researchers have examined the motivations of Information Systems students in their final-year projects and the implications of these motivations for technology and innovation (Lavy & Rashkovits, 2016). Universities play a vital role in positively influencing international students. For example, according to D. Lien & L. Miao (2018) and J. Chen *et al.* (2023), Confucius Institutes in China support local firms in navigating the complexities of international operations, including the adaptation process and associated risks, thereby facilitating a deeper understanding of host-country markets.

Other studies, such as that by D. Frommberger & F. Baumann (2020), emphasise the significant impact of higher education on health behaviours and overall well-being, which is essential for the long-term development of human capital. Additionally, H. Li *et al.* (2017) and H. Fu *et al.* (2022) found that higher education increases individuals' social confidence by enhancing their socio-economic status.

To expand the network of partners in educational development within the Kyrgyz Republic, there is a need to improve the quality of education and diversify the quality of educational services. According to T. Avdeeva *et al.* (2017) and N. Akylbekova *et al.* (2024), existing challenges in higher education – such as the delayed alignment of research with industry needs and the slow adoption of emerging disciplines – can be addressed through the internationalisation and transnationalisation of higher education. Embracing this inevitable trend, alongside the integration of digital technologies, is critical for future progress (Sayakbaeva *et al.*, 2018; Demidchik *et al.*, 2021).

The integration of digital technologies and intelligent systems into the education sector is not only essential for modernising the learning process but also plays a key role in shaping the labour market. A well-developed education system aligned with technological advancements enhances workforce competencies and improves employability (Pérez-Montoro & Tamarro, 2012). In this context, the State Investment Budget (SIB) serves as a powerful driver of economic growth by supporting job creation and accelerating the uptake of innovative technologies. These investments contribute to higher productivity, increased incomes, and overall improvements in living standards, thereby establishing a direct link between education, technological progress, and labour market expansion (Zhakshylykova, 2016).

According to N. Mukambaev *et al.* (2024), the relationship between demographic potential indicators and climatic aspects of water stress underscores the need for specialised expertise to address the challenges of sustainable water management. Digital technologies serve as catalysts for training high-demand specialists capable of developing innovative solutions that balance population growth with environmental sustainability in regions experiencing water scarcity. Quality education, a core component of the United Nations' 2030 Agenda for Sustainable Development (2015), aims to ensure inclusive and equitable education for all. Digital technologies have become indispensable tools for achieving this goal (Boyarinova, 2020; Haleem *et al.*, 2022). As stated by I. Biletska *et al.* (2021), the integration of digital solutions enables students to complete tasks more efficiently and apply new tools competently in professional contexts. Educators across general secondary schools, colleges, vocational institutions, and universities need to develop key competencies in using cloud technologies to enhance the educational process, particularly in the context of distance learning (Vakaliuk *et al.*, 2021). Several studies, including that of M. Beardsley *et al.* (2021), have explored the motivation and capacity of teachers to integrate digital technologies into their pedagogical practices.

In Ukraine, according to V. Dudar *et al.* (2021), the widespread implementation of distance learning alongside traditional education has been identified as a strategic priority, involving the integration of information and communication technologies and digital tools. To meet the evolving expectations of a new generation of learners, higher education institutions are increasingly adopting digital platforms such as Virtual Learning Environments (VLEs) and social media (Lacka & Wong, 2021).

Research by M. Qureshi *et al.* (2021) highlights the importance of advancing education and cultivating high-tech competencies. As digital technologies continue to shape the future of education, traditional educational models are anticipated to be progressively replaced. S. Revunov *et al.* (2023) advocate for the adoption of digital tools to strengthen education exports, align with international edtech standards, and address the challenges of digital transformation in the education sector. To advance and achieve international recognition in higher education, it is vital to enhance teaching quality through relevant educational programmes and to create environments that unlock students' intellectual and creative potential. A competency-based approach is central to developing the skills necessary for effective societal participation and future employment. D. Frommberger & F. Baumann (2020) argue that the development of international vocational qualifications and the promotion of global cooperation in vocational education are essential for the internationalisation of vocational training. According to L. Xing *et al.* (2021) and Y. Du *et al.* (2023), the rising demand for education exports is driven by the need to strengthen human capital in knowledge-intensive service sectors and to resolve the persistent mismatch in human capital, which constrains innovation. This necessitates increased investment in education and in upskilling the workforce. In essence, the integration of digital technologies into education is not merely a modernisation effort but a strategic imperative to cultivate a globally competitive workforce, expand access to quality education, and foster sustainable development. Achieving these goals demands sustained international collaboration and significant investment in both infrastructure and human capital.

■ CONCLUSIONS

Digital technologies are rapidly transforming the landscape of education and the labour market, offering new opportunities for both sectors. The integration of digital tools into education facilitates more efficient learning, enhanced access to knowledge, and the development of essential skills that align with the demands of modern industries. As businesses increasingly rely on digital solutions to improve productivity and adapt to evolving environments, the need for professionals with digital competencies has never been more urgent. The development of digital literacy and specialised skills through education systems is crucial for preparing the workforce for the future. Higher education institutions, in particular, must prioritise the integration of digital technologies into their curricula, ensuring that

students acquire the capabilities necessary to succeed in an increasingly technology-driven employment landscape. Moreover, collaboration between educational institutions and the private sector will be essential in aligning academic programmes with industry requirements, fostering innovation, and promoting the growth of sectors driven by digital transformation. By embracing digital technologies, education systems can better prepare learners for the challenges of tomorrow's labour market, enabling them to become highly skilled professionals who contribute meaningfully to economic development and societal advancement.

The rapid adoption of digital technologies in professional education is reshaping how individuals prepare for the labour market. Innovations such as AI-driven learning systems, VR/AR simulations, blockchain-based credentialing, and big data analytics are making education more accessible, personalised, and industry-relevant. However, these developments also pose challenges, including limitations in digital infrastructure, cybersecurity risks, and the necessity for educators to adapt to new pedagogical approaches. To fully realise the benefits of digital transformation, governments, educational institutions, and industry stakeholders must collaborate in formulating policies that support technological integration, promote digital literacy training, and ensure that education systems remain

responsive to evolving labour market demands. By embracing these innovations, professional education can become more inclusive, efficient, and aligned with the competencies required for future employment.

In conclusion, the integration of digital technologies into education and workforce development offers a significant opportunity to bridge the divide between education and industry, ensuring that individuals are equipped with the skills required to thrive in a dynamic global economy. Ongoing collaboration among all stakeholders will be pivotal in shaping a future in which digital competencies are central to both personal fulfilment and professional success. Future research should prioritise longitudinal studies to evaluate the long-term effects of specific digital education interventions on career trajectories and labour market adaptability, particularly across diverse socioeconomic contexts.

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■ CONFLICT OF INTEREST

None.

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Санариптик технологиялар суроо-талапка ээ адистерди даярдоо катализатору катары: билим берүү жана эмгек рыногу үчүн жаңы мүмкүнчүлүктөр

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Аннотация. Тез технологиялык өнүгүү доорунда санариптик технологиялар жана жасалма интеллект (ЖИ) жогорку квалификациялуу адистерди даярдоо үчүн инновациялык чечимдерди сунуштоо менен кесиптик билим берүүнү өзгөртүп жатат. Бул документ заманбап билим берүү системаларын калыптандырууда, окутуунун натыйжалуулугун жогорулатууда жана бүтүрүүчүлөрдүн компетенцияларын эмгек рыногунун талаптарына шайкеш келтирүүдөгү негизги кыймылдаткыч катары санариптештирүүнүн ролун изилдөөгө багытталган. Бул изилдөөнүн негизги максаты санариптик технологиялардын кесиптик даярдыкка тийгизген таасирин жана алардын билим берүү менен жумуштуулуктун ортосундагы ажырымды жоюу мүмкүнчүлүгүн талдоо болгон. Изилдөө профессионалдык окуу программаларында ЖИ менен башкарылган окутуу платформаларынын, виртуалдык жана кеңейтилген реалдуулуктун, адаптацияланган окутуу системаларынын жана чоң маалыматтардын аналитикасынын интеграциясын карады. Ошондой эле бул технологиялар тармактардын өнүгүп жаткан муктаждыктарына жооп берген көндүмдөрдү өнүктүрүүгө канчалык салым кошооруна баа берилди. Андан тышкары, документ билим берүүнүн жеткиликтүүлүгүн, персоналдаштырууну жана жалпы сапатын жакшыртууда санариптик куралдардын артыкчылыктарын баса белгиледи. Анда санариптештирүүнүн өмүр бою билим алууга көмөктөшүүдөгү, кайра квалификациясын жогорулатуудагы жана жумушчу күчүнүн үзгүлтүксүз өнүгүшүн камсыздоодогу ролу каралган. Бирок, изилдөө ошондой эле инфраструктураны өнүктүрүү, санариптик сабаттуулук жана ченемдик укуктук базанын зарылдыгын камтыган негизги көйгөйлөрдү моюнга алды. Изилдөөлөрдүн жыйынтыгында билим берүүдөгү санариптик трансформация келечекке даяр жумушчу күчүн калыптандырууда чечүүчү ролду ойной турганы, адистерди барган сайын санариптик экономикада ийгиликке жетүү үчүн зарыл болгон компетенциялар менен жабдуу баса белгиленди.

Негизги сөздөр: маалыматтык-коммуникациялык технологиялар; персоналдык компьютер; веб-сайт; жасалма интеллект; кесиптик билим берүү; адаптивдик окутуу; санариптик трансформация

Цифровые технологии как катализатор подготовки востребованных специалистов: новые возможности для образования и рынка труда

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Аннотация. В эпоху стремительного технологического прогресса цифровые технологии и искусственный интеллект (ИИ) трансформируют профессиональное образование, предлагая инновационные решения для подготовки высококвалифицированных специалистов. Цель данной работы состояла в том, чтобы изучить роль цифровизации как ключевого фактора в формировании современных образовательных систем, повышении эффективности обучения и согласовании компетенций выпускников с требованиями рынка труда. Основной задачей исследования было проанализировать влияние цифровых технологий на профессиональную подготовку и их потенциал для преодоления разрыва между образованием и трудоустройством. В исследовании рассматривалась интеграция обучающих платформ, управляемых искусственным интеллектом, виртуальной и дополненной реальности, адаптивных систем обучения и аналитики больших данных в программы профессиональной подготовки. Также оценивалась степень, в которой эти технологии способствуют развитию навыков, отвечающих меняющимся потребностям отраслей. Кроме того, в статье подчеркнуты преимущества цифровых инструментов в повышении доступности, персонализации и общего качества образования. В ней рассмотрена роль цифровизации в содействии обучению на протяжении всей жизни, переквалификации и повышении квалификации для обеспечения непрерывного развития специалистов. Однако в исследовании также были отмечены основные проблемы, в том числе касающиеся развития инфраструктуры, цифровой грамотности и необходимости создания нормативно-правовой базы. Полученные результаты подчеркивают, что цифровая трансформация образования играет решающую роль в формировании специалистов, готовых к будущему, обладающих компетенциями, необходимыми для успешной работы в условиях современной экономики, которая все больше зависит от цифровых технологий.

Ключевые слова: информационно-коммуникационные технологии; персональный компьютер; веб-сайт; искусственный интеллект; профессиональное образование; адаптивное обучение; цифровая трансформация