

Article

Digital Learning and Digital Institution in Higher Education

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Abstract: Higher education institutions are going through major changes in their education and operations. Several influences are driving these major changes. Digital transformation, online courses, digital-navy students, operational costs, and micro and nano degrees are just some examples of these influences. Digital technologies show a range of tools selected to include formalized learning environments in teaching in higher education, and students utilize these tools to promote their learning. The Industrial Revolution 4.0's technological growth has penetrated higher education institutions (HEIs), forcing them to deal with the digital transformation (DT) in all of its dimensions. As they enable us to characterize the various interrelationships among stakeholders in a digitally enabled context of teaching and learning, applying digital transformation techniques to the education sector is an emerging field that has attracted attention recently. The aim of this study is to provide an overview of the distinguishing features of the digital transformation implementation process that has occurred at higher education institutions. In addition, how digital learning can be seen as part of the ecosystem of modern higher education. Further study is necessary to determine how higher education institutions can comprehend digital transformation and meet the demands imposed by the fourth Industrial Revolution.

Keywords: digitalization; higher education digital institution; digital education; digital educational technologies



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1. Introduction

In the second decade of the twenty-first century, higher education institutions (HEIs) have witnessed a digital transformation (DT). It is a fundamental and required procedure for companies that profess to be leaders of transition and be highly competitive in their industry. Several academics have described the digital evolution from the perspective of the industry. Among these is Hess et al. [1] who claim that “digital transformation” refers to how digital technology may alter a company’s strategy by creating new products, altering the institutional culture, or automating business operations. According to a definition provided later by Gobble [2], “digital transformation is the tremendous progression of business operations, processes, knowledge and skills, and modeling techniques, for the optimum transformation of the advancement of a technology concoction and its expedited effect on society, in a corporate strategy and prioritized way”. Higher education institutions must adapt if they are to endure throughout time as a crucial component of this transition and avoid disappearing from the scene.

Furthermore, rethinking whole business practices throughout the value chain is challenging to do because it requires effectively utilizing all the chances and possibilities created by the abundance of accessible digital technologies. The dilemma is more urgent for businesses that constantly work to maintain competitiveness in a world market. Still, institutions are also facing it as the rivalry to attract the top students and researchers is growing [3]. Intriguingly, higher education institutions are confronted with a transformative situation ingrained in the innovative business models, supposedly changing how they have evolved through time, proactively tying in internal and external clients, and boosting employee engagement and encounters in the institution [4]. However, many

institutions are creating specialized digital strategies in response to the significant shift toward technological advances. Still, many need more vision, capacity, and dedication to put them into practice successfully [5]. The present state of knowledge in digital transformation in institutions and to identify its unique qualities as perspectives, characters, and deployments that have occurred as a result of digital transformation make it crucial to have a complete view of the whole digital transformation in higher education institutions. This study summarizes the research work documented on the subject through a literature review of the digital transformation in HEIs.

1.1. Digital Transformation

It is interesting to note that diverse viewpoints were taken on the digital transformation inside higher education institutions, and an agreement on its description has yet to be reached. Grab et al. [6] presented digital transformation as a disruptive force that radically alters whole sectors of the economy and institutions. Bresinsky and Reusner [7] acknowledged that digital companies need to concentrate on both the social and technological domains for a successful adaptation. Additionally, according to Gama [8], digital transformation in higher education institutions is in line with technology advancements from the standpoint of a renewed business model. The components engaged in the digital technological process include individuals, groups, frameworks, and the competitive landscape [9]. The shift toward the service quality lifespan and how digital technology enhances or replaces conventional goods and services are the focus of the studies by Sullivan and Staib [10] which engaged a social factor in the digital transformation processes. The range of digital technologies in higher education institutions includes contacts with customers, rival businesses, and vendors outside the organization's boundaries. They also connected digital transformation as a resource to provide extra and differentiating value. Digital technology was also noticed from the educational perspective, incorporating digital tools into organizational procedures for teaching and learning [11].

Digital transformation has several frontiers from this perspective. Digital platforms and materials for teaching and learning were where Bozhko et al. [12] believed it was crucial to employ resources that adhere to the current educational guidelines and procedures, with digital technology-based tools coming in first. In developing new pedagogical approaches, the authors stressed that academic, programmatic, institutional, and fundamental changes are just as significant as technical ones in digital education. In this approach, using digital educational tools opens new responsibilities for instructors and learners, provides flexible and engaging learning environments, and fosters more autonomy and teamwork [11]. Digital literacy and digital skills are essential in the sharing transformation, where new, highly qualified personnel with proficiency in technology and interpersonal relationships is required [13].

According to Bond et al. [14], from the viewpoint of university lecturers, technical and instructional advice is advised. From an administrative point of view, many higher education institutions have taken advantage of technology to offer students learning versatility in their classroom instruction and just-in-time mentoring to improve the availability of high-quality education while also improving the internal processes for delivering teaching. Depending on the dimensions that support it, digital technology, as seen from the infrastructural region of space, has a variety of shopfronts. Learning portals and digital services are crucial instruments that meet current educational practices and requirements [7].

According to Seres et al. [15], as digital technologies are used more often and everything becomes more connected, stability, accountability, and information security are facing more significant issues. The idea of a flexible framework and flexible infrastructure that might manage adaptive and emerging activities (administrative, educational, and research related) was considered by researchers [16].

The dimension of the curriculum may be viewed from many angles. Modernizing the curriculum entails creating curricula that adhere to modern educational standards and methodologies, creating multinational textbooks, discovering innovative content delivery

methods using digital learning, and expanding information and communication technologies [14]. The primary objective of upgrading the academic institution is to provide a flexible approach to job market requirements [13]. The students are calling for an enhancement in the “basics” of their experiences, with characteristics such as the digitalization of formal procedures; unfettered, round-the-clock access to all knowledge; and services utilizing many platforms.

1.2. Transforming Institutions

In reality, higher education institutions are using digital strategies to enhance “how” they carry out their present job, to try something new in creating value, to represent the impact of digital technology while simultaneously building new graphical representations or digitizing their current processes in light of the new labor market requirements and the rising expectations of students to reinvent their life experiences in learning, teaching, studies, and strategic planning [17]. They are trying to enhance the current employment and operational processes. The DT needs significant expenditures to abandon the old and adopt cutting-edge technologies.

For academic institutions to be successful, their model of educational and organizational democratic accountability must be restructured to act rapidly and precisely, create fresh concepts effectively, and enable adaptable and respectful facilities. This attitude transformation toward an “entrepreneurial mindset” must begin [16]. In order to make informed choices, data management and service level indications connected with business intelligence systems offer a thorough understanding of the ongoing business operations and a crucial perspective for making successful decisions [17]. Research must comply with the demands and aspirations of the actors participating in the research processes by aligning with the digital transformation. The digital transformations in higher education institutions and human resources have a strong correlation. Digital technology impacts and influences aspects related to human resources and helps increase the performance [18].

On the other hand, the primary facilitator of universities through a professional digital workplace is the digital skills of human resources. Autonomous competency certifications are used and integrative relationships between institutions, specialized community colleges, big businesses, and local government are created [19]. Identifying and controlling digital solutions is critical for highly digitalized businesses because each change may play a significant role in the effective adoption [7]. The educational group requires an analysis and should be designed to align with and within the context of the oversight strategy and administration framework of higher education [13], much like how the governance practices theory must match the conceptual, institutional, and tactical elements of innovative resource allocation. The numerous normative and non-normative scenarios should be considered in this evaluation.

Additionally, this denotes considering risk management to reduce how much these innovations affect the organization’s employees. Because it is such an important commodity, the informational extent of the digital transformation in higher education institutions must be in line with a consistent work style. First, data from multiple sources may be reduced for a leaner and more efficiently designed strategy to enhance the internal procedure for the strategic development and execution [20]. Second, from a teaching standpoint, current conditions have led to the creation of instructional resources in digital forms, which have emerged as the primary means by which online education is enabled [21].

As a brand-new aspect of higher education institutions that necessitates a digital advertising paradigm, the promotional extent is included in the digital transformation in higher education institutions [22]. The use of digital technologies to improve or replace current services with new ones, to streamline the processes involved in offering educational possibilities, and to lessen general uncertainty promotes the institution to reinvent itself [6]. The individuals engaged, the objectives that direct digital processes, the used methodologies, and the innovations that were used are all strictly related to the linkages developed in the digital transformation in higher education institutions after the information was

analyzed. From a social viewpoint, most of the relevant players are students, instructors, businesses, organizations, digital services, governmental agencies, teacher preparation programs, or communities. According to the internal work, the most relevant players are students, instructors, sustainably grown units, educational authorities, business leaders, content producers, organizations, and restaurants.

Most of the relevant actors from a technical standpoint are students, instructors, college administrators, the digital technologies team, or academics. Depending on the viewpoint (cultural, institutional, and technical) that was covered, several goals have led the digital technological processes at higher education institutions. From a sociological perspective, the goals that are currently in place are mainly those that aim to improve society, create work skills, help stakeholders grow, and enhance. Higher education institutions' legitimacy enables the technological change in government, eliminates spacetime obstacles, and focuses on promoting the opportunity for education, positioning the higher education institutions' human resources as a crucial element to achieve digital technology and to adapt and make flexible curricula. The main objectives of digitalization at higher education institutions that emerge are connected to the framework model, business processes, administrations, teaching, curriculum, employment access, market availability, investigation, and internet marketing as unique issues to consider. From a technical standpoint, the main objectives of the digital transformation at higher education institutions are to provide technology to support human resources, instruction, development, organization, accessibility, marketplace accessibility, the construction process, community, and research. Depending on the standpoint (social, institutional, and technical) that was handled, several technologies have assisted the digital transformation at higher education institutions. Digital technology, online communities, learning management services, big data, online educational technology, programming, advanced analytics, computing, and significant technologies are considered from a social viewpoint in digital educational and transformational activities. Complete management systems require the financial, digitalization, computing, and programming of the technological advancements that are most notable from an organizational standpoint. Digital educational technology, the internet of things, information architecture, virtualization, digital applications, the environment of digital technology, virtual environments, business frameworks, and job management systems are the most powerful technologies from a technological standpoint.

2. Digital Institution

For centuries, universities served as the primary location for producing and disseminating knowledge. A competing ecosystem centered on the internet that fulfills the same role as these elements has posed a threat in recent decades. The ability to access knowledge from anywhere in the world is no longer limited to academic institutions; rather, it can be found in a variety of platforms, applications, encyclopedias, and open-source web browsers, which is a hallmark of the digital age and enables people to learn about a wide range of topics. For higher education institutions, this new environment poses a challenge rather than a danger. There is little doubt that academic institutions are active in Industry 4.0 in addition to the manufacturing sector. Innovation is the process of bringing together many fields of knowledge and creating something new from them, even though ancient expertise is preserved in digital libraries that collect the roots on which development is founded. According to an institutional perspective, higher education institutions are more likely than other academic institutions to charge a particular tuition for each subject, explore every field, form links, and close the gaps between them.

Because responsive leadership is essential for digital innovation in education, considering higher education institutions as businesses that set relationships between stakeholders, mentors, and supports is a recent model that has focused on developing managerial competencies besides technical competencies based on a comparison of technology maturity models. This approach, which provides a crucial framework, is structured into six steps: identification, definition, design, development, evaluation, and communication [23]. Iden-

tifying the skills necessary for tracking, analyzing, and understanding the advantages of technological developments, in addition to having a thorough understanding of the organizational business structures, procedures, and strategies; establishing the conditions for the launch of the digital transformation process with the appropriate resources and tools; building technical competencies for integration and business process design competencies for re-designing processes; developing project management skills for the project's coordination and organization parts; assessing data analysis capabilities to make it easier to assess risks and project impact in light of a large amount of data that need to be acquired, developed, evaluated, and disseminated; and expressing a collection of abilities in the areas of leadership, communication, persuasion, and the capacity to win support for the project's outcomes. Digital institutions for higher education require rethinking, restructuring, and reinvention due to their multipurpose, multi-process, multidisciplinary, multi-state, and multi-factorial nature. It takes a team effort to put the individual at the center of the process of development, transformation, and social influence. To put it another way, DT ought to be a fundamental and comprehensive change in the HEI, approached from the technological, organizational, and social angles [24,25]. From an organizational standpoint, the significance of this organizational perspective in the procedure is astounding. Companies looking to reinvent themselves should start at the top. Most of the specific dimensions that investigations had chosen in isolation around this perspective were combined into this dimension, and primarily four dimensions emerged: business process, administration, information, and governance.

In every organization, including colleges, the worldview, culture, and digital literacy of the students, teachers, administrators, and other stakeholders are crucial to the process. Because of this, the majority of obstacles and possibilities in organizational change relate to people, processes, strategies, structures, and competitive dynamics. The Fourth Industrial Revolution is frequently characterized from a technological and physical standpoint as the outcome of the integration and compounding impacts of numerous "exponential technologies," such as artificial intelligence (AI), biotechnologies, and nanomaterials. Cross-border digital technologies such as IoT devices, 3D printing, and big data analytics are now driving transformations that go far beyond internal process optimizations because they have the potential to drastically alter business models, organizational structures, corporate cultures, and entire industry structures. In order to support human resources, teaching, innovation, administration, access, market openness, building process, society, and research, the university should therefore provide flexible IT, new enterprise platforms, and a strong and scalable operational backbone as parts of an agile digital infrastructure. On the other hand, the university needs to have the necessary physical facilities to meet modern educational standards and procedures (i.e., institutes of innovations, labs for teaching, digital training units, buildings, and labs for teaching according to digital and innovation scenarios). HEIs are aiming to successfully shift the paradigm while closely monitoring the evolution of the DT process. Even while the benefits of DT, their analytics, and platform technologies are becoming more noticeable in businesses, there is still a need to consider how they can affect higher education. A theoretically sound and methodologically sound maturity model for DT is currently lacking in research, both at HEIs and in the IT industry.

According to Rampelt et al. [26], DT has an effect on all aspects of HEI operations. It infuses every facet of the teaching, learning, research, and employment processes, contexts, forms, and objectives of higher education. New infrastructures are being built as a result of this shift, and more people are using digital media and technology for teaching and learning, research, support services, administration, and communication. For both employees and students to excel in their current and future professional roles, they must also pick up new digital skills. As an institution, the university has always been committed to knowledge, education, and training. It has taken on new responsibilities and goals throughout history as a result of the occasionally unsettling changes that society has undergone. The importance of knowledge for the development of enterprises and the wealth of nations was highlighted by the Industrial Revolution, particularly in the middle of the nineteenth century. In order

to promote innovation, economic value, and social advancement, it is essential to transfer new knowledge created in academic institutions, research labs, and universities to the business and production sectors for its implementation. The value-knowledge binomial replaced the value-work binomial after the turn of the 20th century, and knowledge was elevated to the status of a social good that needed to be created, shared, transferred, and applied in order to promote economic growth, cultural advancement, and improvements in social cohesion.

2.1. Principal Objectives of Digital Institutions in Higher Education

The following four major objectives are frequently mentioned by higher education leaders [27]. They want to enhance the learning environment for the students, raise program operational effectiveness, boost computer capacity for cutting-edge research, and promote educational innovation. In order to make these visions into reality, management uses digital transformation. The following is how a digital institution can accomplish these objectives:

- **Improving the learning environment for students:** With additions such as TEDX seminars, apps for more thorough learning, and VR-AI technologies that enable students to share their views and ideas and comprehend subjects better, technology improves the learning environment. In general, technology aids students in developing the social, technical, and critical thinking abilities required for high-paying employment in the twenty-first century. Along with other advantages, technology provides teachers with access to evidence-based tools (such as tests and modules) that enable them to assess student performance and modify the curriculum as necessary.
- **Increasing the organization's operational effectiveness:** Higher education institutions have used analytics to control erratic enrolment and escalating recruitment costs since the early 2000s. Higher education institutions employ diagnostic analytics to suggest (then analyze) potential solutions to their problems, descriptive analytics to describe conditions, predictive analytics to forecast events, and so forth in order to compete. Marketing, recruitment, admissions selection, financial assistance, student counseling, academic planning, financial forecasting, and even executive planning all employ data analytics on campus.
- **Boosting computer capacity for cutting-edge research:** Complete articles and abstracts for millions of publications, including monographs, reports, conference proceedings, and dissertations, are available in digital libraries and databases. Infinite research is accessible to students and teachers thanks to well-known search engines, such as Google and YouTube. To assist students in finding information about tests, curricula, and other topics, schools put up their own IT infrastructures. In summary, digital technology offers a streamlined, affordable path to high-quality education, complete with the most up-to-date, reliable material in all fields.
- **Promoting educational innovation:** Teachers now have more time and resources to create because of technology. For example, only seven Ph.D. grads out of 200 can secure full-time positions in academia or research after they graduate. Innovation is needed more than ever to create jobs and make use of technology in improving the education experience.
- **Spending less:** By moving campus technology systems to the cloud, substituting skilled instructors with e-learning, gradually replacing textbooks with digital resources, and replacing expensive equipment with VR or AR resources, educational technology lowers the cost of higher education. While other solutions save time by enabling educators to tailor and speed their instruction, apps for instructors liberate educators to focus on more important work. Under-resourced schools especially benefit from technology because it makes access to high-quality content more inexpensive. Through professional learning communities, they can educate both themselves and their personnel, among other advantages. They can also use less expensive tech to speed up their sessions.

2.2. Educational Processes

According to students' perspectives, the following are the main benefits of the digitalization of the educational process: the creation of favorable conditions for the development of independent learning skills, the ability to select resources for self-development, the creation of personal mobility, and the improvement in the motivation for self-education and self-development [28]. Students believe that teachers' professional development should focus on improving their psychological, technological, and public speaking talents. Using virtual tools during training in digital institutions of higher education will help students develop skills, such as the ability to apply knowledge learned in online education, master the algorithm for solving common technical problems in distance learning, and develop communication skills for organizing the educational process in these institutions. Students believe that the desired direction of the work of public organizations and international educational structures should be to increase the level of access to electronic resources for all strata of the population and to train potential higher education seekers in the use of digital technologies and electronic resources. The formalization of education, the intense pressure placed on students during the educational process, and the lack of teacher proficiency in using digital tools are the main issues degree-seeking students in digital higher education institutions face.

The process of digitalizing education entails establishing ways to implement the accepted pedagogical concept within the framework of its effective use, regulating regulatory and methodological aspects, determining the place of digital technologies in didactics and the system of integrative knowledge, defining the areas to which these provisions relate, and creating conditions for the effective implementation of these provisions [29]. The advancement of technology has made it possible to combine education, science, society, government, commerce, and innovation in both virtual and physical ways, which has facilitated the growth of digital education [30]. The effective collaboration of several professors, students, pupils, and teachers in the fields of gaining new knowledge and developing digital skills is fostered by digital education. Several scholars point out that contemporary virtual educational technologies give teachers the chance to automate the majority of their tasks; free up staff time for searching, communicating, and working one-on-one with students; receive immediate feedback from students; and manage the educational process more effectively [31].

As a result, the digitization of education involves students using mobile and internet technology, broadening their knowledge and extending their bounds. Students develop new abilities required for success in the twenty-first century through the effective use of digital technology, the engagement of education seekers in independent research, the choice of information, and participation in project activities. Open online resources were recently actively developed and used, implementing a variety of techniques, starting with individual tasks and tests and finishing with comprehensive courses (modules) with the development of the necessary abilities [32], in particular, who observes that the dynamics of the development of online education are mirrored in the expanding availability of online courses, confirming this tendency [33]. The development and meaningfulness of the virtual educational process are carried out with the help of software solutions that provide an opportunity to construct training courses from available sources of information and in specialized software environments, systems of author development, and automated design. The system of virtual education makes it possible to effectively apply new technological means and unlimited information resources in the educational process. Online courses and blended learning create a field of unlimited educational opportunities, focusing on the specific needs of each person, regardless of their place of residence but in accordance with their interests and abilities. Such changes require the teacher to be proficient in the digital educational environment. Against this background, the future task of all universities lies in improving the qualifications of teachers in terms of digital competencies, focusing not only on the development of courses but also on using and applying the digital environment in the educational process. The digital environment requires teachers to possess a different

mentality and a different worldview and use more progressive means of working with students [33].

The basic changes that can be observed in the educational system of the world today are the changing role of higher educational institutions, which should not only ensure the educational process but also become a platform for creating innovations with the constant use of the latest scientific developments, combining resources to implement joint projects, and creating scientific and educational online platforms [34]. Digital tools facilitate communication between students and help organize joint learning, contributing to the reduction in social inequality, free access to open educational systems, and a global array of information in a digital educational environment [34].

3. E-Learning and Digital Learning

Used and expanded as a communications platform, the internet has recently transformed the way we operate and is now ready to transform education. Institutions are becoming more enthusiastic about the possibilities of online learning to give affordable and current education to people of all ages and socioeconomic levels, regardless of location, as academicians have grasped its enormous opportunity as an educational exercise. According to Elango et al. [35], the internet is the sole medium for education that can dismantle obstacles to education, offer young individuals the opportunity to become twenty-first century learners, and let them study in ways that suit their preferences and cognitive strategies. Teachers are critical in utilizing technology to provide students with the opportunity to study anything, whenever and wherever they want. The internet is viewed as the key to providing access to additional data and allowing students to utilize their efforts to acquire it in this technological age where they are required to gain the required knowledge. Many people believe that “e-learning” is the only workable answer to the issue of transmitting the materials required to support continuous learning. According to the OECD [36], the use of technology-based information and communication (ICT) to improve and assist learning in higher education is referred to as “e-learning”. E-learning may also help students learn computer skills and other skills they will need when they begin working [37].

E-learning might involve a variety of methods, such as e-mail or electronic learning access for students. According to Fang’s [38] study of students, those in developed countries who were exposed to extensive computer usage at school, at home, and in society liked the “digital cultural context”, among other things. Similarly, in Al-Fadhli’s [39] research, students discovered that digital learning is superior to the conventional form of instruction and that it is more fun. However, because of the complexity and incoherence of present e-learning theoretical approaches, this approach is used erratically, arbitrarily, and to various degrees of effectiveness. Despite the dedication and passion displayed by academics and professors, there is still a great deal of indifference, uncertainty, and mistrust among students concerning online learning [40]. Even though most people understand that e-learning has the potential to enhance education and the new process at all stages, many believe that the existing flaws are still too significant to address a wide range of issues. The value of continuous learning is expanding, and students in the twenty-first century are embracing e-learning as a useful tool. According to Kasworm [41], e-learning enables flexible learning and access to resources based on students’ requirements. It also offers more participatory resources that make it simple for students to acquire knowledge and provide opinions. Currently, several institutions have included e-learning in their curricula to meet students’ varied learning needs [42].

3.1. Role of Technology in Higher Education

There is a long history of using online teaching and learning, but the outcomes are still not satisfactory. Due to their unorthodox teaching methods, some instructors have chosen not to use online teaching tools. The variables affecting students’ desire to use online educational tools were explored by Callo and Yazon [43]. Getting instructors to change their techniques or styles of education is one of the biggest obstacles. When Baran [44] looked at

effective e-learning systems, it became clear that the role of the teacher was vital. But some students are not used to using e-learning platforms for academic objectives. Numerous studies have looked into ways to provide students with effective online teaching and learning. The major obstacles to student involvement in online education are enthusiasm and participation, even if technology and communication skills are essential for increasing student retention and happiness [45]. For teachers to enhance their students' virtual educational experiences, we provide practice, multimedia presentations, personality assignments, and situations linked to practice for contributing to the overall experience [46]. Schools and colleges need to adapt their teaching strategies as a result of multicultural education and virtual technology [47]. For these tactics to be effectively used, learners must be engaged. Despite the various educational tactics that were proposed to enhance student's learning, the major difficulty is that they do not engage. The student's enthusiasm for using such web-based learning methods determines the efficiency of the teaching methodologies [48].

Online learning, as defined by Zhao et al. [49], is the approach of carrying out instructional strategies through real-time live broadcasts online. Teaching strategies must be uploaded in advance for the learning system, lectures and seminars must be given, queries from students must be answered, and class debates must be permitted. Even while engagement and participation are essential for online learning, the situations have changed. Every participant, especially instructors and students, must participate in online teaching. Whatever their educational strategies, amount of engagement, or technical constraints, instructors must adjust. The information technology (IT) sections of the institutions are tasked with providing online educational resources, networks, and technology acquisition to enable the real-time delivery of teaching. Because students may obtain life lessons from anywhere, it is hard for teachers to evaluate or regulate how well they are preparing for a live program of study.

A student's readiness for live digital learning is one of the requirements for an active learning environment and academic achievement [50]. Because participation is not guaranteed in remote learning, unlike traditional face-to-face instruction, it is difficult to gauge how focused students are [51]. The efficacy of live online learning and the student's capacity to engage in class are both greatly impacted by their preparedness. It is critical to look at the factors that are most important in students' preparation for live online learning. The readiness for online courses is the subject of much research. According to researchers, it depends on how independently students engage in their education, how confidently they use knowledge, and how they see how it is delivered.

Learners' readiness for online learning is determined by several variables. Walia [52] examined students' readiness for online learning about their approaches to education and gender gaps. The seven evaluation criteria used in the original study were learner technical competence, living concerns, instructional presence, stated efficiency, relationship satisfaction, capabilities, and different learning. Engin [53] examined the students' emotive intellectual capabilities to ascertain whether they were ready for online learning. The computer self-efficacy component was chosen to determine how likely pupils were to use computers out of the five criteria that made up the evaluations. A similar technique was developed by Hung et al. [54] to evaluate if teens were prepared for online learning based on the number of students. The tools, parameters, and standards used to assess pupils' readiness for the digital context were carefully examined [55]. It is suggested that multimodal e-learning preparation is influenced by attitudes, identities, aspirations, self-efficacy on the internet, and digital literacy.

Despite the extensive use of online learning, research on live (real-time) online education is still lacking. In certain research, live-stream education systems and digital teaching methods were employed (Liu, 2018). The methods and strategies for teaching in real time were investigated [56]. The higher education sector, where students' readiness for live online courses has not been investigated, is not the primary focus of these studies. To ascertain if students in the higher education sector are ready for live digital education at the degree and doctorate levels, research is required. By incorporating the five key factors

of technology eagerness [57], the public persona moving ahead to learn, attaining the good, curiosity in learning, and digital communication identity, we enlarged instructors' learning perceptions to evaluate students' desire and the ability for real-time online learning.

Disseminating concepts for social innovation and new information has become increasingly important thanks to digital learning and online education [58]. In the literature, there was a discussion about the process of leveraging technology to provide vulnerable people with training and education through more affordable approaches. Distance learning and lifelong learning are important concerns that can help deliver excellent education to remote places through social innovation technologies and software [59].

The potential of DT to enhance learning has long been understood in the European environment. It is undoubtedly stated in the Yerevan Communiqué of 2015 [60] that "we would encourage and support HEIs and staff in encouraging pedagogical innovation in student-centered learning environments and in fully utilizing the potential benefits of digital technologies for learning and teaching." Similarly to this, the European Commission stated in its "Digital Education Action Plan" that pupils from high and low socioeconomic backgrounds can benefit from having access to and using digital technologies to reduce the achievement gap. Digital learning may, in fact, drastically reduce the cost of access to training and better fulfill individual needs based on learning preferences and abilities [61]. Investing in digital learning can help demystify the elite perception of the university classroom while democratizing information across boundaries. It provides lifelong education so that employees can continue to learn while they are employed, raising their skill premiums [58]. Therefore, the social component is very much present in the shift to a more digital and open learning model; in fact, one may even claim that it is the key catalyst for this change. The contemporary pandemic setting, which has unpredictably sparked the digital transformation of education, makes all of the aforementioned points especially pertinent.

It is necessary to switch from one-dimensional learning spaces to multidimensional collaborative learning spaces as a result of the pedagogical changes brought on by digital advances. According to research, learning results improve when students are exposed to hybrid and digital learning settings [62]. The development of hybrid learning environments made up of socio-digital involvement strategies based on digital, mobile, virtual, online, social, and physical places is advised for deep and meaningful learning experiences in the digital era. New players have just entered the education sector, but established ones, such as institutions, can benefit from DT to create fresh teaching and learning materials [61]. The Massachusetts Institute of Technology (MIT) made a ground-breaking move in 2002 to provide formative open online courses under the OCW program. With the help of the digital revolution, MIT's choice has created a type of tsunami in the fields of knowledge transfer, knowledge accrediting, and talent certification. The MOOCs, which are open courses with widespread access to high-quality information, were preceded by the OCW. These are very dispersed and increasingly specialized online training courses. The foundation of MOOCs is the belief that knowledge should be freely shared and that learning should not be constrained by factors such as location, income, or demographics.

3.2. Digital Learning Ecosystem in Higher Education

The ecosystem that integrates digital technology to bring about a digital transformation in higher education settings is covered in this section. The organizational structure, organizational culture, leadership, employee responsibilities, and talents are the most crucial factors. Seven parts of each of those four domains are covered by this ecosystem for digital learning in higher education: digital learning technologies, instructional modality, personnel and support services, organizational policies and planning, instructor development, learner development, and partnerships. Figure 1 shows the ecosystem.

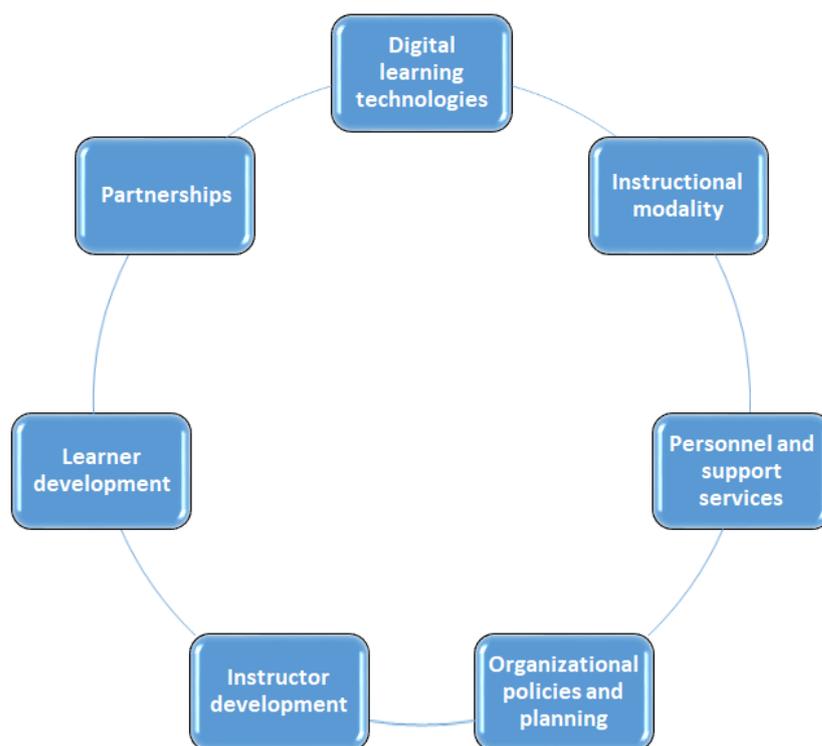


Figure 1. Digital Learning Ecosystem in Higher Education.

1. **Digital Learning Technologies.** These technologies play a crucial role in digital teaching and learning. Digital technologies can be used in various instructional modalities to engage learners. Instructors can use these technologies to build engaging digital teaching and learning solutions. However, effective digital teaching and learning in higher education settings require significant increases in the infrastructure to support these technologies. Some commonly used digital teaching and learning technologies are as follows:

- Learning management systems (LMS).
- Synchronous technologies [63].
- Multimedia applications.
- Collaborative applications.
- Cloud-based technologies.
- Emerging technologies.

The technologies that can be used for digital education are not all included in this list. Before purchasing a technology for their campuses, technology leaders must evaluate its outcomes, quality, and cost. Leaders in technology should also look at their technology infrastructure to see if it can handle digital education.

2. **Instructional Modality.** Offering education can be through several instructional modalities. When a college or university offers several learning modalities or courses in more than one modality, students can enroll in the modality that works best for them. Following is a list of common instructional modalities (on-campus technology enhanced, hybrid/blended, asynchronous online, synchronous online, bichronous online, and HyFlex). Digital elements are present in all of these instructional modalities, with the exception of technology-enhanced on-campus courses. Digital teaching and learning are heavily used in the other five modalities. Students now have more options because more institutions and programs offer online courses. Now, students can choose to finish courses and programs from anywhere and at any time. Digital learning's efficiency and effectiveness were tested by leaders, teachers, and students in higher education. Although they may still be emerging in some contexts, these teaching and learning models are now accepted by a greater number of institutions [64].

3. **Personnel and Support Services.** At universities and colleges, additional investments in support services and personnel are required due to the increasing prevalence of digital teaching and learning in various instructional modalities. Instructional designers, technology support specialists, academic and student support services, incentives, and recognition are some of the personnel and support services required for a successful digital transformation in the teaching and learning sector. Instructors are encouraged to adopt cutting-edge digital teaching strategies by providing support, services, incentives, and recognition.
4. **Organizational Policies and Planning.** Administrators must be prepared to support general teaching and learning across subject areas and lead digital teaching and learning initiatives. Digital teaching and learning innovations should be valued in all processes, including tenure and promotions (policies and standards, strategic planning, funding models, and equitable learning opportunities), and leaders should continue to make decisions based on research. In general, additional policies are required to encourage digital education. Digital teaching and learning-related funding, personnel, technology, and existing policy inequities must also be rethought by instructional leaders.
5. **Instructor Development.** Faculty who had never taught online had to quickly adapt to the pandemic. Many needed to take part in professional development activities for digital teaching and learning. Training opportunities and resources for faculty development must adapt to faculty needs as the Dx moves forward. The purpose of these resources is to increase faculty members' knowledge of accessibility, intellectual property, online teaching best practices, and pedagogical and technological skills (faculty beliefs, accessibility, intellectual property rights, and copyright). During the pandemic, many faculty members did not have sufficient time to implement online teaching principles when they switched to digital teaching and learning. The quality of online courses will improve if educators take the time to reconsider and implement pedagogical best practices.
6. **Learner Development.** Students have the opportunity to learn in a variety of ways through digital learning. This gets them ready for the workforce of the future, where most jobs will require digital skills and knowledge (PCs and web access, using time productively and self-guidelines, educational substance and individuals, help, and people group building). Digital learners' success is aided by community building, time management and self-regulation, engagement and help-seeking strategies, and technology resources.
7. **Partnerships.** The pandemic brought to light the possibility of utilizing a variety of partnerships to create high-quality digital education (collaboration with other universities, professional organizations, and industry). Digital teaching and learning initiatives are strengthened by utilizing the expertise of industry professionals, professional associations, and other outside organizations.

While the ecosystem features seven unmistakable regions, accomplishing it requires an iterative cycle. These initiatives will become commonplace for higher education institutions as advanced digital technologies develop. It is crucial to the success of ecosystem implementation to prepare students to solve problems in the digital world and to embrace flexibility and accessibility.

4. Recommendations

Logically, students and instructors would be the key participants in its digital processes. Nevertheless, their demands and objectives might vary based on the viewpoint discussed. The following sentences describe how each performer's interests are combined in different ways:

- **Student:** Students at higher education institutions are the group that has most affected or compelled them to think about making their shift to a digital transformation. First and foremost, they anticipate having the chance to learn without being constrained

by time or geography [65]. Higher education institutions should thus deliver holistic education, web-based training, electronic educational programming, innovative teaching and research, tailored programs and perspectives, and reorganized working procedures. Second, learners anticipate acquiring the competencies and pragmatic skills necessary for life in the digital age. Students also want shorter specialized training programs where they may get a taste of Industry 4.0's potential [7]. Third, students assume that HEIs will expand their digital services by enabling strategic planning, cooperation, and value co-creation. It indicates that the student expects the higher education institutes to value their learning environment. Finally, cost-cutting will help the economy of students.

- **Teacher:** In the beginning, educators should reinvent their approaches to learning, inquiry, workflow, and administration [19]. They should focus on increasing their teaching effectiveness to help all participants communicate, collaborate, and co-create value. Instructors should introduce students to digital services available at the tertiary level. Faculty trust in digital transformation at higher education institutions can boost their efficiency in the classroom and offer fresh, cutting-edge digital experiences.
- **Industry:** From the perspective of the economy's digitization, higher education institutions should first convey the knowledge, skills, and foresight necessary for the industrial and financial complexity of domains [16]. As a result, higher education institutions would offer fresh and cutting-edge digital experiences, encouraging interaction, teamwork, and value co-creation among all participants. The second important component of their platforms is digital partnering. Organizations can use technology to generate a prediction model that combines data from consumer relationships and digital sources. Third, higher education institutions could offer more condensed training courses for individuals. Executives at the institution are aware of the possibility presented by digital transformation to improve interprocess communication both inside and across all organizational units. Similarly, they guarantee efficient data processing administration and the corporate adoption of digital technology. As a result, they enhance the use of data and data-related information in all decision-making support operations, whether at an operational or a strategic level, enabling choices based on genuine and accurate facts. The infrastructural capacity to support this DT of HEIs and the financial and technical limitations that come with it are problems for higher education institutions.
- **Digital Transformation Team:** It is crucial to have a solid command structure and a highly specialized team that can convincingly explain and incorporate the technologies in higher education institutions. This team must also be aware of the importance of integrating a digital work executive structure and possess an agile foundation that can handle existing, flexible, and newly emerging processes. Additionally, the digital transformational team must handle many social, behavioral, and practical digital disruptions.
- **Government:** The public political impact for an administration process transformation and simplification, as well as digital efforts forcing higher education institutions to accelerate procedure and service innovation and adaption in response to increasing social demands, regulatory and legal modifications, and strategic culture.
- **Organizational Units:** Because this transition makes it possible to isolate the management and procedure performance from the actual location where the processes are carried out, digital transformation in higher education institutions directly benefits organizational units. A problem for organismic units in the digital age is the need for self-managed teams in the workplace [6].
- **Graduates:** Graduate students of higher education anticipate that higher education institutions would engage in tasks relevant to the development of competencies required by the digital economy by offering IT expertise at the international level as well as new and cutting-edge digital capabilities.
- **Researcher:** The origins and effects of digitalization for economies, nations, and societies have drawn more attention from academics, authors, and decision-makers.

Digitalization will ensure the effective use of resources for researchers and expedite the processing of their requests.

- **Community:** As a result of new societal demands, statutory and regulatory alterations, and strategic culture, digital technology in higher education institutions is developing and adapting methods and services faster than ever before [13].
- **Digital Platform:** As a facilitator and supporter of this approach, online technologies operate as players in the technological initiatives in higher education institutes. Electronic learning content—repositories, digital process web service design, and institutional mechanisms to incorporate into teaching and e-learning technologies [20].
- **IT Business Executive:** By integrating digital efforts with a structure to manage them, business executive actors drive the re-engineering of company operations, re-skilling of employees, and transformation of services. The project relates to the IT infrastructure [3].
- **Teacher Training Unit:** Because of the significant issue of the computer divide among all interested parties which requires them to keep updating their knowledge of the field at the worldwide platform, the fundamentals of academic achievement in the areas of customization, high flexibility, and the integration of different educational and labor dynamics, the teacher training unit becomes a powerful entity in the digital transformation in higher education institutions.
- **Content Suppliers:** As vital collaborators, content suppliers may improve the caliber and availability of the materials offered by higher education information systems. In higher education institutions, the information system is a necessary technological component for increasing the utilization of data and knowledge in all decision-support processes, whether at an organizational or a strategic level. This allows choices to be made based on actual data. The scholastic organization impacts the educational program modernization and managerial methods [8].

The unification of the paths made by higher education institutions to conduct their digital transformation, which is detailed in the studies, is included in the following parts because the digital transformation in organizational change must be thorough and inclusive. Due to the rules for a digital transformation in higher education institutions from a macro-organizational perspective, technology calls for a well-thought-out digital marketing strategy, which includes the transformational framework, so that all critical participants and constituents may actively shape the institution to survive in the digital era [21]. Ensuring the institution has the resources required for its execution is crucial for the success of a digital strategy. The enhancement, growth, and redefinition of the goods and services that businesses offer, as well as the invention, leveraging, and convergence of the business operations used to provide these goods, are two components of DT.

In terms of the viewpoints of university lecturers, it is advised to seek both technical and pedagogical support. Academics cite the Institutes of Advancement as an essential infrastructure resource for case study-based training facilities. The digital technological center for constructing a directory of general administration for the training procedure and corporate research, employee skills, capacity planning, and other supportive services is required, according to the authors as a result of the implementation of digital transformation at higher education institutions. The underlying technologies in higher education institutions must be re-engineered for success. Because of the size of the institution and the numerous daily operations it manages, this task required hypersensitivity and attention to conquer the natural immunity of the different institutions to modify. It was also a very demanding process that called for a novel solution because it involved dematerializing all the methods while maintaining the quickness of the technological infrastructures.

The creation of a system that assists the business processes of higher education goes hand in hand with the re-engineering exercise. The authors divide this technique into two steps. First, the technology has to make it possible to quickly dematerialize the institution's whole spectrum of business operations (many hundreds). Second, it was anticipated to encourage the standardization, simplification, and improvement in employment conditions. The integration of organizational computer networks with strategic planning, the

administration of curriculum content and components, scientific evidence data warehouses, academic library repositories, and the development of an integrated student lifecycle management system are all required by the programming structure. A competency center is a tactical tool that supports the growth of the higher education institutes of human resources. The fundamental facilitators of institutional, technological advancement through the proficient digital workforce are digital competencies, qualities that fit someone for dwelling, educating, and functioning in a digital world [12]. IT architectural-style governance and digitalization together provide a conceptual instrument that aids enterprises in understanding their design and method of operation. In addition, the technology deployment in the institutions' settlements showed the significant advantages of connecting IT systems with learning systems in terms of improved decision making, the enhanced flexibility of educational institutions, and fewer IT-related liabilities. Change management: It is essential to reduce the potential negative consequences of a technological transformation and the electronic "syndromes" all through the large-scale transition. Strong leadership and a comprehension that upheaval, accountability keeps cranking, and catastrophes are to be anticipated during this process are also essential.

5. Conclusions

It was attempted to address the digital transformation in higher education institutions from the sociological, administrative, and technological perspectives. The recent rise in publications is proof of higher education institutions' enthusiasm to achieve their objectives. Additionally, we discovered that the propensity has a clear significance from a social point of view, indicating that academics are conscious of the human resource capabilities and skills to complete digital technology projects effectively. Teaching, construction, pedagogy, administration, investigation, operational processes, social service, expansion, digital transformation control, knowledge, and advertising are the areas of institutions that digital strategies have impacted. According to the literature, the intricacy of the digital process is measured by those above, and no article has covered them entirely. Students, teachers, industry, higher education management staff, the digital transformation coaching staff, the authorities, sustainably grown units, former students, scholars, social instructors, digital services, IT corporate leaders, teacher education units, family members, content producers, information systems, divisions, schools, and the manor house are the stakeholders that the authors have identified as having participated in the digital processes at higher education institutions, either as leaders or as beneficiaries. The parts these players play is determined by the dimensions and viewpoints covered during the digital strategies. Each evaluated publication highlighted the various ways the digital process was addressed in higher education institutions.

Technology in higher education institutions necessitates revisiting, reorganizing, and reinventing because of its multipurpose, multi-process, multidisciplinary, multi-state, and multi-auctorial nature, as is demonstrated by this. It is a team effort that centers the individual in the process of growth, change, and its effects on society. In other words, digital transformation needs to be a fundamental and comprehensive change in higher education institutes [66]. According to this study, the digital transformational dimensions within higher education institutions go beyond simply implying technological advancement and instead accordingly make adjustments of meaning that have an impact on the institution's cultural context, its individuals, its standard operating procedures, its foundational activities, and their evaluations; its pedagogical approaches; and its teaching, studies, outgrowth, and administrative regulations. The lack of surrogacy methods for these kinds of proposals at the holistic higher educational level that correspond to the company's model, operating procedures, and consumer experience, taking into account the internal digital capabilities and its current and future view, is demonstrated by the fact that the majority of studies focused on digital transformation in higher education institutions and approached it in a fragmented manner.

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