



Review Article / Derleme Makalesi

Revisiting Digital Transformation of Azerbaijan Higher Education in the New Digital Era

Yeni Dijital Çağda Azerbaycan Yükseköğretiminin Dijital Dönüşümünün Yeniden Değerlendirilmesi

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ABSTRACT

The purpose of this study is to shed light on the impact of global and local dynamics on digital transformation and therefore provide information on the growing higher education ecosystem in Azerbaijan. This study explores digital transformation of Azerbaijan higher education institutions in teaching and learning process as well as administrative issues, highlighting the complexities and multifaceted approach. The study analyses the key concerns in the digital transformation of Azerbaijan modern higher education and proposes an approach that describes the driving factors of transformational changes as well as their effects. Based on the existing literature, we consider the processes of change in the contexts of globalisation, regionalization, the information society, the Internet revolution, government reforms, downsizing and restructuring, management practices, and the establishment of new funds. In addition, we view increased competition between universities as a dynamic factor influencing the transformation process. As well as, we identified that the literature approached the challenges from the perspectives of university governance and teaching-learning, research and development activities and partnerships, gaps between digital skills and knowledge for the digital economy. In the discussion part, specific suggestions were provided as well as potential areas were identified for future research.

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ÖZ

Bu çalışmanın amacı, küresel ve yerel dinamiklerin dijital dönüşüm üzerindeki etkisine ışık tutmak ve dolayısıyla Azerbaycan'da büyüyen yükseköğretim ekosistemi hakkında bilgi sağlamaktır. Bu çalışma, Azerbaycan'daki yükseköğretim kurumlarının öğretim ve öğrenme sü-

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recindeki dijital dönüşümünün yanı sıra idari konuları da inceleyerek karmaşıklıkları ve çok yönlü yaklaşımı vurgulamaktadır. Çalışma, Azerbaycan'da modern yüksek öğretimin dijital dönüşümünün temel sorunlarını analiz ediyor ve dönüşümsel değişimlerin itici faktörlerini ve bunların sonuçlarını açıklayan bir yaklaşım öneriyor. Mevcut literatürden yararlanarak küreselleşme, bölgeselleşme, bilgi toplumu, İnternet devrimi, hükümet reformu, küçülme ve yeniden yapılanma, yönetim uygulamaları ve yeni fonların yaratılmasındaki değişim süreçlerini inceliyoruz. Ayrıca üniversiteler arasındaki rekabetin artmasını da dönüşüm sürecini etkileyen dinamik bir faktör olarak görüyoruz. Ayrıca literatürün zorluklara üniversite yönetimi ve öğretme-öğrenme, araştırma ve geliştirme faaliyetleri ve ortaklıkları, dijital ekonomi için dijital beceriler ve bilgiler arasındaki boşluklar perspektifinden yaklaştığımızı tespit ettik. Tartışma bölümünde ilerideki akademik araştırmalar için spesifik öneriler sunulmuş ve potansiyel alanlar belirlenmiştir.

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1. INTRODUCTION

In modern times, the role of universities has undergone a transformation through globalization, internationalization along with changes in demographic structures. Higher education institutions play a decisive role in the innovation economy today (Medvedeva, 2015). The widespread integration of digital technology and e-learning systems in higher education has brought many positive aspects, especially in meeting educational needs and expectations both at home and abroad. From this aspect, digital technologies have been defined as a sophisticated environment that improves digital learning environments across different regions (Abad-Segura et al. 2020). The changes related to technologies occurring in academia are being driven rapidly by digital transformation in which numerous technological tools have leveraged the delivery or exchange of materials online utilising various tools and platforms. These technologies serve purposes such as facilitating teaching-learning processes as well as assessment and evaluation procedures, developing broad connections among students, faculty and university staff, and facilitating the sharing of resources (Adedoyin & Soykan, 2020). However, this shift towards flexible, personalized and evolving learning has revealed gaps in the knowledge and skills of teaching staff (OECD, 2016; Zhao & Watterston, 2021). In the context of the teaching-learning process, Bond et al. (2018) cite a lack of digital skills as inhibitors to using more educational technology in the classroom, in addition to systemic problems, such as access to technology and workload. Thus, today revisiting students' and faculty staff's perceptions of the use of digital tools for learning, now it has become critical to increase their technology awareness for their professional lives as lifelong learners.

The modern higher education environment is at the intersection of technological innovation and pedagogical evolution. For improving the abilities to use these innovations and overcome barriers during pedagogical evolution, Azerbaijan higher education sector has shifted its main

focus to prioritizing the student and faculty experience over the technology itself. From this point of view, The Socio-Economic Development Strategy of the Republic of Azerbaijan for 2022-2026 which has been accepted by the President of the Republic of Azerbaijan explicitly recognized the development of innovative and digital skills in higher education as a key priority (Azərbaycan Respublikasının 2022-2026-cı illərdə Sosial-iqtisadi İnkişaf Strategiyası, 2022, p. 18). As a part of broader integration of technology in education, innovative technology-based teaching methods have emerged, requiring curricula to be adapted to effectively engage the new generation. The widespread use of technological advances in academic settings has resulted in an unprecedented change in the methods, spaces, formats, and goals of teaching, learning, research, and work. This digital transformation entails the establishment of new infrastructure, growing use of digital media and technology in a variety of disciplines, and an urgent need to improve the digital skills of both students and employees to meet the expectations of present and future professions (Rampelt et al., 2019).

Our study investigates the current situation of higher education institutions in Azerbaijan in the era of digitization. In this critical analysis, we attempt to analyse the dynamics of various changes occurring in the digital transformation of higher education in Azerbaijan. In addition, we examine the key elements involved in the digital transformation process, shedding light on the necessary steps to shape the future of higher education in Azerbaijan. Thereby, we are aimed to make a positive contribution to the development of higher education, especially in Azerbaijan, thereby contributing to the economic development of the country. In addition, we provide several recommendations for development programs in accordance with the Socio-Economic Development Strategy of the Republic of Azerbaijan for 2022-2026. Thus, the study can be beneficial for university management, faculty, students and other stakeholders in establishing a robust educational structure in institutions that meets the changing demands of the digital economy.

2. DIGITAL TRANSFORMATION IN HIGHER EDUCATION

In the literature, digital transformation is characterized by various forms, including the use of a variety of digital technologies to improve individual tasks, streamline processes, increase operational efficiency, and facilitate the emergence of new business models (Taşci & Taşlibeyaz, 2021, p. 173). This concept is primarily applicable to business and strategic thinking of enterprises and certain organizations. It is described as a process of transition to a new way of life, including the adoption of digital, social, mobile and other new technologies (Fitzgerald et al., 2014; Hanelt et al., 2021) so as to keep up with the demands of the digital era.

Focusing on education, successful implementation of digital transformation requires sustained leadership to manage the changing landscape created by new technologies. Recognized as key agents of social change, higher education institutions play an important role in human capital development around the world. It is very important for these institutions not only to keep pace with technological advances, but also to lead them. Although universities are actively improving their technological infrastructure, there is an urgent need for further improvement, especially in the areas of research and digital innovation. Achieving this modernization requires the development of competencies among both university professionals and students. Gümüšoğlu (2017) identifies education, management, research and social contribution as the main pillars of digital transformation in higher education. A strategic approach to each of these components can lead to a more robust and flexible educational ecosystem that meets the demands of the innovation economy and promotes a culture of lifelong learning among both educators and students.

Additionally, different studies emphasize that governance of institutions plays an important role in the transformation process as universities partner with industries to facilitate e-recruitment of graduates and/or enhance career opportunities, along with facilitate student transfers, provide online learning services, monitor student progress and so on. Grosseck et al. (2020) emphasize the importance of universities setting clear goals involving digital infrastructure, developing digital knowledge and skills among faculty and students, and integrating technology into teaching methods (p. 567). Effective governance in educational institutions is critical to overcoming the challenges of digital transformation. This includes strategic planning, developing partnerships, promoting innovation, and ensuring the institution adapts to the changing needs of students and industries.

The digital transformation brings to fruition the appearance of new pedagogical proposals. Gama (2019) advises

designing and implementing intelligent models focused on students to improve their cognitive and academic productivity. Some programs combine the promotion of professional skills in the field of digital transformation with the development of an entrepreneurial mindset. From this perspective, Bresinsky and Von Reusner (2018) introduce “Living Lab” as a concept that supports both innovations and social learning for sustainable transformation. Another proposal by Hulla et al. (2019) is “Learning factories” that impart knowledge and skills for both industry and academics.

Higher education institutions are actively involved in research and initiatives aimed at digitizing administrative activities, implementing electronic documentation processes and reducing inefficiencies related to time and paper consumption. Important measures in this direction have been implemented in Azerbaijani higher schools, especially in universities that accept students from various foreign countries. These changes have been accelerated by the challenges posed by the pandemic. Currently, universities in Azerbaijan have successfully transferred registration processes to online platforms¹, and strengthened these digital procedures in faculties. It represents ongoing and organized efforts to streamlining administrative work and leverage technology to increase efficiency and accessibility.

3. METHODOLOGY

This review study aimed to answer these key questions: (1) How have researchers approached the dynamics of changes and consequences for digital transformation process of Azerbaijan higher education? and (2) What are the main challenges of digital transformation for Azerbaijan higher education institutions?. This review article included a comprehensive critical analysis of academic databases, journals, government reports, and relevant publications. With the use of Google Scholar, Web of Sciences, and ERIC databases, different keywords such as “digital transformation in higher education”, “digitalization of higher education”, “challenges and perspectives in Azerbaijan higher education”, “digital education” and “higher education in Azerbaijan”, “research and development activities in Azerbaijan” were included in our search to find relevant articles. 20 related articles and 5 government reports were selected for this study (Table 1).

After that, relevant data, findings and main arguments were extracted and organized from the selected literature. This process involved categorizing the literature into topics such as technological challenges, pedagogical changes, and socioeconomic impacts to facilitation of analysis process of our study. As well as, the methodological rigor and validity of each selected study was critically assessed. Likewise, a comparative analysis was conducted to identify

¹<https://ted.az/az/view/news/23915/universitetlere-daxil-olanlarin-sened-qebulu-bu-cur-heyata-kechirileceknbsp>

Table 1. Information for the articles and government reports for critical review

Authors	Year
Azərbaycan Respublikasının 2022-2026-cı illərdə sosial-iqtisadi inkişaf Strategiyası	2022
Gənclərin xarici ölkələrin nüfuzlu ali təhsil müəssisələrində təhsil almalarına dair 2022–2026-cı illər üçün Dövlət Proqramı	2022
State program on increasing the international competitiveness of the higher education system in the Republic of Azerbaijan for 2019-2023	November, 2018
Strategic Roadmap for National Economy Perspective of the Republic of Azerbaijan	2016
World Bank	2018
Abdullayev et al.	2023
Aliyeva	2020
Ahmadov	2022
Ahadov et al.	2019
Bayramova & Aliyev	2019
Bukar & Mustafa	2020
Ergun & Kondakci	2021
EU4Digital	2020
Hajiyeva	2020
Hasanoglu & Zeynalli	2022
Ilyasov et al.	2023
Isaeva & Aliyev	2023
Isakhanli & Pashayeva	2018
Isaxanli	2018
Lepisto	2015
Rzayev & Suleymanov	2018
Suleymanov	2020
Valehov & Streitwieser	2022
Valiyev & Babayev	2021
Zeynalli et al.	2022

commonalities, contradictions and gaps in the existing literature. Thus, these approaches allowed us to understand the challenges of digital transformation and digitalization strategies of higher education for Azerbaijan higher educational institutions.

4. RESULTS

4.1. Dynamics of Changes and Consequences for Digital Transformation of Azerbaijan Higher Education

So far, as in other countries, numerous demographical, economic, pedagogical, and technical developments have necessitated the implementation of digital transformation in Azerbaijan higher education institutions. Increased proportion of population, globalisation, the information society, new technologies, greater local and worldwide competitiveness, rising demand for higher education, and the fact that English is a global language are all driving factors in higher education change and transformation. When we look at the Table 2 that shows the dynamics and outcomes

of higher education changes, we can see which direction these changes are taking and how they are affecting higher educational institutions.

The government in Azerbaijan is interested in allocating highly financial incentives by sending talented students and highly skilled scientists to various developed countries (such as, the USA, the UK, Germany and others) to study and train for some time (State program on increasing the international competitiveness of the higher education system in the Republic of Azerbaijan for 2019-2023, November, 2018; Gənclərin xarici ölkələrin nüfuzlu ali təhsil müəssisələrində təhsil almalarına dair 2022–2026-cı illər üçün Dövlət Proqramı, 2022; Suleymanov, 2020). After graduation, they return Azerbaijan and are employed as both researchers, as well as university managers in different universities or research institutions to develop higher educational institutions of Azerbaijan. Ergun and Kondakci (2021) in their study revealed that studying abroad had a transforming effect on future generations of academia knowledgeable individuals in Azerbaijan, who have become

Table 2. The road to digital transformation process in Azerbaijan Higher Education

Dynamics of changes	Consequences
Globalization (Isaxanli, 2018; Isakhanli & Pashayeva, 2018).	Expanding the borders of higher education Academic mobility Increased competition
Regionalization (Lepisto, 2015; Isakhanli & Pashayeva, 2018; Suleymanov, 2020; Valehov & Streitwieser, 2022).	Referring the best examples through integration to the European Higher Education Systems; The harmonization and convergence of international higher education systems
Information Society and the Internet Revolution (Bayramova & Aliyev, 2019; Bukar & Mustafa, 2020; Hajiyeva, 2020; Suleymanov, 2020; Hasanoglu & Zeynalli, 2022).	Lifelong learning Distance education E-learning Systems Interdisciplinary and multidisciplinary education
State reforms: downsizing and restructuring, management practices, creation of new funds (Lepisto, 2015; Ahmadov, 2022; Valehov & Streitwieser, 2022; Kazimli, 2023).	Deregulation in higher education Liberalization in higher education Transparency in higher education Decentralization and privatization Rejecting the traditional “collaborative management model” in state universities and replacing it with the “entrepreneurial university model”. Absolute and/or relative reduction of public funding in higher education and its replacement by private funding
Increasing competition between universities (Isakhanli & Pashayeva, 2018; Suleymanov, 2020; Ergun & Kondakci, 2021).	Diversity in higher education provision Expanding quality and accreditation practices Commercialization: proliferation of for-profit private and corporate universities

local agents, practitioners, and transmitters of values and professional conduct back home.

Some of them may lead to the development as a wide network among other highly qualified individuals in the global higher education sector and therefore, can increase scientific production with the joint research and development activities in the country, thanks to the ties they have established with the country they come from (Suleymanov, 2020; Valehov & Streitwieser, 2022). It should not be forgotten that individuals operating in the country cannot have extensive experience, so one cannot expect them to strengthen the economic potential of both the university and the country (Brown and Lauder, 2006).

4.2. Analysis of Current Challenges in Azerbaijan Higher Education for the Digital Transformation Period

Despite the dynamic changes observed in the field of higher education in Azerbaijan, there are still serious problems that need to be addressed. These problems lead to the problematic situations during the effective implementation and integration of digital technologies into the country education system. Therefore, we aspired to analyze the literature to identify these problems from the different perspectives. Research question 2 “What are the main

challenges of digital transformation for Azerbaijan higher education institutions?” focuses on analyzing the nuances of the challenges arising in the digital transformation of the higher education sector in Azerbaijan. We explored current literature to identify and analyse challenges to teaching and learning approaches, research and development, and student preparation for the digital economy (Table 3).

Valiyev and Babayev (2021) stated that “Despite the established institutional, legal, and policy frameworks and long experience in the implementation of the youth policy, the government of Azerbaijan has been facing serious challenges with regard to its youth population” (p.146). It should be emphasized that among the country’s 10.6% unemployed youth with higher education, there is a significant portion of over 16,000 university graduates who currently lack employment opportunities, according to 2019 ILO estimates for Azerbaijan (O’ Neil, January 5, 2022). The main limitation that significantly affects the prospects of young people is associated with an outdated, low-quality education system that is unable to instil the necessary skills demanded by the modern labour market” (Valiyev and Babayev, 2021, p. 151). The insufficient use of modern teaching technologies in university classrooms results

Table 3. Current challenges in Azerbaijan Higher Education Institutions

1	Challenges related to teaching and learning	Insufficient digital resources Limited financial support Lack of modern teaching tools (electronic databases and textbooks) Adequately equipped classrooms for face-to-face teaching Technical infrastructure for online learning Limited access to digital libraries worldwide
2	Challenges related to research and development activities and partnerships	Cooperation and partnership between private sector, universities and research centers State funding/ support needed more Available funding gap of Azerbaijan innovation cluster organizations Subsidization of higher education institutions is primarily tuition-based
3	Challenges related to skills and knowledge for the digital economy	Skills mismatch between theory (what individuals have learnt) and practice (how they can apply their skills and knowledge in the real practices) Limited long-term internships in industrial companies Limited international exchange programs Ignorance of the implementation of proposed innovations by aging faculty members

in an insufficient educational experience for students and a failure to meet modern standards. The prevailing tendency is to acquire superficial knowledge through theoretical and practical training, focused primarily on passing exams rather than promoting career growth. Consequently, graduates find themselves ill-prepared to compete in the labour market, leading to problems of unemployment.

At the same time, Valehov & Streitwieser (2022) acknowledges lack of young, forward-thinking personnel in higher education institutions (HEIs) of Azerbaijan, which leads to an uncompetitive environment. This lack of young perspectives contributes to resistance to implementing significant changes in universities, primarily because senior faculty tend to react negatively to proposed innovations. An aging faculty coupled with limited international exchange programs adds to the challenge of creating a

dynamic and competitive academic environment (Valehov & Streitwieser, 2022).

One of the most important issues is to create opportunities for students to have long-term internships in industrial companies. In order to train skilled and quality personnel, students must work in internships. For this reason, it is possible to carry out internships in industrial companies, and the student must be paid at least partially for the duration of work. According to World Bank Group (2018), “R&D in Azerbaijan is primarily carried by the public sector. Eighty-six percent of R&D is conducted by public research institutions, 9% by HEIs and 5% by the private sector (Figure 1)” (p.7).

Subsidisation of higher education institutions is primarily tuition-based (Suleymanov, 2020; Isakhanli & Pashayeva, 2018). Of course, most of the institutions are also financed by resources provided by their trustees (founders), various

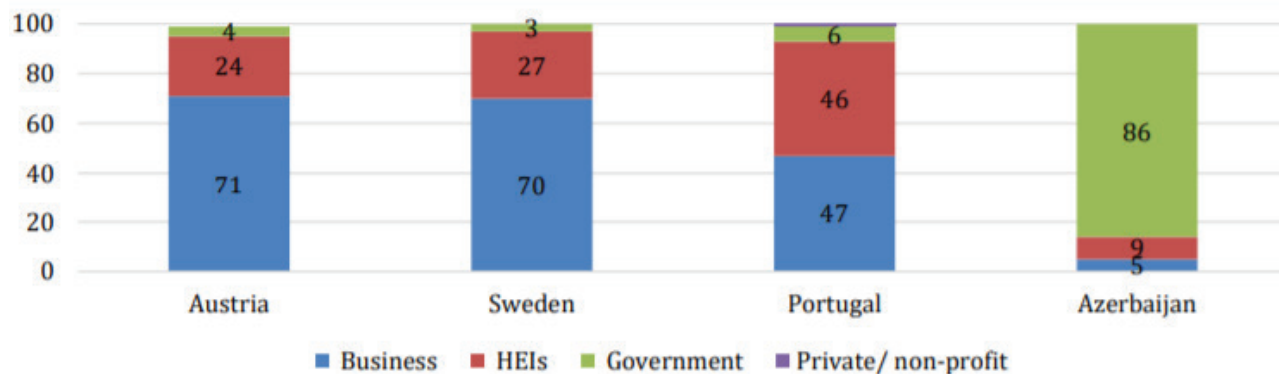


Figure 1. Sectoral investment in R&D.

Source: World Bank, 2018, p.9

grants, credits, allowances, etc. However, higher educational institutions prioritize financial returns and prestige over investment in digital infrastructure, potentially hindering the adoption of innovative teaching methods. Financial constraints resulting from tuition fees and other sources of funding limit investment in digital infrastructure, impeding the establishment of effective digital education platforms.

From another perspective, EU4Digital (2020) acknowledged the funding gap of Azerbaijan innovation cluster organizations, especially in supporting the operational functions of digital innovation centres that are not affiliated with the government. Lack of targeted funding streams for digitalization initiatives can lead to insufficient institutional support and slow adoption of the use of digital technology by educators. As Ahmadov (2022) mentioned, there is already a need for the development of full-cycle financing for innovations in Azerbaijan, private sector investments, investments, capital investments, including both the development of regulation and the acceleration of the process of development of experience and relations at various stages of innovation financing. In fact, since 2016 Strategic Roadmap for National Economy Perspective of the Republic of Azerbaijan (2016) has emphasized the use of clusters inside institutions to improve the efficiency of the “education-research-innovation” continuum. These clusters should be supported, particularly at multidisciplinary and/or research universities, with the goal of increasing labour productivity while simultaneously developing highly-qualified human capital and intellectual capacities. The construction of such clusters is seen as critical for regional human capital development and acts as a stimulant for the practical implementation of scientific results in a variety of fields.

From another perspective, developing centres of excellence for scientific research and framing the conditions for innovation and high-tech entrepreneurship can make a country attractive especially to highly skilled workers (Isaeva & Aliyev, 2023). It is undeniable fact that researchers and students are often looking for environments that support such advances. However, a critical challenge arises for universities struggling to improve due to limited budgets or technological limitations (Suleymanov, 2020). These institutions face challenges in contributing to new innovations and technological advances. It is clear that universities cannot solve these problems independently and are actively looking for strategic partners. In this context, the role of the state in promoting an environment of cooperation becomes decisive. Unfortunately, the current scenario in Azerbaijan shows that “cooperation” and “partnership between the private sector, universities and research centers” is not satisfactory and needs more “state funding/support”. (Aliyeva, 2020, p. 30).

Valehov and Streitwieser (2022) advise that partnerships with technology companies, start-ups and other educational institutions need to be strengthened to share best practices and remain at the forefront of technological

advancements, and extensive technology parks should be created through the joint efforts of universities. In fact, technological resources are unevenly distributed across Azerbaijan higher education institutions (EU4Digital, 2020). Some institutions have cutting-edge equipment, while others struggle with out-of-date instruments that do not satisfy modern-day standards. The financial and technological restrictions that these organisations confront can impede complete digitalization attempts. It is vital to recognise the high cost of technology and understand that financial restrictions, along with limited access to particular technologies, impede adoption.

Additionally, one way to evaluate a certain capacity of the universities to foster innovation is to investigate its ability to get patents, which can represent an institutional efficacy in turning public research into larger social benefits. According to Clarivate Analytics, 364 patented scientific achievements were obtained in Azerbaijan between 1999 and 2017, indicating the commercialization of scientific advances in the nation (cited in Valehov & Streitwieser, 2022). Azerbaijan filed far fewer patent applications than its regional peers, particularly Belarus and, to a lesser extent, Georgia. In 2016, Azerbaijan presented 163 patent applications domestically, compared to 513 in Belarus and 274 in Georgia. Despite a minor rise in patent applications to 171 in 2018, the ranking remained lower than those of the other two nations (Valehov & Streitwieser, 2022).

On the other hand, currently, the transition from traditional teaching-oriented universities to universities emphasizing research poses a major challenge to the higher education system in Azerbaijan (Valehov & Streitwieser, 2022). Therefore, that the promotion of research and development activities (R&D activities) in Azerbaijani universities requires a unified approach. This transformation is vital to fostering innovation, strengthening universities’ integration with their multifaceted mission, and making significant contributions to the country’s overall development (Valehov & Streitwieser, 2022). Thus, by fostering collaboration, developing digital expertise, and addressing access challenges, institutions can not only reduce costs, but also foster a culture of research excellence.

One critical component is the establishment of digital libraries, which play an essential role in validating scientific research and providing access to the wide range of academic resources across different countries (Singh & Asif, 2019, Hajiyeva, 2020). Providing digital access to a range of e-books and scientific publications, especially public journals, not only saves institutional resources but also protects the credibility of future research. However, there are notable challenges that need to be addressed. First and foremost, institutions in Azerbaijan should ensure easy access to library resources to help students develop research opportunities. This involves providing digital access to academic content and encouraging active student engagement with these resources. As an example, Hajiyeva (2020) stated that Azerbaijan State University of Economics established a 24/7

electronic library and created a digital educational environment, ensuring all classrooms are equipped with necessary technology and internet access. However, relying on the interviews from different Azerbaijan universities, Isaeva and Aliyev (2023) explored insufficient resources, limited financial support make well-intentioned plans impractical. In addition, they have identified “there is a lack of modern teaching tools, such as electronic databases and textbooks as well as adequately equipped classrooms for face-to-face teaching and the technical infrastructure needed for online learning” (p.70). Since access to some international scientific publications is restricted, it is necessary to provide open sources in different universities along with compile a list of open online journals for faculty members and students.

5. RESULTS AND DISCUSSION

5.1. Revisiting Azerbaijan Higher Education in the Digital Knowledge Economy

Higher education institutions are expected to reach out to all sectors of society and lead change. In this sense, the digital transformation envisages the provision of open courses that support adult education, which can reach all sectors of society as well as developing a high-quality, flexible and affordable educational environment. From this point of view, there is also a special need for digitalization to bring about changes such as improving career management and learner skills, establishing seamless connections between industry, researchers and learners, and creating online short-term certificate programs to acquire various professional competencies (Hajiyeva, 2020). Referring these changes, the strategy of socio-economic development of the Republic of Azerbaijan for 2022-2026 has put forward the development of a ‘lifelong learning’ mechanism to ensure constant literacy of citizens (Azərbaycan Respublikasının 2022-2026-cı illərdə Sosial-iqtisadi İnkişaf Strategiyası, 2022). As a result of this mechanism, advanced training courses intended to be organized for people of different age groups in accordance with the requirements of the labour market in the global space, and people of different age groups can be involved in these courses and become highly specialized specialists (Hajiyeva, 2020).

Making these changes could particularly support university internationalization policies on the global stage. Richter and his colleagues note that digital transformation in higher education is crucial for universities to take their place on the international stage, form a special part of the global knowledge economy and prepare their students for the future (Taşçı and Taşlıbeyaz, 2021). In the reconstruction of many universities in Azerbaijan through self-financing initiatives (stated by Lepisto, 2015; Isakhanli & Pashayeva, 2018), obtaining new areas of income (Suleymanov, 2020), turning universities into new sources of investment (Ahmadov, 2022) are key factors driving this evolution.

Implementing significant reforms for large-scale transformations is not only important for the development of Azerbaijan higher education institutions and their alignment with the broader goals of the higher education sector, but also plays a critical role in the overall progress of Azerbaijan (Valehov & Streitwieser, 2022). There is a need to strengthen the discussion about the importance of leadership and innovative practices in the digital transformation of higher education. Thus, the active participation of management is critical to moving these institutions towards a future in which digital technologies are seamlessly integrated into the academic field. By encouraging a culture of innovation and implementing strategic practices, leadership can position these institutions as leaders in shaping the landscape of modern education (Aliyeva, 2020; EU4Digital, 2020; Ilyasov et al., 2023). University leadership must actively participate in strategic planning, defining a clear vision for the seamless integration of digital technologies into the academic environment.

Moreover, leadership need be improved which can foster a culture of continuous learning by investing in training programs aimed at improving the digital literacy of faculty and staff (Isaeva & Aliyev, 2023). Providing resources for faculty to stay abreast of new technologies and enable them to effectively use these tools in teaching and research will lead to staff adaptation. Because of their different hierarchical structures, higher education institutions face distinct problems when implementing a digitalisation strategy. Collaboration among key stakeholders—students, teachers, university administrative personnel, and the larger community—is critical for success. Indeed, collaboration between academia and industry needs to be encouraged to bridge the gap between theoretical knowledge and practical application.

While digital technology integration is critical, student-centered approaches are likewise crucial. Technology should improve the learning process by encouraging participation, collaboration, and personalised learning in the Azerbaijan HEI. From this perspective, future research should focus on the establishment of adaptable learning platforms, virtual laboratories, and other interactive technologies that accommodate a wide range of learning styles and preferences.

On the other hand, best experiences across different countries emphasize the key role of introducing a financial mechanism for the successful modernization of education systems which is based on “public-private partnership” (Ahmadov, 2022). This approach proves to be a critical aspect in the transformation of the educational process to a creative pedagogy, with a focus on non-research approaches. The implementation of such a collaborative finance model not only encourages innovation, but also creates a dynamic and forward-thinking educational atmosphere that responds to the changing demands of learning environments. In practice, it is necessary to implement a number of measures and a systematic approach to create a

culture of research, development and innovation in higher education institutions. Educational institutions that want to succeed must first create a commonality in research, development and innovation. From this point of view, new electron system development for higher educational institutions can be a truly effective tool in accordance with the requirements that contribute to meeting the lifelong learning needs of its graduates (Altbach, 2005).

Research and development (R&D) activities are an important aspect of higher education, particularly as the digital revolution develops. The Strategic Roadmap for the Development of the National Economy of the Republic of Azerbaijan, ratified by Presidential Decree in December 2016, articulates a forward-thinking approach to promoting progress in higher education institutions by fostering an integrated ecosystem of education, research, and innovation (Suleymanov, 2020). This strategic goal not only seeks to improve academic brilliance, but also emphasises the significant benefits it offers to human capital development and general economic growth. Central to this vision is the establishment of innovation clusters in Azerbaijani universities, which will act as incubators for cutting-edge research and development efforts. By establishing these clusters, universities are positioned to become dynamic hubs where academics, business, and government can work together to foster innovation. This collaborative atmosphere enables the practical translation of scientific findings across industries, increasing the socioeconomic effect of research initiatives. Furthermore, the establishment of such clusters is an important component of regional human capital development, serving as a catalyst for knowledge diffusion and skill acquisition within local communities. These clusters attract professionals while also allowing aspiring researchers and inventors to realise their full potential by cultivating an innovative and entrepreneurial culture. As a result, this strategy not only increases the amount and quality of scientific publications, but also accelerates the rise of patent activity, bringing Azerbaijan to the forefront of global innovation (Valehov and Streitwieser, 2022). Essentially, the establishment of innovation clusters at Azerbaijani institutions supports both academic growth and economic development by putting research findings into practice. Azerbaijan is well-positioned to establish a path of long-term growth and prosperity in the digital era by combining education, research, and innovation activities.

On the other hand, universities must ensure that they have the resources needed to implement a successful digital strategy. It is insufficient to confine the exchange of ideas to national research partnerships (EU4Digital, 2020; Aliyeva, 2020; Suleymanov, 2020). The most crucial measures towards deepening instructors' and students' knowledge and abilities are virtual meetings, telecollaborations, suggestions from technologically sophisticated universities, and technical support. These activities can assist to increase digital literacy and reduce university inequities.

Of particular importance is the use of data collection and analysis systems to make informed decisions about curriculum development, student achievement and resource allocation, identifying areas for improvement, and enhancing overall institutional effectiveness (Isaeva and Aliyev, 2020). It is also important to understand the importance of cybersecurity, ensure compliance with privacy regulations, and build trust among various parties regarding the responsible use of digital technologies.

As digital transformation progresses, there is a need to consider ethical considerations associated with the use of technology. Institutions must develop guidelines and ethical frameworks to ensure responsible and equitable use of data, artificial intelligence and various emerging technologies. Future research could delve deeper into the ethical implications of using advanced technologies in education, exploring issues such as data privacy, algorithmic bias, and the responsible use of artificial intelligence.

5.2. Digital Literacy Among Students and Teaching Personnel

Improving digital literacy in higher education is an important aspect of the ongoing digital transformation in academic institutions. The success of this transformation depends on the digital competency of various stakeholders, including students, educators, administrators, industry partners, alumni, parents, businesses and the broader community. Given the diversity of age groups among these stakeholders, it is clear that there are differences in technology skills among them.

In accordance with the Strategy for Socio-Economic Development of the Republic of Azerbaijan for 2022-2026, special attention is paid to providing students with digital knowledge. Higher educational institutions are considered indispensable players in this strategy initiatives (Azərbaycan Respublikasının 2022-2026-cı illərdə Sosial-iqtisadi İnkişaf Strategiyası, 2022). However, it seems the age range of students entering higher education varies and extends beyond the typical age group of 17-25 years, and therefore, some people in this age group may not have enough experience or opportunities to improve their technology skills due to socioeconomic limitations or other reasons.

Developing digital literacy among stakeholders, especially students, is a multifaceted and time-consuming process. This requires a comprehensive strategy that considers not only current skill levels, but also the potential barriers and challenges faced by different segments of the student population. As technology continues to evolve, there is a need for a dynamic and adaptive approach to digital literacy education in higher education. Azerbaijan State Economics University has built the centre namely 'UNEC Extern' for distance education (Hajiyeva, 2020). The centre is equipped with cutting-edge technologies which are important for our digital era. This center's operating capabilities allow it to teach up to 20,000 students per year, as well as provide online seminars, training sessions, and certification programmes

for representatives from a variety of organisations and businesses (Hajiyeva, 2020). In addition to building a digital educational system, there is a constant emphasis on improving the digital skills and capabilities of teaching personnel. In fact, current problems in Azerbaijan higher education system create obstacles for universities to quickly adapt to changing labor market demands and hinder the formation of a knowledge-based society (Valehov & Streitwieser, 2022). To improve the effectiveness of digital literacy initiatives, it is critical to consider socioeconomic factors that may hinder skill development. Establishing specialized programs and support mechanisms is critical to meeting the unique needs of students who face challenges accessing and using technology resources. Improving digital literacy in higher education institutions therefore goes beyond a strategic imperative; it is also a social responsibility. As Ahmadov (2022) emphasized, while aligning education with the needs of the labor market is vital for economic development, it is equally important to find a balance. This balance ensures the establishment of a holistic higher education system that not only prepares students for future career, but also develops critical thinking and adaptability in order to be ready for different situations in our rapidly changing world. Continuous monitoring and flexibility in planning are paramount to mitigating problems associated with the dynamic nature of both education and the labor market. Adopting a holistic approach that considers the diverse needs of stakeholders and recognizes the barriers they may face will pave the way for a more inclusive and successful digital transformation in Azerbaijan higher education.

Additionally, collaboration between higher education institutions and external organizations such as industry partners and alumni make a significant contribution to closing digital skills gaps (EU4Digital, 2020). Industry partnerships can provide understanding and practical application of digital skills in the real world, aligning education with labour market demands. Alumni, as well as seasoned professionals, can play a key role in mentoring and guiding current students as they navigate the digital world. To ensure digital literacy initiatives are effective, it is important to consider socioeconomic factors that may hinder skill development. Special programs and support mechanisms need to be created to meet the specific needs of students who have difficulty accessing and using technology resources (Isaeva & Aliyev, 2023).

5.3. Digital Infrastructure of Azerbaijan Higher Education Institutions for Teaching and Learning

Changing student expectations and demands in an educational environment underscore the need to improve fundamental aspects of their academic experience (Isaeva & Aliyev, 2023). This includes digitization of administrative procedures, integration of various platforms and provision of 24/7 unrestricted access to information and services through digital curriculum. In response to government policies supporting ICT integration in education and

administration, universities around Azerbaijan are implementing digital platforms for teaching, learning, and management. ADA University created history as the first public institution to use Blackboard Learn, which moved all associated functions online. The outbreak of the Covid-19 epidemic in 2020 caused ADA University to rapidly transform to 100% distance education (Suleymanov, 2020).

Choosing the right digital approach tailored to student needs is critical to developing a key aspect of digital transformation – the student experience. From this point of view, Azerbaijan State University of Economics has undergone a comprehensive digital transformation with the adoption of the EDUMAN-E-University model (Hajiyeva, 2020; Rzayev & Suleymanov, 2020). This initiative includes the development of specialized electronic classes for teachers and students, the introduction of electronic grade books and the creation of a 24-hour electronic library (Hajiyeva, 2020, p. 295). This university with the brand name - UNEC actively employs and enhances its own software tools to provide smooth digital administration of teaching, learning, and administrative operations. Suleymanov (2020) mentioned that Azerbaijan Diplomatic Academy started to utilise Blackboard Learn system software and transferred all academic activities to this platform since the onset of COVID-19 pandemic. Likewise, Azerbaijan State Oil and Industry University (ASOIU) and Technical Universities (TU) have also adopted a similar approach, creating its own software to optimise different aspects of university management and learning processes. In addition, instructors are encouraged to integrate collaborative work tools within their courses, ensuring that students have a deep understanding of their pedagogical purpose from the start of the course (Peterson, 2012; Bond et al., 2018). Additionally, Bresinsky and Von Reusner (2018) introduce that participatory approaches change the role of the student, going from being a passive recipient of knowledge to being active co-creators and participants in the generation of knowledge.

The Covid-19 problem has accelerated this change, emphasising the need for adaptable, technology-enabled methods. However, the problems that have been aroused above (such as, insufficient resources, limited financial support, lack of technology infrastructure for teaching, electronic databases, etc. (Isaeva and Aliyev, 2023, EU4Digital, 2020)), aspired mostly ADA University and UNEC to effectively shift education and administration to online platforms.

6. CONCLUSION

Our study highlights the multifaceted nature of digital transformation in higher education institutions in Azerbaijan and identifies the critical components required for its effective implementation. We emphasize the need to increase digital literacy among educators, use technology to improve educational practice, and create an environment of innovation through targeted research and development initiatives.

Moreover, our analysis highlights the interconnectedness of these transformations with broader socio-economic and technological trends, from globalization to regionalization, from government reforms to the evolution of the information society. Recognizing these dynamic forces, it is clear that the digital evolution of higher education in Azerbaijan must respond to both local and global dynamics.

In addition, we advocate the adoption of new educational strategies that promote the development of knowledge, creativity, thinking skills and vision. This entails the creation of interdisciplinary programs between universities or departments, as well as the constant development and revision of educational programs, content and methods to ensure compliance with global trends. Strengthening these foundations will enable our higher education institutions to skillfully navigate the changing landscape of university education around the world.

Using these ideas, higher education institutions in Azerbaijan will not only be able to adapt to the digital age, but also play an active role in shaping the future of education. This requires thoughtful and strategic engagement in governance by policymakers, educators, and stakeholders. Our research serves as a valuable guide, offering a roadmap for addressing the challenges and opportunities presented by digital transformation. Active participation in this transformative journey not only ensures the competitiveness and relevance of Azerbaijan's higher education sector, but also equips future generations with the skills and knowledge needed to thrive in the digital age.

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