



Digital Transformation in Higher Education: A Review of Economic Implications for Teaching, Learning, and Graduate Employability

Muhammad Azhar Bhatti¹

¹ Lecturer, Department of Economics, The Islamia University of Bahawalpur, Pakistan.
Email: azhar.bhatti219@gmail.com

ARTICLE INFO

Article History:

Received: November 08, 2025
Revised: December 02, 2025
Accepted: December 03, 2025
Available Online: December 04, 2025

Keywords:

Digital Transformation
Higher Education
Teaching and Learning
Graduate Employability
Economics of Education
Digital Competence

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

The digital transformation has now become the major trend in the field of higher education and has altered the institutional management, pedagogical practices, learning experiences of students, as well as the graduate preparation to more digital labor markets. It is a literature review of the literature related to the digital transformation of higher learning, especially its economic aspects of the same in relation to teaching, learning and graduate employability. The paper is composed of a structured review design and provides the structure of the literature based on the conceptual background, teaching transformation, learning outcomes, digital competence, employability, and institutional preparedness, policy implications. Throughout the studies reviewed, there is the concept of digital transformation as more than the implementation of educational technologies, but it entails institutional strategy, institutional governance, institutional infrastructure, institutional curriculum, the faculty capacity, student digital literacy, and the alignment of labor markets. Economics-of-education can be understood both in a change in the efficiency of the institutions, cost structure, access and equity and human capital formation, and employability value of higher education credentials. The evidence points to the idea that digital tools can make the learning process more flexible, personalized, collaborative, and access learning resources but the advantages are uneven and depend on pedagogical design, organizational support, and digital inclusion. It is also evident that in literature, digital abilities, problem solving, communication, adaptability and authentic evaluation are becoming more important to graduate employability. The review concludes that digital transformation should be viewed as an educational and economic initiative. Its long-term success lies in its strategic investment, redesigning curriculum, faculty developing and inclusive policy, especially in the developing world where the digital infrastructure and institutional preparedness are not equally distributed.

© 2025 The Authors, Published by iRASD. This is an Open Access article under the Creative Common Attribution Non-Commercial 4.0

Corresponding Author's Email: azhar.bhatti219@gmail.com

1. Introduction

The digital transformation is one of the most crucial shifts in the current higher education, as it is not only the way of how the university provide the instruction, but also the organization of the resources, support of the academic processes, and training of the graduates to the data-driven, platform-driven, and AI-driven labor markets. The idea behind the more recent review studies is that the digital transformation of universities cannot be

confined to the implementation of learning management systems or online courses. Rather, it is a complex institutional process comprising of leadership, governance, digital infrastructure, curriculum redesign, faculty capability, student digital competence, and organizational culture (Akour & Alenezi, 2022; Bisri, Putri, & Rosmansyah, 2023; Bygstad et al., 2022; Fernandez et al., 2023; Mabotha & Ngcamu, 2025). The significance of this wider definition is that it changes the discussion to not just mere adoption of technology, but the more profound question of the role of the university in generating educational value in more digital societies. This has been accelerated especially over the last decade. Research on education 4.0, online learning, and institutional digitalization show that the higher education system is forced with the necessity of modernizing the teaching process, the efficiency of the administration, the access, and adaptability to changes in the sphere of technology and the labor market (Haleem et al., 2022; Mukul & Büyüközkan, 2023). This kind of trends justifies why the digital transformation is the strategic concern of the university that st. The situation becomes especially critical in the perspectives of economics of education as higher education is among the primary processes of human capital formation. When institutions go digital, they change the very process of production of education. Digital transformation may affect the delivery costs, scale economies, student support, educational productivity, access and social and personal returns to tertiary education. Some of the marginal costs may be mitigated through digital systems through the reusability of the content, asynchronous delivery, and increased reach but may require a substantial fixed investment in infrastructure, cybersecurity, software, faculty training and instructional design (Antonopoulou, Begkos, & Zhu, 2023; Carmo et al., 2025; Wang et al., 2023). This means that digital transformation is not a pedagogical issue, but it is also an economic issue that involves efficiency, fairness and resource distribution.

The second important reason why the topic is topical is the direct connection with graduate employability. The available literature on employability demonstrates the increasing attention of employers to graduates with the ability to integrate disciplinary knowledge and digital literacy, problem solving, and online collaboration, communication, adaptability, and data-related competencies (Abelha et al., 2020; Eimer & Bohndick, 2023; Tee et al., 2024). Consequently, due to this, digital transformation not only affects the student teaching process but also the type. Literature on digital transformation is expanding at a very fast rate, but it is very much dispersed as it is divided into different discussions. There are also those studies that are oriented towards institutional strategy and governance, there are also those studies that are oriented towards teacher digital competence, there are those studies that are oriented towards student digital literacy and there are those that are oriented towards graduate employability and 21 st century skills. A significant share of subfields, including digital literacy, teacher training, digital competence, authentic assessment and employability, has been summarized in reviews, although comparatively few studies have incorporated those strands into a single framework in terms of economics of education (Audrin & Audrin, 2022; Peters et al., 2022; Starkey, 2019; van Deursen & van Dijk, 2010). The review fills this gap by integrating literature into three related questions, i.e., what can digital transformation do to teaching in higher education? What can it do to student learning and competence development, and what can it do to graduate employability through the economic-of-education prism. The paper is important as it integrates institutional change, pedagogical change and labor-market results within one domain of analysis. The contribution is particularly helpful to the developing countries, where higher education institutions are most likely to be strained by the necessity to become digital and must operate under the circumstances of scarce budgetary prospects, lack of connectivity, and insecure student readiness. By such literature review, what the review aims to prove is that digital transformation cannot be evaluated based on the utilization of technology alone but based on the capacity of technology to improve quality of teaching, learning value and employability outcome in an effective and inclusive way.

2. Methodology

In the higher education and research in the field of educational technology, the international review-paper practice will be followed in writing the manuscript in the structured literature review design. Structured reviews are particularly useful when literature is conceptually heterogeneous as well as methodologically heterogeneous, e.g. in the field of digital transformation as the literature can touch upon institutional strategy, pedagogy, digital competence, and labor-market outcomes. It has been noted that recent reviews in this area

have employed systematic or structured methods to assemble fragmented evidence such as those by Bisri, Putri and Rosmansyah (2023); Eimer and Bohndick (2023); Farias-Gaytan, Aguaded and Ramirez-Montoya (2021); Mabotha and Ngcamu (2025); (Peters et al., 2022); Zhao, Pinto Llorente and Sanchez Gomez (2021). The scope definition, thematic synthesis, and integration of analysis are prioritized in the current paper over the descriptive listing of studies, as is the case in this tradition. The review was influenced by a search logic that was grounded on the intersection of four domains, among them being digital transformation, higher education, teaching and learning, and graduate employability. The keywords included digital transformation, digitalization, higher education, university, teaching, learning, digital competence, digital literacy, graduate employability, digital skills, and human capital. The terms have been chosen due to their repetition in large-scale review articles and conceptual studies in the field and the ability to capture both the institutional and individual capability aspect of digital change (Akour & Alenezi, 2022; Bygstad et al., 2022; Fernandez et al., 2023; Mukul & Büyüközkan, 2023). Preference was given to peer-reviewed journal articles and review studies, although some older and foundational literature was retained when it provided conceptual frameworks used widely, such as the DigComp or other popular literature on digital transformation in higher education and its implications to quality, inclusion, and governance (Carretero, Vuorikari, & Punie, 2017; Ng, 2012; Spante et al., 2018). The evidence base developed is synthesis of systematic reviews, multivocal reviews, empirical studies, policy syntheses and is appropriate to a subject that encompasses the education, management and labor-market analysis fields.

Conceptual and practical relevance was implemented through inclusion criteria. A study was retained when it touched at least one of the following topics: strategy of digital transformation in higher education institutions; teacher digital competence and pedagogy; student learning, digital competence, or digital literacy in higher education; assessment and competence development associated with employability; or the institutional, economic, and policy implications of digital transformation. Articles were limited to either primary or secondary education, software design, which was too technical, and lacked results that had explicit educational implications, or non-higher-education contexts were not included unless they presented a framework that is generally used in higher education research. This methodology is alike in thinking to the recent review papers that compromise breadth with thematic focus (Audrin & Audrin, 2022; Tinmaz et al., 2022; Vlachopoulos & Makri, 2024). Even the synthesis itself was thematic. Instead of arranging the literature article-by-article, the review grouped the studies under conceptual underpinning, teaching change, student learning, graduate employability, institutional economics and governance, barriers and constraints, and implications of practice. Thematic synthesis is also common in international review articles because it helps to establish contact between subfields visible, especially in multidisciplinary topics where the concepts are widely dispersed in different literature (Farias-Gaytan, Aguaded, & Ramirez-Montoya, 2023; Pinto & Leite, 2020; Starkey, 2019). To deliver it, eventually, this systematic review could be reported as a full PRISMA-style systematic review of counts of studies, elimination of duplicates, screening of titles and abstracts, screening of full-text, and coded study-selection flowchart. The design, in its present version, has conformed to accepted review standards by articulating scope, selection logic and synthesis strategy based on the available existing works in the field.

Table 1: Core literature base used in the review

Author(s)	Type	Main contribution
Akour and Alenezi (2022)	Conceptual/review	Future of higher education in digital transformation
Antonopoulou, Begkos and Zhu (2023)	Case study	Uncertainty management and institutional digital transformation
Audrin and Audrin (2022)	Systematic review	Key factors in digital literacy
Basantes-Andrade et al. (2022)	Systematic review	Teacher digital competence standards
Bisri, Putri and Rosmansyah (2023)	Systematic review	Success factors in higher education digital transformation
Bui and Nguyen (2023)	Systematic review	Digital transformation in education
Bygstad et al. (2022)	Conceptual/empirical	Digital learning space in higher education
Carmo et al. (2025)	Review	Digital transformation in HEI management

Eimer and Bohndick (2023)	Systematic review	Employability models in higher education
Farias-Gaytan, Aguaded and Ramirez-Montoya (2021)	Systematic mapping	Transformation and digital literacy
Farias-Gaytan, Aguaded and Ramirez-Montoya (2023)	Systematic review	Digital transformation and digital literacy
Fernandez et al. (2023)	Multivocal review	Institutional digital transformation initiatives
Habib (2023)	Policy/review	Digital strategy in conflict-affected societies
Haleem et al. (2022)	Review	Role of digital technologies in education
Hasan, Alam and Sharmin (2024)	Empirical	Higher education and sustainable employment
Huynh and Tran (2023)	Systematic review	Digitalization for international students
Mabotha and Ngcamu (2025)	Systematic review	Higher education sector digital transformation
Mejías-Acosta et al. (2024)	Scale development	Student digital competence measurement
Moreira-Choez et al. (2024)	Assessment study	Faculty digital competence and AI
Mukul and Büyüközkan (2023)	Systematic review	Education 4.0 and digital transformation
Pelaez-Sanchez, Glasserman-Morales and Rocha-Feregrino (2024)	Instrument design	Digital competencies in Industry 5.0 era
Peters et al. (2022)	Overview of reviews	Teacher digital competence development
Pinto and Leite (2020)	Literature review	Digital technologies supporting student learning
Røe, Wojniusz and Bjerke (2022)	Pedagogical review	Pedagogical prescriptions for digital teaching
Singun (2025)	Systematic review	Barriers to digital transformation
Spada et al. (2022)	Text-mining case	University readiness to deliver digital skills
Tee et al. (2024)	Employer evidence	Demand for digital skills and employability
Tinmaz et al. (2022)	Systematic review	Digital literacy synthesis
Tømte et al. (2019)	Mapping study	Institutional approaches to digitalization
Tushar and Sooraksa (2023)	Semi-systematic review	Global employability skills
Vlachopoulos and Makri (2024)	Systematic review	Authentic assessment and 21st-century skills
Wang et al. (2023)	Decision-analysis study	Drivers of digital transformation in HEIs
Zhao, Pinto Llorente and Sanchez Gomez (2021)	Systematic review	Digital competence research in higher education
Abelha et al. (2020)	Systematic review	Graduate employability and competence
Adegbite (2024)	Empirical	Digital literacy, WIL and employability
Spante et al. (2018)	Systematic review	Digital competence and digital literacy concepts
Starkey (2019)	Systematic review	Teacher preparation for digital age
van Laar et al. (2020)	Systematic review	Determinants of 21st-century digital skills
Sousa and Rocha (2019)	Conceptual/empirical	Digital learning and organizational skills
Ng (2012)	Conceptual	Teaching digital literacy

2.1. Conceptual Foundations: Digital Transformation and Economics of Education

Digitization, digitalization and digital transformation are terms that cannot be used interchangeably in literature, and this peculiarity is critical to the comprehensibility of the concept. Digitization normally refers to the procedure of transforming the analog content into the digital one and digitalization refers to the procedure of using more digital technology in the processes, services and communications. Digital transformation is broader and deeper since it involves institutional adaptation, value-generation, decision-making, and relationship with stakeholders. This is because change in higher learning does not mean just erecting platforms on the internet or shifting the lectures to the internet. Instead, it needs governance,

pedagogy, support, quality assurance, and organizational culture changes (Akour & Alenezi, 2022; Bisri, Putri, & Rosmansyah, 2023; Bygstad et al., 2022; Fernandez et al., 2023). This broad definition proves especially useful when it is viewed through the prism of this economics of education. Universities invest in infrastructure, software, clouds, faculty development, and redesign of the university curriculum with the hope that their investments will lead to institutional productivity, access, and relevance of tertiary education. The Human Capital Theory can be used to explain the significance of these changes. University education enhances knowledge and skills that augment productivity of individuals and that are engaged in economic growth to a greater extent. The digital revolution can potentially change the nature of the way in which human capital is generated and the type of skills that is remunerated in the knowledge-based and technology-based labor markets (Sousa & Rocha, 2019; van Laar et al., 2020).

The second theoretical foundation is digital competence. The digital competence evidence shows that when it comes to becoming an effective participant of the e-learning environment, the list of what can be lost is much longer than the capacity to use devices or applications in a productive way. Some of the repetitive dimensions include information and data literacy, communication and collaboration, content creation, safety, ethics, problem solving, and critical engagement with digital media, which have been identified in systematic reviews (Audrin & Audrin, 2022; Carretero, Vuorikari, & Punie, 2017; Tinmaz et al., 2022; Zhao, Pinto Llorente, & Sanchez Gomez, 2021). These dimensions are key to the economics of higher education since the benefits of digital transformation are determined by whether students and faculty can utilize technologies productively, critically and in contextually relevant ways. The access to the non-value addition tools to education or employability can be increased by unqualified access. There is another concept that should be mentioned in line with explaining inequality and that is digital literacy. The initial studies on internet skills and digital divide have recognized the differences in access to be preceded by the differences in skills and disparities in usage (van Deursen & van Dijk, 2010). Later studies assert that even the so-called digital natives among the students should be taught to learn the meaningful digital literacy (Ng, 2012). This is particularly true in the context of higher education since universities may be overestimating the preparedness of the students and as such, invest in insufficient resources in nurturing the digital abilities. University digitalization thus becomes mixed with the social inequalities that are already present and determines who can afford to utilize digital education or cannot. All these theoretical strands refer to the fact that the idea of digital transformation in higher education can be outlined as a complement between the institution change and capability building. They need strategy and leadership and investment, yet it seems the critical element of successful change is the digital capacity of faculty and students and the ability of the institution to transform the technological capacity into educational and economic value. This is the dynamic force that makes one and the same digital technologies have various results in institutions and nations. It further provides the analytical underpinning to research teaching, learning and employability as mutually contingent results and not independent concerns.

2.2. Digital Transformation and Teaching

Teaching is one of the most apparent fields in which a change has been felt in the sphere of higher learning. It is claimed that a shift to more flexible, platform-mediated, and hybrid types of delivery where content, communication, feedback, and collaboration is mediated increasingly more by digital systems is underway (Bygstad et al., 2022; Tømte et al., 2019). It also mentions the process of the digital transformation of higher education and says that the material transfer is no longer the predeterminant of the teaching process, rather, it is becoming more and more the servant of the active learning process, flexible interaction, and data-driven feedback, and multimodal interaction (Akour & Alenezi, 2022; Mukul & Büyüközkan, 2023). The key findings in the literature are that the quality of digital teaching is more pedagogical than the technology access. The digital transformation of teaching, as (Røe, Wojniusz, & Bjerke, 2022) defines it, is that there will be prescriptions of pedagogy and that it will proceed to create the active learning processes rather than simply copy the previous models of lectures to the digital media. Likewise, Haleem et al. (2022) observe that technologies in education may generate value when they establish interaction, collaboration, and learner autonomy and not when they recreate the passive presentation in various forms. It is point-to-note that universities do invest more in tools than in the

pedagogical redesign which is necessary to make the tools educationally useful. The transformation is another economic factor that changes the cost of higher education in the context of teaching transformation. The digital systems will be able to minimize a portion of the marginal cost of delivery because it will be possible to reuse the content, access asynchronously and expand the geographic coverage. They can also permit greater latitude in scheduling and expansion of the non-traditional participation. However, the efficiencies are also coupled with new fixed and recurrent costs, including hardware and software investment, platforms maintenance, cybersecurity, instructions design, technical support, and training of teachers (Antonopoulou, Begkos, & Zhu, 2023; Carmo et al., 2025; Wang et al., 2023). Digital transformation, therefore, cannot be introduced as a low-price-reducing policy. It may be called one of the strategic investments that will be returned to the quality of implementation and institutional preparedness.

The next important one is faculty preparedness. According to synthetic reviews of teacher digital competence in post-secondary education, the change towards technical knowledge by pedagogical judgment, assessment literacy, and ethical awareness on the teacher side has been identified to be the significant change (Basantes-Andrade et al., 2022; Peters et al., 2022; Starkey, 2019). It will be the case that teachers will be forced to develop interaction, engagement, assessment and feedback in a digital space appropriate way. The more up-to-date sources are free-ranging, and they are also claiming that artificial intelligence awareness, multimodal assessment, and digital content critical assessment should be made part of the teacher competency (Moreira-Choez et al., 2024). Lack of this would put the institutions at risk of initiating digitization without paying much attention to the quality of teaching. Literature, however, leaves no doubts that the most positive changes in the instruction that the digital transformation can introduce are those in which the strategy of the institution, along with the development of the faculties, and the redesign of the pedagogical process of the institution, are heading in the same direction. On the one hand, in the scenario in which the mentioned points are incorporated, digital technologies can offer flexibility, customization, and greater interaction. The two are not congruent in digital instruction at two levels, pedagogic anemic and administratively contemporary. This distinction is of particular concern to policy makers and university heads who are considering the digital transformation payoff.

2.3. Digital Transformation and Student Learning

The educational technology fantasies are more likely to be the student learning literature as a better qualified image. Digital transformation may also lead to a rise in the availability of learning materials, learning flexibility, collaboration, and new patterns of interaction between learners and teachers. These opportunities are identified in all the reviewed works by Haleem et al. (2022); Mukul and Büyüközkan (2023); Pinto and Leite (2020), especially in relation to blended learning, learning platform, and digitally mediated communication. Simultaneously, the fact that digital technology does not always improve the learning outcomes is also predetermined. According to the OECD research, education benefits can only be achieved with the combination of effective pedagogy, teacher support, and institutional strategy (OECD, 2021, 2022, 2023). This is in line with the general literature in higher education that has revealed that the mere availability of digital systems is not a predictor of deeper learning, critical thinking and improved academic achievement. The course design, the quality of interaction, the design of the assessment, the motivation, and the self-regulated learning capacity are the elements that define the student learning outcomes (Huynh & Tran, 2023; Pinto & Leite, 2020). In this respect, digital competence is particularly significant. To be able to take advantage of digitally transformed learning environments, students ought to be able to search, evaluate, construct, disseminate, and morally make use of digital data. The presence of digital competencies surveys among students of higher education also points to the fact that the level of change is not a playing field due to the high diversity of students and institutions (Mejías-Acosta et al., 2024; Pelaez-Sanchez, Glasserman-Morales, & Rocha-Feregrino, 2024). The available literature about digital literacy also demonstrates that the degree of knowledge about digital devices does not always result in reflective, academic, and productive digital practice (Ng, 2012; Spante et al., 2018).

This is important in the economics-of-education viewpoint since the quality of digital transformation will be determined by whether it enhances the productivity of learning. When

the digital systems have the effect of increasing access, yet do not enhance competence formation or academic engagement, then the returns on institutional investment are not significant. On the other hand, through digital transformation, that promotes flexible participation, self-directed learning, timely feedback, and competence development, can increase both the private and social returns to higher education. This is especially among those students who are juggling between work and study, distance, family, or limited mobility where digital flexibility can minimize the obstacles to participation. The other threat that is pointed out in the literature on learning is the threat of reproducing inequality. The students differ in access to the internet, quality of devices, digital confidence, pre-preparation, and institutional support. This is how digital transformation can cause the distance between the students who have the opportunities and those who become more disadvantaged. By this, it implies that the benefits of learning are not based solely on the availability of technology, but are accommodative, supportive, and the systematic acquisition of competence. That way, the question of equity cannot be separated in the quality of digital transformation.

2.4. Graduate Employability in the Digital Era

Graduate employability is one of the strongest arguments in favor of digital transformation of higher education. Recent studies of employability are beginning to view employability as a multidimensional educational outcome that is characterized by disciplinary knowledge, personal competence, social skills, career management, and labor-market fit. According to Abelha et al. (2020); Eimer and Bohndick (2023) systematic reviews, employability is now a core responsibility of higher education rather than a by-product of obtaining a degree. The digital age is a digital competence that is interwoven with employability. Graduates must also learn information literacy, data management, communication, teamwork, development of digital content, online professionalism, and problem solving in technologically mediated environments and subject knowledge (Tee et al., 2024; Tushar & Sooraksa, 2023). These requirements align with the broader body of research on 21 st century skills and organization digital transformation that emphasizes the idea that graduates must be able to adapt to new technological realities and be able to effectively utilize digital tools (Sousa & Rocha, 2019; van Laar et al., 2020). It is also found that higher learning institutions are usually unable to completely match the curriculum with these emerging needs. Spada et al. (2022) demonstrate that institutions of higher learning might not be capable of keeping pace with the requirements of the labor-market with respect to the provision of digital skills and competences and Hasan, Alam and Sharmin (2024) point to the role institutions of higher learning play in the development of sustainable labor-market opportunities. Adegbite (2024) also confirms the concept of digital literacy as a mediator between work-integrated learning and graduate employability, which suggests that the benefits of using experiential learning to facilitate employability can be enhanced in the event of good digital skills.

One more important process that relates to digital transformation and employability is the design of assessment. Authentic assessment has also been described as one of the ways to build and show transferable skills that could be used in the modern workplace, such as collaboration, critical thinking, self-management, and digital communication (Vlachopoulos & Makri, 2024). It suggests that digital transformation is not just important when students are learning using the assistance of digital systems, but it is also possible when it is possible to re-design assessment by exploiting the digital systems in the way that would make graduate capabilities more visible and labor-market relevant. The digital transformation hence influences the value proposition of higher education in economics terms. Digital transformation can enable universities to enhance productivity of graduates and increase the economic payoff of tertiary education through alignment of curricula, pedagogy and assessment of labor-market needs. The labor-market reward of transformation will be less noteworthy unless digitalization is also applied to the modes of delivery, with the corresponding emphasis on the development of skills. Employability literature, then, encourages the notion that digital transformation is to be viewed in terms of the effect it imposes on the evolution of human capital rather than in terms of the technological adoption itself.

2.5. Institutional Economics, Governance, and Policy

The digital revolution has extensive effects on economics and governance of institutions of higher learning. On the institutional level, it influences capital investment, staffing patterns, competition, recruitment of students, quality assurance, and administrative coordination. The analysis of higher education digital transformation has revealed multiple times that leadership, strategic planning, coordination of stakeholders, and readiness of infrastructure are the key success factors (Bisri, Putri, & Rosmansyah, 2023; Fernandez et al., 2023; Wang et al., 2023). It means that digital transformation is not a technical process that IT departments are delegated to handle, but an institutional governance issue, and it spreads to the basic academic and administrative processes. There are economic costs and opportunities associated with the transformation. Efficiency at universities can be achieved through automation, platform integration, data-driven decision making, and more flexible provision. They can also increase the coverage of the non-traditional learners and competitiveness in the domestic and international education markets. However, these benefits require preliminary and continued investment in broadband, cloud, software subscriptions, cybersecurity, employee training, digital support, and curriculum change (Antonopoulou, Begkos, & Zhu, 2023; Carmo et al., 2025). In this way, the issues of budgeting, sequencing and strategic priorities become the center of institutional policy.

The issue of governance is also important since digital transformation crosscuts across academic, administrative, and student-service functions. According to OECD surveys of higher education digitalization, governments and institutional leaders should align issues of standards, quality, inclusion, and system-wide support instead of digital change as the preserve of institutional ad-hocism (OECD, 2021, 2022, 2023). This is particularly critical in situations where the institutions are dissimilar in terms of resources and digital maturity. Digital transformation can also be used to accomplish further institutional inequality without policy coordination since more resourceful universities can proceed and weaker institutions will be further disadvantaged. The literature also suggests that institutional legitimacy and resilience are consequences of digital transformation. According to case studies, the institutions of higher learning that incorporate digital transformation within the general strategy have higher chances of responding to uncertainty, maintaining continuity, and redesigning services to respond to the changes in conditions (Akour & Alenezi, 2022; Antonopoulou, Begkos, & Zhu, 2023). This makes digital governance institutional sustainability. The ability of the universities to offer digitally enabled learning, research and student services in addition to the academic reputation are also being rated. These are more urgent matters of governance in the case of developing countries. In the context where the infrastructure is not evenly distributed and limited budgets are in place, the digital transformation suggests making clear decisions about where the investment will yield the most educational and economic benefits. The policy issue then becomes to develop digital transformation policies that are efficient, equitable and long-term capacity building instead of having a limited view on visible technological procurement.

2.6. Barriers and Constraints

There are numerous obstacles to digital transformation in higher education, which may or may not exist. An increasing amount of review literature demonstrates that barriers are not restricted to the absence of hardware or software. Instead, they contain poor leadership, lack of clarity, scarcity of resources, lack of competence among staff members, resistance of stakeholders, organizational culture, and uncertainty about ethics (Bisri, Putri, & Rosmansyah, 2023; Mabotha & Ngcamu, 2025; Singun, 2025). It implies that change is not a simple matter as it is technical, organizational and pedagogical change which is interwoven. One of the major challenges is faculty capability and workload. The digital competence review of teachers indicates that most of them are being tasked with responsibilities of teaching redesigning, working with new technologies, and solving issues of digital assessment with insufficient training and time (Basantes-Andrade et al., 2022; Peters et al., 2022; Starkey, 2019). This may cause a disjuncture between the institutional wish and the classroom action. Such systems may not necessarily provide pedagogical advantages in practice even in the context of platform provision in universities unless the teachers are guaranteed, encouraged or even motivated to use them wisely. The other obstacle is conceptual and curricular discontinuity. Digital literacy, digital skills, digital competence, and digital transformation are used interchangeably in the literature, which can make it difficult to design policies and curriculum (Audrin & Audrin, 2022; Spante et al., 2018; Tinmaz et al., 2022; Zhao, Pinto Llorente, & Sanchez Gomez, 2021). This is further complicated by the fact that the

competencies that institutions are keen on developing have not been clearly defined, making it hard to develop coherent curricula, measure outcomes and inform the faculty and students of what to expect.

Student inequality is also a major limitation. The digital opportunities are conditional on the presence of devices, the quality of the internet, historical literacy, confidence, and social support. Limited literature exists about the digital divide implying that access and skill and usage disparities interact i.e. that existing unequal conditions can diminish the impact of digital transformation on the students who might be most in need of institutional assistance (van Deursen & van Dijk, 2010). Therefore, it is possible to observe that digital transformation can potentially replicate the same socioeconomic inequalities, unless universities establish support systems that have intent. The final challenge is evaluation, genuineness, and honesty. The development of artificial intelligence and digital content tools has made the question of academic integrity, authenticity of student work, and the reliability of traditional assessment practices more popular. According to recent studies on the topic of authentic assessment, colleges and universities need to transform assessment so that they can design and measure meaningful 21st century skills instead of just automated tasks (Vlachopoulos & Makri, 2024). These limitations confirm that the issue of digital transformation is not a problem of implementation, but an ongoing challenge of governance and quality of education.

3. Discussion

As the literature review of the given paper has already shown, even the very concept of the digital transformation of higher learning can be viewed as a systematic process that can be traced back to the institutional change, pedagogical flexibility, competency formation, and labor-market relevance. Among the most apparent trends that can be identified in the studies under consideration, it should be said that digital transformation cannot be reduced to the use of the technology in question. According to all Bisri, Putri and Rosmansyah (2023); Fernandez et al. (2023); Mabotha and Ngcamu (2025) state that an institution needs leadership, strategy, and coordination of change. The fact that the case-based studies have been used made it possible to justify the observation and present the idea that the universities, which view the concept of digitalization as an initiative, can be better-positioned to face the uncertainty and restructure their academic activity in a more efficient manner (Akour & Alenezi, 2022; Antonopoulou, Begkos, & Zhu, 2023). This means that the higher learning institutions cannot be regarded as consumers of digital technology, but an organization that makes the voluntary decision on the worth of digital technology in learning and economy through governance decisions. The second significant finding is that of technology and pedagogy. Being one of the recurrent arguments, as it is expressed in the teaching literature, the pedagogical architecture of the digital transformation is what can be appreciated and not the access to the platform. In particular, the authors Basantes-Andrade et al. (2022); Peters et al. (2022); Røe, Wojniusz and Bjerke (2022) highlight the relevance of the principles of active learning and digital competence of teachers as one of the primary prerequisites of successful change, respectively. This means that the technology investment that does not entail investment in the faculty capability will not positively impact the learning. This has gained economic importance of an education-wise in the sense that it means that the human capacity is the mediator of the digital-investment-payoff. In other words, digital systems alone do not create any value to the universities as such, but value is created once technological infrastructure is integrated with professional development, support services and curriculum reform which is pedagogically consistent.

It is one of the interpretations that are supported by the literature on learning. According to the discussion of the digital learning environment, digital systems can be applied to the environment of flexibility, communication, and resource provision improvement but do not necessarily have a positive influence on the outcome of the learning (Haleem et al., 2022; Pinto & Leite, 2020). OECD warns about such analyses that technology can only enhance education when it is included in an education system of coherent pedagogical and institutional propositions (OECD, 2021, 2022, 2023). It is among the factors that make digital transformation not as effective in institutions and groups of students. The digital transformation will help to improve the productivity of the learning in the case scenario by making it easier to combine the infrastructure, and the inclusive support, working assessment and competence development of the universities. In the absence of such aids, the

digitalization will be able to alter the place of teaching but not necessarily alter the learning process. The reviewed research articles led to the concept of digital competence that could be viewed as the mediating variable between teaching, learning, and employability. According to Audrin and Audrin (2022); Tinmaz et al. (2022); Zhao, Pinto Llorente and Sanchez Gomez (2021), in the literature review, the technical operation is not information literacy, cooperation, content creation, problem solving and ethical use, but digital competence. This broader perspective is important because it is the construction of the capabilities that receive the resources of access to equipment. It is possible to demonstrate the argument by citing the employability literature, which indicates that employers are slowly becoming more willing to hire the graduates who are more prone to working in the digital environment, communicating in cross-platform settings, solving problems, and adapting to the changing technological environment (Tee et al., 2024; Tushar & Sooraksa, 2023). In this way, the actions of digital transformation should not be measured by the actions of institutional modernization only; it must also be measured by the degree to which it makes the students more competent and prepares the graduates to the labour market.

The other significant conclusion of the reviewed literature is that graduate employability is now turning into a significant problem of the scale of the digital revolution of education. Employability has already become one of the trendiest multidimensional outcomes of higher education that Abelha et al. (2020); Eimer and Bohndick (2023) have been able to demonstrate. Institutions not only can influence employability with regards to what the curriculum involves but also provide the learners with the opportunity to learn their competences, experience learning, and digital literacy (Adegbite, 2024; Hasan, Alam, & Sharmin, 2024). It indicates that digital transformation may be the most fruitful in the cases when it can assist universities in organizing the pedagogy, assessment and career preparation. Digital systems that can be used to add value to a degree of employability are authentic assessment, group work, reflective learning, and work-integrated experiences. The advantages of digitalization to the labor-market will be less applicable in the case where the delivery of the contents online will be the extreme of digitalization. The other conflict that is prevalent in literature is efficiency and equity conflict. Digital transformation can facilitate the institutional scale, flexibility, and administrative coordination. It can be used to lower the percentage of the marginal delivery costs and enable the universities to focus on larger segments of the learners. However, the new and recent studies of digital divide have shown that the accessibility of gadgets and the Internet connection is not half of the coin, though, the skills, confidence, and support also matter (Ng, 2012; van Deursen & van Dijk, 2010). Digital transformation can therefore not only increase the possibility but also replicate inequality. The strain is particularly applicable to developing nations and resource-limited environments, in which the disparity in the delivery of infrastructure and student readiness still exists. The policy implication is that the digital transformation strategies are to be developed on the inclusive capability-building, but not on the technological acquisition.

Governance is one of the problems that are related to it. The most appropriate sources of digital transformation are coherent policy, quality standards, and strategic planning, which are provided by the reports of OECD and the institutional research (OECD, 2021, 2022, 2023; Wang et al., 2023). This is true since the universities are not always shown in a systematic manner where the administrative system is being changed at a greater pace than the curriculum is being offered or platforms are being purchased without investing in the development and restructuring of the staff. Literature, in its turn, can be summarized in the fact that the quality of governance is what would make digital transformation the source of sustainable transformation or a series of disjointed actions. In these aspects, the issue of digital transformation should be treated as the problem of institutional capabilities and policy congruency, rather than a particular problem of technology management. In general, the literature review makes it possible to conclude that the possibility of implementing the digital transformation will be the sole measure that can be applied to add value to higher education, and it is the aspect of the institutional strategy in the context of integrating infrastructure, pedagogy, competence development, assessment, and employability. The importance of this can be discussed with the assistance of the economics-of-education approach. The human capital dimensions that are influenced by digital transformation include the establishment of human capital, quality of education delivery, allocation of learning opportunities and the worth of higher education degrees in the labor-market. In this way, the ultimate measure of success of digital transformation will not be the number of tools used by a university, but the ability

of these tools to deliver quantifiable results in the form of higher quality teaching, student learning and graduate preparedness to work in digitally transforming economies.

3.1. Implications for Practice and Future Research

The leaders of the universities indicate four urgent priorities. First, digital transformation should be an academic strategy-driven process, not a decision by individual IT. Second, faculty development is to be considered as an essential investment and not as a marginal activity. Third, the curricula and assessment should be reorganized to show digital and employability skills. Fourth, digital inclusion should be maintained in the forefront so that transformation does not institutionalize inequality. Researchers still have some gaps left. The cost-effectiveness of the digital transformation, the long-run labor-market results of digital higher education, and unequal digitalization impacts by discipline should be supported. The situation in the developing countries is even more challenging since the institutional restrictions, and the organization of the labor market is even more decentralized in the developed economies. Finally, the rapid spread of generative artificial intelligence has been accelerated, which presupposes that the research in the future will have no other option but to refer to the dimension of authenticity, critical thinking, and the role of faculty in digitally transformed universities.

4. Conclusion

This review has examined digital transformation in higher education in the compound lens of teaching, learning, graduate employability, and economics of education. The conclusion, which was made and informed by the literature review, is that the digital transformation is far beyond the introduction of educational technologies in universities. It institutionalizes and influences institutional strategy, institutional governance, institutional pedagogy, institutional assessment, competence development and alignment with labor-market (Akour & Alenezi, 2022; Bisri, Putri, & Rosmansyah, 2023; Fernandez et al., 2023). This extended definition of digital transformation is required because it is the cause of why some universities are achieving colossal returns to education and why others are experiencing a technological transformation that is otherwise superficial.

The above evidence presented in this paper indicates that the determinant of technology-pedagogy relationship is the success of transformation teaching process. Online space, digital platforms, new artificial intelligence devices can render flexible, collaborative and active learners and, in turn, does not presuppose the improved teaching. Faculty development, pedagogical redesign, and institutional support are reported to be the most rewarded in terms of the technology implementation (Basantes-Andrade et al., 2022; Peters et al., 2022; Røe, Wojniusz, & Bjerke, 2022). This means that the higher education policy should be focused on the ability of the teachers and not accidental. The low-spending universities can afford to digitalize the process of administration or even the delivery of courses with no salient consequences on the study experience of the students. The review also indicates that the worth of the digital transformation to the learning of the students is anchored on setting up of competencies and inclusive design. The online systems allow the potential to multiply the resources, flexibility of the process of learning and even the new communication and self-directed learning. They are not, however, unconditional earnings as they are unearthed in literature. The course design, support structures, motivation of the students, and design of the digital competence, unequal access, poor preparation, and poor assessment can ruin them (Haleem et al., 2022; Mejías-Acosta et al., 2024; OECD, 2023; Pinto & Leite, 2020). As such, the quality of learning that digital transformation will enable and the reduction of the educational inequality that the digital transformation will introduce, rather than enhance, will be the metrics used to gauge the success of the digital transformation.

Graduate employability is one of the effects that can be applied to establish the effect of digital transformation. It becomes known in the articles being analyzed that employers are imposing on graduates the following demands, which, together with the demands to be knowledgeable in the matter, make the argument more likely to take place: digitally literate, collaborative, communicative, flexible, and problem solvers in technologically mediated environments, on top of the above-mentioned ones (Abelha et al., 2020; Tee et al., 2024).

To create these capabilities, universities can enhance social and private returns to higher education by reorganizing curricula, assessment and work-related learning in case they do it via digital transformation. They cannot concentrate on the delivery technologies if the value of the change in the labor market is high. Digital transformation is also a cost-effective and control concern that is institutionally tenacious. Universities must make hard choices in terms of infrastructure, budgeting, sequencing, staff development, quality assurance and support of students. The literature has established that strategy and leadership contribution are important factors in the success of digital transformation becoming a stable institutional capacity or a system of initiatives that are not interdependent (Antonopoulou, Begkos, & Zhu, 2023; Carmo et al., 2025; Wang et al., 2023). It may also be transferred to the policy of the population, especially those resources where the differences between the institutions are large in terms of resources and digital maturity. The assistance that OECD is providing is to make the realization of the awareness that digital transformation requires a holistic conception in the terms of standards, equality, administration, and long-term development of the systems, but not the short-term acquisition (OECD, 2021, 2022, 2023).

The facts that are specifically applicable in the messages of the review are that digital transformation is an efficiency opportunity and equity risk. It can lead to increased access, increased flexibility and increased coordination, but it can also replicate or even amplify disadvantages in the situations where the students and teachers do not have access to devices, connectivity and digital skills or institutional support. The current literature on digital inequality that supports it is highly relevant in the case as the disparity in access interacts with the disparity in competence and the disparity in usage (Ng, 2012; van Deursen & van Dijk, 2010). In companies and developing nations that are not resource endowed, it means that there should be inclusive digital transformation strategies. It should not just invest in platforms and infrastructure, but also invest in cheap connectivity, support of students, teacher training, and curriculum reformation. In conclusion, one can assume that the concept of digitalization of higher education can be regarded as the long-term educational and economic initiative, the realization of which is based on the development of human capital. Success is based on the ability of universities to combine infrastructure, pedagogy, competence development, assessment, governance, and employability into a coherent strategy. As the literature review demonstrates, the presence of technology is not the key parameter of success, but the degree to which digital transformation will improve the quality of teaching, help students study, and prepare graduates to work in the advanced labor markets in an effective and just manner is the most essential one. It means that the researchers should continue with their study in the future to make sure that they can not only measure digital adoption but educational outcomes, distributional effects and labor-market benefits. It informs the policy makers and the university leaders that digital transformation must be pursued as one of the strategic courses of the integration of economically relevant, inclusive and high-quality higher education.

References

- Abelha, M., Fernandes, S., Mesquita, D., Seabra, F., & Ferreira-Oliveira, A. T. (2020). Graduate Employability and Competence Development in Higher Education—A Systematic Literature Review Using PRISMA. *Sustainability*, 12(15), 5900. <https://doi.org/10.3390/su12155900>
- Adegbite, W. M. (2024). Unpacking mediation and moderating effect of digital literacy and life-career knowledge in the relationship between work-integrated learning and graduate employability. *Social Sciences & Humanities Open*, 10, 101161. <https://doi.org/10.1016/j.ssaho.2024.101161>
- Akour, M., & Alenezi, M. (2022). Higher Education Future in the Era of Digital Transformation. *Education Sciences*, 12(11), 784. <https://doi.org/10.3390/educsci12110784>
- Antonopoulou, K., Begkos, C., & Zhu, Z. (2023). Staying afloat amidst extreme uncertainty: A case study of digital transformation in Higher Education. *Technological Forecasting and Social Change*, 192, 122603. <https://doi.org/10.1016/j.techfore.2023.122603>
- Audrin, C., & Audrin, B. (2022). Key factors in digital literacy in learning and education: a systematic literature review using text mining. *Education and Information Technologies*, 27(6), 7395-7419. <https://doi.org/10.1007/s10639-021-10832-5>
- Basantes-Andrade, A., Casillas-Martín, S., Cabezas-González, M., Naranjo-Toro, M., & Guerra-Reyes, F. (2022). Standards of Teacher Digital Competence in Higher Education: A Systematic Literature Review. *Sustainability*, 14(21), 13983. <https://doi.org/10.3390/su142113983>

- Bisri, A., Putri, A., & Rosmansyah, Y. (2023). A Systematic Literature Review on Digital Transformation in Higher Education: Revealing Key Success Factors. *International Journal of Emerging Technologies in Learning (IJET)*, 18(14), 164-187. <https://doi.org/10.3991/ijet.v18i14.40201>
- Bui, T. T., & Nguyen, T. S. (2023). The Survey of Digital Transformation in Education: A Systematic Review. *International Journal of TESOL & Education*, 3(4), 32-51. <https://doi.org/10.54855/ijte.23343>
- Bygstad, B., Øvrelid, E., Ludvigsen, S., & Dæhlen, M. (2022). From dual digitalization to digital learning space: Exploring the digital transformation of higher education. *Computers & Education*, 182, 104463. <https://doi.org/10.1016/j.compedu.2022.104463>
- Carmo, J. E. S., Lacerda, D. P., Klingenberg, C. O., & Piran, F. A. S. (2025). Digital transformation in the management of higher education institutions. *Sustainable Futures*, 9, 100692. <https://doi.org/10.1016/j.sftr.2025.100692>
- Carretero, S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The digital competence framework for citizens with eight proficiency levels and examples of use*.
- Eimer, A., & Bohndick, C. (2023). Employability models for higher education: A systematic literature review and analysis. *Social Sciences & Humanities Open*, 8(1), 100588. <https://doi.org/10.1016/j.ssaho.2023.100588>
- Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M.-S. (2021). Transformation and digital literacy: Systematic literature mapping. *Education and Information Technologies*, 27(2), 1417-1437. <https://doi.org/10.1007/s10639-021-10624-x>
- Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M.-S. (2023). Digital transformation and digital literacy in the context of complexity within higher education institutions: a systematic literature review. *Humanities and Social Sciences Communications*, 10(1), 386. <https://doi.org/10.1057/s41599-023-01875-9>
- Fernandez, A., Gomez, B., Binjaku, K., & Mece, E. K. (2023). Digital transformation initiatives in higher education institutions: A multivocal literature review. *Educ Inf Technol (Dordr)*, 28, 1-32. <https://doi.org/10.1007/s10639-022-11544-0>
- Habib, M. (2023). Digital transformation strategy for developing higher education in conflict-affected societies. *Social Sciences & Humanities Open*, 8(1), 100627. <https://doi.org/10.1016/j.ssaho.2023.100627>
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275-285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Hasan, M., Alam, M. J., & Sharmin, D. (2024). The role of higher education for sustainable employment in Bangladesh. *Discover Sustainability*, 5(1), 516. <https://doi.org/10.1007/s43621-024-00778-2>
- Huynh, T., & Tran, L. T. (2023). Digitalisation of the Teaching and Learning for International Students in Higher Education: A Systematic Review. *Journal of Comparative & International Higher Education*, 15(3), 63-80. <https://doi.org/10.32674/jcihe.v15i3.4799>
- Mabotha, P. A. P., & Ngcamu, B. S. (2025). Digital Transformation in the Higher Education Sector: A Systematic Literature Review. *Administrative Sciences*, 16(1), 1. <https://doi.org/10.3390/admsci16010001>
- Mejías-Acosta, A., D'Armas Regnault, M., Vargas-Cano, E., Cárdenas-Cobo, J., & Vidal-Silva, C. (2024). Assessment of digital competencies in higher education students: development and validation of a measurement scale. *Frontiers in Education*, 9, 1497376. <https://doi.org/10.3389/feduc.2024.1497376>
- Moreira-Choez, J. S., Gómez Barzola, K. E., Lamus de Rodríguez, T. M., Sabando-García, A. R., Cruz Mendoza, J. C., & Cedeño Barcia, L. A. (2024). Assessment of digital competencies in higher education faculty: a multimodal approach within the framework of artificial intelligence. *Frontiers in Education*, 9, 1425487. <https://doi.org/10.3389/feduc.2024.1425487>
- Mukul, E., & Büyüközkan, G. (2023). Digital transformation in education: A systematic review of education 4.0. *Technological Forecasting and Social Change*, 194, 122664. <https://doi.org/10.1016/j.techfore.2023.122664>
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065-1078. In.
- OECD. (2021). *Supporting the digital transformation of higher education in Hungary*.

- OECD. (2022). *Digital higher education: Emerging quality standards, practices and policy pointers*.
- OECD. (2023). *OECD digital education outlook 2023: Towards a digital transformation of education*.
- Pelaez-Sanchez, I. C., Glasserman-Morales, L. D., & Rocha-Feregrino, G. (2024). Exploring digital competencies in higher education: design and validation of instruments for the era of Industry 5.0. *Frontiers in Education*, 9, 1415800. <https://doi.org/10.3389/feduc.2024.1415800>
- Peters, M., Elasri Ejjaberi, A., Jesús Martínez, M., & Fabregues, S. (2022). Teacher digital competence development in higher education: Overview of systematic reviews. *Australasian Journal of Educational Technology*, 38(3), 122-139. <https://doi.org/10.14742/ajet.7543>
- Pinto, M., & Leite, C. (2020). Digital technologies in support of students learning in Higher Education: literature review. *Digital Education Review*, 37(37), 343-360. <https://doi.org/10.1344/der.2020.37.343-360>
- Røe, Y., Wojniusz, S., & Bjerke, A. H. (2022). The Digital Transformation of Higher Education Teaching: Four Pedagogical Prescriptions to Move Active Learning Pedagogy Forward. *Frontiers in Education*, 6, 784701. <https://doi.org/10.3389/feduc.2021.784701>
- Singun, A. (2025). Unveiling the barriers to digital transformation in higher education institutions: a systematic literature review. *Discover Education*, 4(1). <https://doi.org/10.1007/s44217-025-00430-9>
- Sousa, M. J., & Rocha, Á. (2019). Digital learning: Developing skills for digital transformation of organizations. *Future Generation Computer Systems*, 91, 327-334. <https://doi.org/10.1016/j.future.2018.08.048>
- Spada, I., Chiarello, F., Barandoni, S., Ruggi, G., Martini, A., & Fantoni, G. (2022). Are universities ready to deliver digital skills and competences? A text mining-based case study of marketing courses in Italy. *Technological Forecasting and Social Change*, 182, 121869. <https://doi.org/10.1016/j.techfore.2022.121869>
- Spante, M., Hashemi, S. S., Lundin, M., Algers, A., & Wang, S. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, 5(1), 1519143. <https://doi.org/10.1080/2331186x.2018.1519143>
- Starkey, L. (2019). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50(1), 37-56. <https://doi.org/10.1080/0305764x.2019.1625867>
- Tee, P. K., Wong, L. C., Dada, M., Song, B. L., & Ng, C. P. (2024). Demand for digital skills, skill gaps and graduate employability: Evidence from employers in Malaysia. *F1000Res*, 13, 389. <https://doi.org/10.12688/f1000research.148514.1>
- Tinmaz, H., Lee, Y. T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learn Environ*, 9(1), 21. <https://doi.org/10.1186/s40561-022-00204-y>
- Tømte, C. E., Fossland, T., Aamodt, P. O., & Degn, L. (2019). Digitalisation in higher education: mapping institutional approaches for teaching and learning. *Quality in Higher Education*, 25(1), 98-114. <https://doi.org/10.1080/13538322.2019.1603611>
- Tushar, H., & Sooraksa, N. (2023). Global employability skills in the 21st century workplace: A semi-systematic literature review. *Heliyon*, 9(11), e21023. <https://doi.org/10.1016/j.heliyon.2023.e21023>
- van Deursen, A., & van Dijk, J. (2010). Internet skills and the digital divide. *New Media & Society*, 13(6), 893-911. <https://doi.org/10.1177/1461444810386774>
- van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2020). Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review. *SAGE Open*, 10(1). <https://doi.org/10.1177/2158244019900176>
- Vlachopoulos, D., & Makri, A. (2024). A systematic literature review on authentic assessment in higher education: Best practices for the development of 21st century skills, and policy considerations. *Studies in Educational Evaluation*, 83, 101425. <https://doi.org/10.1016/j.stueduc.2024.101425>
- Wang, K., Li, B., Tian, T., Zakuan, N., & Rani, P. (2023). Evaluate the drivers for digital transformation in higher education institutions in the era of industry 4.0 based on decision-making method. *Journal of Innovation & Knowledge*, 8(3), 100364. <https://doi.org/10.1016/j.jik.2023.100364>

Zhao, Y., Pinto Llorente, A. M., & Sanchez Gomez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Comput Educ*, 168, 104212. <https://doi.org/10.1016/j.compedu.2021.104212>