

Digital Transformation in Higher Education in Developing Countries to Promote Sustainable Development

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Abstract- Sustainability stands as a paramount concern for the global community, transcending individual responsibilities to become a collective imperative. At its core, sustainability hinges on the prudent preservation of available resources, ensuring their longevity by easing wasteful practices and preventing depletion. Within this global context, the education sector in developing countries, particularly higher education, struggles to support sustainability. Notably, numerous Arab universities still employ traditional methods to manage the educational process, encompassing teaching methodologies. Compounded by administrative challenges, these practices have led to an alarming depletion of university resources. In response to this critical issue, the present research rigorously investigates the experiences of Arab universities in navigating the transition to e-learning and integrating electronic tools to enhance the educational process, as a pre-step to digital transformation. A meticulous exploration of the obstacles and challenges confronted by these institutions in this transformative journey is a focal point of this study. Through comprehensive analysis, the research presents a strategic roadmap designed to guide Arab universities toward a nuanced and effective digital transformation. This roadmap, envisioned by the research, holds the potential to significantly contribute to achieving sustainability goals by preserving university resources and, by extension, national resources. By aligning educational practices with modern technological advancements, the research envisions a harmonious integration that addresses immediate challenges and fosters a resilient foundation for sustained educational and national development.

Index Terms- Digital transformation, Sustainability, Higher Education, Arabic Universities.

I. INTRODUCTION

Digital transformation (DT) is a series of deep and coordinated culture, workforce, and technology shifts that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition. Moreover, digital transformation is investing in thought and behavior change to bring about a radical transformation in the way people work, by taking advantage of the great technical development that has occurred to serve beneficiaries faster and better (Benavides et al., 2020).

The principles of digital transformation in the education sector include digital infrastructure construction, digital education resource development and sharing, digital management system construction and application, online campus ethos and culture, teaching models, and online continuing education (Xiao, 2019).

Digital transformation plays a crucial role in helping graduates prepare for and excel in the future workforce through enhancing their digital skills which are becoming increasingly essential in the modern job market, digital transformation has accelerated the adoption of remote work and virtual collaboration tools, online education and e-learning platforms are part of the digital transformation. Graduates can continue to upskill, adapting to the changing demands of the job market without needing to pursue traditional, full-time education. on the other hand, graduates who understand data analysis and data-driven decision-making are more valuable in many industries. Digital transformation has led to an increased emphasis on data and analytics in the workplace. Moreover, automation is a concern for some, graduates who understand how to work with and alongside automated systems and artificial intelligence are better positioned in the job market. They can focus on higher-level tasks while letting machines handle repetitive work. Finally, graduates can leverage digital technologies to promote sustainability in their work. Whether it's reducing the carbon footprint through remote work, using data to optimize resource usage, or creating sustainable products and services, digital tools can support environmentally responsible career choices (Alenezi, 2023 ; Hashim et al. 2022).

Digital transformation spending is expected In 2022, to reach US\$1.6 trillion. By 2026, global spending on digital transformation is expected to reach US\$3.4 trillion (Statista Research Department, Aug 6, 2023).

Ross et al. (2016) provide recommendations for a successful digital transformation journey. The digital strategy should focus on customer engagement and digital solutions, acquiring new skills and capabilities, investing in the operational backbone, and developing the digital and services backbone (Ross et al., 2016). These recommendations apply in all digital transformation contexts. For this reason, they should be highlighted in the general digital transformation approach that will be proposed in this paper.

Sustainable in Higher Education

When examining the definition and comprehension of digital transformation objectives, it becomes apparent that they are closely linked to the broader sustainability goals on a global scale. Among the 17 sustainability goals, education is specifically highlighted as the fourth goal.

According to (United Nations) the 17 Sustainable Development Goals (SDGs) are a set of global objectives established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. These goals are designed to address a wide range of social, economic, and environmental challenges, to create a more sustainable and equitable world by 2030: (1) No Poverty, (2) Zero Hunger, (3) Good Health and Well-being, (4) Quality Education, (5) Gender Equality, (6) Clean Water and Sanitation, (7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation, and Infrastructure, (10) Reduced Inequality, (11) Sustainable Cities and Communities, (12) Responsible Consumption and Production, (13) Climate Action, (14) Life Below Water, (15) Life on Land, (16) Peace, Justice, and Strong Institutions, and (17) Partnerships for the Goals.

Sustainability is a social goal for people to co-exist on Earth over a long time. Specific definitions of this term are disputed and have varied with literature, context, and time (Brundiers et al., 2021). On the other hand, sustainability in the education sector has necessitated the trend towards digital transformation to adapt to the changes imposed by new technologies (Abad-Segura et al., 2020; AlMunifi & Alfawzan , 2023).

In today's higher education landscape, digital transformation has become a necessity rather than an option. Students now expect the same level of digital convenience and personalization they encounter in other industries. This includes self-service options, automation, and excellent customer service. To adapt to these heightened expectations and address environmental pressures, higher education institutions must embrace digital transformation. By doing so, they can streamline operations, reduce costs, enhance the student experience, and strengthen their brand.

Digital transformation in higher education includes the following examples: increasing the use of digital platforms and tools to attract and keep students, such as websites, social media, chatbots, and email marketing, gathering, integrating, and activating data across campus to guide decision-making. Moreover, it enables self-service capabilities so that students may handle tasks like class registration, transcript requests, and financial aid requests independently as well as automate cross-departmental operations to expedite and improve task completion.

Unfortunately, many attempts at digital transformation in organizations fall short, with only about 30 percent achieving their goals and creating lasting change (Fahey, 2021). To succeed in transforming their operations and effectively utilizing technology, leaders in colleges and universities must first identify the obstacles they face and then carefully plan their digital transformation journey, the author (Fahey, 2021) identified four Digital Transformation Barriers for many higher education institutions: antiquated, siloed technology ecosystem, lack of technology governance, lack of necessary skills, and change management difficulties.

The impetus for digital transformation arises from the prevailing technology trends, including cloud computing (Olaloye et al., 2019), artificial intelligence (Alotaibi & Alshehri 2023 ; Al- Rasheedi, & Khan, 2021) the Internet of Things (Al-Qozani, & Aleryani, 2018) alongside optimizing the utilization of social media (Davidovitch & Belichenko 2018 ; Alamri et al., 2020) and educational platforms, all to enhance communication and interaction among students.

Findler and the co-authors (Findler, et al., 2019) seek to expand upon previous literature reviews by offering a fresh perspective on the influence of higher education institutions (HEIs) on sustainable development (SD). Instead of merely examining what HEIs do to promote SD, this study aims to explore the broader effects of their actions on society, the environment, and the economy. The research identifies six distinct impact areas where HEIs can directly or indirectly contribute to SD. Through this systematic literature review, the authors provide a valuable resource for decision-makers within HEIs, as well as for researchers and educators. It offers them deeper insights into the potential repercussions of their activities on society, the environment, and the economy, serving as a solid foundation for addressing these impacts effectively. Furthermore, this review underscores the inherent responsibility of HEIs to foster greater sustainability within societies. HEIs should integrate SD into their systems while carefully considering their societal consequences.

II. LITERATURE STUDIES

Arab universities' experiences in digital transformation

Iraqi University experience has been addressed by (Binnage, 2020), She discussed in her study the successful experience of the Iraqi University in implementing digital education to benefit from it to achieve a qualitative shift in the progress of Libyan universities. The results shown by the Iraqi University's experience in applying digital learning can be summarized as follows. The e-learning program is not a replacement for traditional university education but rather complements it. It can enhance both student learning and teaching skills. Phased implementation is crucial, especially when introducing it across various specializations. Transitioning from traditional libraries

to digital ones supports e-learning by providing a digital environment for course materials. Adopting international standards can save time and effort and ensure a successful start for e-learning. Globally, e-learning implementation has had a positive impact, although some challenges arise from weak IT infrastructure in certain countries. The trend toward e-learning in universities addresses issues in the educational process in Arabic countries.

On the other hand, Libyan Universities' experience has been addressed by (Al-Hassi, 2022) who aimed to explore the relationship between digital transformation and sustainable development, particularly in the context of higher education institutions. The researcher used a descriptive approach and a questionnaire as the primary research tool. The results revealed that 70.7% of the surveyed individuals held a negative attitude towards digital transformation in Libyan universities. This negativity stemmed from limited e-learning system usage, insufficient financial resources, and a lack of specialized staff for successful digital educational projects. Furthermore, there was a pessimistic view regarding the university's ability to address societal development needs, likely due to the underutilization of electronic education and the absence of qualified personnel. In conclusion, the study recommended a shift in higher education systems towards a realistic digital strategic vision that incorporates both technological and cognitive aspects to enhance the quality of educational and training processes.

Moreover, the Jordanian Universities' experience has been addressed by (Al-Sayed, 2022), who aimed to assess the state of digital transformation in Jordanian universities as perceived by faculty and administrative members. The sample included 410 participants chosen through a stratified random method, comprising 155 faculty members and 255 administrative staff. The research employed a descriptive survey approach, focusing on four aspects: digital culture, institutional support, infrastructure, and insight and vision. The study findings indicated that both faculty and administrative members rated the level of digital transformation in Jordanian universities as moderate. Infrastructure was the strongest aspect in terms of digital transformation for faculty members, while institutional support ranked highest for administrative staff.

Egyptian Universities' experience have been addressed by (Al-Muslimani, 2022) who aimed to reveal the reality of digital transformation in Egyptian universities, its requirements, and implementation obstacles. A descriptive approach was used, and a questionnaire was constructed to address faculty members at universities and was applied electronically to a random sample in the different governorates, amounting to (137) male and female respondents. The study concluded that Egyptian universities have taken good steps towards digital transformation. The results of the study showed that the reality of the digital transformation axis received a high response rate of (83.61%), and universities still need more measures for digital implementation. The digital transformation requirements axis received the highest approval rate (87.49%). There are obstacles facing Egyptian universities in their pursuit of digital transformation. The obstacles to the digital transformation axis received a high response rate of (79.38%), and the study ended by presenting a proposed vision for digital transformation in Egyptian universities.

Ashour, (2020) examines the actual experiences of students with digital technology during their academic studies to better understand the realities that the students encounter when using technology inside and outside of their classrooms. It draws on a survey of 762 undergraduate students at two universities in the United Arab Emirates (UAE). The study investigates what exactly students require to improve their learning. The gathered information supports the conclusions of international studies that universities are not being "transformed" by the digital era. Additionally, conventional teaching strategies as well as conventional student behavior and thinking about technology continue to be dominant. Combining technology with the formal in-person method can provide considerable benefits concerning considering the unique characteristics of students in the UAE context to effectively improve student learning and success.

Obstacles Facing Higher Education in Arab Universities Towards Digital Transformation

Several reasons why teachers resist making use of technology include feeling anger when computers break down and they can not solve the problem, fear that technology will take over their teaching role, and embarrassment that they are not experts in using educational technology. Moreover, teachers resist using technology if they are not given adequate and comfortable time to learn and are afraid of failing in front of their students because most of them have not grasped technology well from an early time, and lack sufficient skills to implement technology in their classrooms (Shahibi et al., 2022).

Babiker, (2014) studied challenges and future of e-learning in the Arab world. One of the survey's key findings was that older respondents had more conservative views on ICT and e-learning. This could be explained by the degree of ICT, e-learning, and educational technology expertise within each group.

Many studies have been conducted to assess the capacity of Arab universities to transition to online education during the COVID-19 pandemic. Recognizing that online education forms the foundation of digital transformation and serves as the initial building block in this trend, these studies have identified the primary challenges that have hindered most Arab countries (excluding the Gulf nations). The aim of understanding these challenges is to understand the key barriers to digital transformation and whether the pandemic has played a role in highlighting these obstacles.

Higher education in developing countries faces significant challenges that can be addressed or resolved through e-learning and its various technologies. A literature review conducted by (Eltahir, 2019) identified major challenges in implementing e-learning systems in

developing countries. These challenges encompass inadequate network infrastructure, limited knowledge of information and communication technology (ICT), deficiencies in content development, and language competency.

Another review study conducted by (Aung & Khaing, 2016) emphasized that challenges in Arab universities specifically include ICT infrastructure, the development of local content, copyright concerns, and cultural factors as the primary obstacles to the successful implementation of e-learning.

On the other hand, Zarei & Mohammadi, (2022) studied the readiness of universities in developing countries to shift to online education during COVID-19 and also concluded that developing countries were not fully prepared for this digital transformation. Improper and inadequate technological and operational fundamentals have caused problems for all students, teachers, and other individuals involved. Moreover, AlMunifi & Aleryani, (2023) studied the challenges faced by online courses in the Arab region and revealed that there are many challenges, such as weak internet and infrastructure, occasional power outages, and the difficulty of owning personal computers. Yemen, grappling with multiple pressures such as warfare and internal armed conflict, faces numerous obstacles in its higher education institutions, hindering a smooth transition to distance education amid the COVID-19 pandemic. These obstacles encompass a weak internet infrastructure, resistance to change, concerns about academic career stability, financial stability of universities, the complexity of certain specialized fields, and the high costs associated with transformation (AlMunifi, & Aleryani, 2021 ; Al-Baadani, & Abbas, 2020)

In addition to Yemen, (Lassoued, et al. 2020) have examined challenges in higher education in Algeria, Egypt, Palestine, and Iraq. These challenges related to online learning include weak internet speeds in remote areas, resulting interruptions in broadcasting and learning, lack of security and confidentiality regarding data and information, piracy concerns on internet platforms affecting courses and exams, limitations in remote communication capabilities, difficulties in owning computers for some students, and the challenge of supporting untrained learners during self-study. Moreover, there's the difficulty of ensuring students can effectively use computers in the absence of instructors with computer expertise.

Furthermore, a study by (Al-Hassi, 2022) on digital transformation in Libyan universities revealed limited utilization of e-learning systems, inadequate financial resources, and a shortage of specialized personnel needed for successful digital education initiatives. (Al-Sayed, 2022), study in 2022 on digital transformation in Jordanian universities found weak infrastructure and limited institutional support. (Al-Muslimani, 2022) study on digital transformation in Egyptian universities indicated that positive steps are being taken, but Egyptian universities still encounter obstacles in their pursuit of digital transformation.

The Cloud Computing in Digital Transformation

McKinsey reports that most companies aim to allocate 80% of their IT budget toward the cloud by 2024, including PaaS, IaaS, SaaS, and private cloud. Furthermore, McKinsey estimates that companies leading cloud migration should expect significant financial gains, potentially unlocking \$1 trillion in value (Balakrishnan et al, 2021).

To effectively implement a digital transformation strategy, a company will need to pivot its business process several times. Cloud computing saves an organization from the hassle of investing in various IT resources by providing the required computing resources, infrastructure, and platforms on the go.

Education is a crucial factor in ensuring sustainable progress, especially in countries with growing economies. Due to the virtualization of resources, cloud computing has complex Internet and scalability. Both public and private educational institutions should take advantage of the potential benefits of cloud infrastructure to ensure high-quality service regardless of the minimal resources available and make their way to digital transformation (Al- Rasheedi, & Khan, 2021).

The need for IT infrastructure including their constant maintenance for diverse educational uses is highly burdensome on institutions, especially in times of economic crisis. Cloud computing therefore becomes a preferred option for optimum quality of service despite the minimum resources available in the institutions (Olaloye et al., 2019). That why the majority of businesses and individuals are now actively and purposefully pursuing and adopting cloud computing as a crucial development and growth strategy for achieving sustainable competitive advantage in today's dynamic, competitive, and turbulent business environments. This is due to the most recent advancements in digital technologies (Jaradat, et al., 2020).

Al- Rasheedi, & Khan, (2021) studied the use of cloud computing in the education sector in Saudi Arabia, they mention it is slow and steady. Their paper presents the results of an investigation conducted about education in the Kingdom of Saudi Arabia. They also discussed the challenges related to cloud computing, especially in the educational sector. The result of their study, they formulated guidelines to accelerate the benefits of cloud computing.

On the other hand, (Jaradat, et al., 2020) studied cloud computing at Jordanian universities. The research results showed that the academic communities have not focused much on cloud computing to investigate the elements that enhance purposeful behavior to use cloud technology in developing country contexts. It is thought that the drivers and barriers to technology adoption cannot be extrapolated to other contexts and environments with distinct cultures. To understand how technologies are being accepted in each culture, it is vital to treat each culture independently because lifestyle and socioeconomic inclinations in developing countries differ from those in industrialized countries.

Furthermore, (El Khatib, et al., 2019) explored the potential impact of cloud computing technology on higher education institutions in the United Arab Emirates (UAE), including Zayed University (ZU), Higher College of Technology (HCT), and the UAE University (UAU). The study aimed to assess the need and feasibility of implementing external cloud computing services to enhance collaboration

and services within these higher educational institutions. The findings reveal that these institutions currently lack adequate cloud computing infrastructure, which has resulted in delays in delivering student services. However, administrators express a strong belief in the potential of cloud computing technology for facilitating inter-institutional collaboration.

According to the Social Constructivism Theory's tenets, (Alenezi, 2019) investigated how cloud computing could improve teaching at Saudi Arabian colleges from the perspective of the experts. The findings of the study demonstrated the significance of cloud computing in improving learning and teaching environments in academic institutions. The author advised fostering a culture of cloud computing use in teaching and learning among university faculty members and mandating extensive training sessions for them to hone their cloud computing education skills effectively.

Jalamneh & Moaiad, (2021) studied the challenges of implementing cloud computing in Arab libraries. The finding of the obstacles to cloud computing deployment in libraries and other information institutions in the Arab establishment was the major goal of this paper. The study's findings indicate that professionalism, training, and technological issues including a lack of apps and programs, inadequate storage space for the volume of data, lack of privacy protections, and lack of information security pose the biggest obstacles.

Alfailakawi (2021) proposed many recommendations for the effective use of cloud computing, including ensuring training and awareness for the target group in universities as a result of his study of the reality of using cloud computing in Kuwait universities.

Ibrahim (2022) investigated cloud computing in universities in Iraq. The findings of the study will help to focus the attention of professionals working in the educational field on the usage of cloud computing apps for knowledge sharing during the educational process.

This study showed how cloud computing and Knowledge sharing rely on quick, dependable, and widely accessible communication routes that are reasonably priced. Therefore, universities must enhance the Internet infrastructure and create more efficient software that is automatically updated regularly to obtain data and information at any time and place, provide high availability of network service at a competitive price, and store crucial data such as educational records or test scores by setting certain security and privacy conditions from before the institution, enabling faculty members with training and workshops to bridge the gap between in cloud computing and knowledge sharing.

Alghali et al., (2014) studied the challenges and benefits of implementing cloud-based e-learning in Libya. Cloud computing offers developing country educational institutions a fantastic chance to enhance teaching and learning. To improve the standard of education, educational institutions in developing nations should benefit from integrating cloud technologies. Some of the difficulties with cloud-based e-learning, meanwhile, remain. These problems are more intricate in developing nations. The next major development in effective e-learning systems, according to academics, is cloud computing. This is due to features and the capacity to outperform current e-learning systems technologically and economically.

Technologies in Digital Transformation (AI, IoT, AR, BD, Blockchain)

Artificial Intelligence (AI) and the Internet of Things (IoT) represent two technologies poised to drive significant innovation within the field of education. Over recent years, digital transformation has extended its reach to encompass all sectors including education. Education at the higher education level presents unique challenges due to the wide array of training programs, varying durations, and diverse subject matter. The Internet of Things offers the potential to establish intelligent and pervasive learning environments, while artificial intelligence promises to revolutionize the entire learning and teaching process (Quy, et al., 2023).

Using AI to meet educational needs/initiatives brings countless benefits to both universities and students, but is not limited to (a) the development of intensive and meritorious learning materials (b) accurate grading of research papers (c) the speedy release of student results and (d) Track students' mental health across different programs. This collective phenomenon suggests that students may be referred to independent/automated support services in the future/which will become the norm (Meyer, 2019).

Alotaibi & Alshehri (2023) studied obstacles in using artificial intelligence in Saudi Arabia's higher education institutions. The results suggest that AI is still in its early stages of development in the field of education, but it has become an undeniable reality for higher education institutions. Embracing this transformative technology is essential for preparing for future learning challenges, and all students must gain the necessary technical skills to engage with and create artificial intelligence in the future. According to the findings, AI has the potential to address significant educational hurdles, transform teaching and learning methods, and accelerate progress toward the Saudi 2030 goals. However, the study also underscores specific challenges related to integrating AI-based learning into the higher education landscape of Saudi Arabia, underscoring the importance of educators acquiring new technological skills to effectively incorporate AI into their teaching.

Aldosari (2020) examined the prospective effects of artificial intelligence on higher education within Prince Sattam bin Abdulaziz University. The findings from the analysis revealed a decline in the awareness level regarding the implementation mechanisms of artificial intelligence. It underscores the necessity of enhancing awareness within the Saudi context concerning the potential applications of artificial intelligence in educational settings.

The educational institution receives a lot of information every day, including information about participation and attendance, test results, student evaluations of their teachers, information about their socioeconomic status that they share, and their level of satisfaction with the education they receive. Over time, this data flow increases thanks to practical methods of data collection and analysis that educational institutions can use to their advantage and provide the institutions with good information that will support their decisions (Abdulaziz & Aleryani, 2022).

With the help of smart devices and the IoT, traditional barriers to teaching and learning are eliminated. Students can connect with experts from around the globe, and educational social software is currently being developed within the IoT context (Al-Qozani, & Aleryani, 2018).

Many universities do not have or develop big data (BD) capabilities/as well as data scientists to analyze to develop intelligent insights about their programs, student distributions, and connections to different educational courses (behavioral patterns associated with education) (Hashim et al., 2022).

Augmented reality (AR) combines three-dimensional virtual items with reality. Regarding many economic, social, and environmental factors, technologies like augmented reality can be effective instruments to encourage sustainable development in higher education (Alahmari, et al. 2019). The purpose of (Alahmari, et al., 2019) study is to ascertain whether academic staff members are aware of the possible advantages of implementing augmented reality technology in Saudi Arabian universities in terms of its sustainability for the economy and the environment. It was challenging for the researcher to gather data from an exploratory source because AR is still a relatively new technology and some of the participants were unfamiliar with it.

Kaminslyi et al., (2018) studied the digital transformation of university education in Ukraine, they suggested building educational content management modules using blockchain technology. They ensure that modernizing corporate IT architecture management is an essential component of the university education system's digital transformation strategy, and it should be carried out via the use of a cloud-based platform. The foundation for developing an international cloud-based platform for higher education should be the integration of the instructional content management systems from various Ukrainian universities.

Social media in Digital Transformation

Social media platforms including academic social media platforms can offer several benefits in higher education when used strategically and thoughtfully. Such as providing a convenient and immediate way for students and instructors to communicate with each other, and facilitating collaboration among students, educators can use them to share important updates, announcements, and resources with their students, increasing student engagement with course materials, moreover, students can use them to connect with peers, alumni, and professionals in their field of study. Social media also can break down geographical barriers, allowing institutions to reach a wider audience for recruitment and outreach efforts.

Using social media applications (SMAs) in higher education may offer various educational advantages as well as facilitate a significant connection between student satisfaction and students' academic performance. Due to their ease of use and usefulness, social media applications can help students to become more understanding, and active, and engage with peers and their lecturers (Alamri et al. 2020; Davidovitch & Belichenko, 2018).

Aleryani et al., (2017a) studied the usage of academic social networking sites by Yemeni scholars at Yemeni and international universities. The findings demonstrated that Yemeni researchers are still not familiar with academic social networking platforms. Despite some of them considering adopting one in the future, more than 33% of respondents are unaware of them. The majority of responders pay more attention to others' profiles rather than sharing their research. Moreover, in a different article, the same authors (Aleryani et al. 2017b) studied the usage of personal cloud storage by Yemeni at Yemeni Universities and overseas. The findings indicated that many Yemeni academics are still not making good use of personal cloud storage. The majority of respondents (77.8%) are unaware of them, while some are considering using them in the future.

Beyond the boundaries of personal communication, social media is also redefining how organizations reach their audiences and communicate with individuals. It has become an integral part of the strategies of almost all industrial sectors, and higher education institutes are also prioritizing social media to connect to a large audience. This can also be attributed to the fact that social media has become the primary means of interaction within the world for the younger generation, and this young generation is the primary audience for higher education institutions (Kumar & Nanda, 2019).

Alghizzawi et al., (2019) investigates the impact of student social media use on the British University in Dubai that led to the acceptance of e-learning platforms. The results demonstrated that knowledge sharing, social media capabilities, and motivation to use social media platforms, such as Facebook, YouTube, and Twitter, positively influenced the understanding of how useful and simple the e-learning platforms were perceived to be, which in turn led to increased student acceptance of e-learning platforms.

Aleryani (2016) studied the influence of culture on the ethical standards of using Facebook in developing countries. The results showed good behavior in general, while there were some bad behaviors, especially towards professors and colleagues. Although Facebook allows users to publish their feelings and opinions freely and without concern for the ethical standards they follow in their real lives, this may be considered a violation of the rights of others.

According to an analysis of 24 studies by (Chugh et al., 2021) emphasizes that not all academics now utilize social media and those that do tend to use it mostly for networking and career promotion. The main reason why so many academics don't use social media to teach is that they don't know how to use it well or do not feel confident doing so. Even though academics rarely utilize social media, it has several advantages for research, teaching, and career development, including better relationships and connections with stakeholders, more possibilities, and better learning and happiness for students. This review seeks to provide readers with a timely introduction to current theories regarding how academics in higher education around the world use social media.

Digital transformation stages in higher education

The journey to digital transformation in higher education involves progressing through these four stages: stabilization, standardization, optimization, and transformation, each building upon the previous one to achieve the full benefits of digital transformation (Fahey, 2021).

1. **Stabilization:** In this initial stage, institutions focus on stabilizing their core systems and functions. This includes upgrading systems, improving network infrastructure, enhancing security, and providing robust end-user support.
2. **Standardization:** After achieving stability, institutions move to standardization. This phase involves identifying opportunities for efficiency and cost savings in the technology infrastructure. It includes eliminating redundant systems, implementing governance, reducing customization, and transitioning to standard cloud technologies.
3. **Optimization:** Once the technology foundation is standardized, institutions can leverage technology to automate manual tasks, optimize resource allocation, and enhance efficiency. Optimization enables faculty and staff to create quicker, more predictable, and personalized experiences for students.
4. **Transformation:** In the final stage, institutions use their optimized technology ecosystem to implement transformative technologies. These technologies leverage connected data to drive decisions through predictive analytics, introduce innovations in teaching and learning, personalize the student journey, and develop technology-enabled strategies for student retention.

Povejsil, (2021) listed nine keys for developing and maintaining a sustainable IT strategy in higher education:

1. **Establish institutional goals and conduct assessments:** begin by recognizing technology as a strategic enabler and align it with the university's overarching vision. Assess existing vulnerabilities, priorities, and how technology has impacted other industries.
2. **Recognize how technology supports objectives:** in strategic plans, identify specific objectives such as academic achievement, alumni engagement, or equity in higher education. Incorporate technology-related initiatives that align with these goals.
3. **Evaluate existing IT services and security risks:** conduct assessments for both information security and technology capabilities. Identify vulnerabilities and areas where technology can support the strategic plan while addressing security risks.
4. **Gain buy-in from key stakeholders:** secure support for technology initiatives from top leadership down to all constituents across campus. Encourage stakeholders to view technology as a strategic enabler.
5. **Secure funding:** recognize the importance of adequate IT funding for digital transformation.
6. **Prioritize basic needs first:** address fundamental issues and vulnerabilities before investing in advanced technologies. Start with resolving problems identified in security risk assessments or IT assessments.
7. **Transition to the cloud:** consider migrating data centers, servers, and network infrastructure to cloud-based solutions. Ensure network reliability and capacity to support a high number of users and devices.
8. **Integrate the right tools:** implement tools that align with the primary objectives outlined in the strategic IT plan. Ensure compatibility and consistency among technology elements.
9. **Train and support users:** provide training and support to users across the institution to effectively utilize new tools. Anticipate a learning curve when adopting new technology, and invest in user education.

Grajek, (2020) highlights a comprehensive set of actions that educational institutions should consider in their journey toward digital transformation and improved efficiency. She conducted a study focused on how colleges and universities are progressing toward digital transformation. She outlined a series of key actions:

1. **Crafting an information security strategy:** this involves the development of a security strategy based on risk assessment, aimed at efficiently identifying, responding to, and preventing security threats and challenges.
2. **Privacy protection:** ensuring the safeguarding of the privacy rights of institutional constituents and upholding accountability in safeguarding all forms of restricted data.
3. **Sustainable funding models:** creating funding models that can sustain quality and accommodate evolving needs, especially considering the increasing use of IT services in an era marked by budget constraints.
4. **Digital integration:** ensuring seamless integration, scalability, and adaptability of systems, along with preserving data integrity, security, adherence to standards, and governance across various applications and platforms.
5. **Student-centric approach to higher education:** establishing a comprehensive ecosystem of services aimed at supporting students throughout their academic journey, from initial prospecting to enrollment, learning, job placement, alumni engagement, and continuous education.
6. **Enhancing student retention and completion:** developing capabilities and systems that incorporate artificial intelligence into student services, providing personalized and timely support.
7. **Optimizing enrollment:** leveraging technology, data, and analytics to create an inclusive and financially sustainable enrollment strategy. This strategy aims to serve a broader range of learners by personalizing recruitment, enrollment processes, and learning experiences.
8. **Promoting higher education affordability:** aligning the priorities and resources of IT organizations with those of the institution to work towards a sustainable future.
9. **Streamlining administrative processes:** applying user-centered design principles, process improvements, and system reengineering to eliminate redundant or unnecessary efforts and enhance the end-user experience.
10. **Elevating the role of the integrative chief information officer (CIO):** Reinforcing the position of IT leadership as an essential strategic partner within institutional leadership to effectively support the institution's core missions.

III. RESEARCH METHODOLOGY

Research Problem

Sustainability has emerged as a pressing and vital concern, Within societies and business sectors. The education sector, specifically higher education, holds a significant role in aiming for sustainability. Arab universities grapple with numerous challenges and hurdles that strain their limited resources. Given the scarcity of capabilities and the need for optimized resource utilization, digital transformation presents a fitting solution. However, this approach remains underutilized in most Arab universities due to several addressable obstacles. Many contemporary applications can yield substantial savings in terms of both material requisites and operational expenses. These encompass the advantages of cloud computing, artificial intelligence applications, and the Internet of Things. Unfortunately, most Arab universities have yet to embrace these innovations fully.

Methodology

This research adopts a descriptive approach, seeking to meticulously identify and elucidate the nuances of the phenomenon under investigation. Placing the subject within its appropriate context, the study delves into the intricate circumstances surrounding it. The primary focus of this research is to comprehensively examine the pivotal role of digital transformation in fostering sustainability within universities in developing countries. With an overarching objective of elucidating the significance of leveraging digital transformation for sustainable development, the research navigates through pertinent literature related to the defined research axes.

It systematically investigates the experiences of Arab universities in transitioning to online learning as an initial stride toward digital transformation. Furthermore, the study explores how these institutions have embraced and deployed cutting-edge technologies, including but not limited to cloud computing, artificial intelligence, the Internet of Things, augmented reality, and multimedia. The overarching aim is to strategically employ these technologies to curtail expenses and optimize resource utilization, ultimately contributing to the realization of comprehensive sustainability goals.

The outcomes of this research endeavor aspire to yield academic insights, drawing conclusions that are closely tied to the defined research objectives. Beyond academic contributions, the study endeavors to formulate practical solutions encapsulated in a set of recommendations and proposals. These actionable insights are intended to serve as a valuable resource for stakeholders within Arab universities, offering strategic guidance for navigating the complexities of digital transformation and sustainability in the higher education landscape.

IV. RESULTS AND DISCUSSION

By extracting barriers to digital transformation from previous literature, the research identified a set of barriers to digital transformation and classified them into specific groups as shown below: contextual barriers, social constraints, technical barriers, and cultural barriers. Under each category, there is a subgroup of barriers. In this research, the researcher benefited from insights from the work of (Aditya, et al., 2022) in addition to insights from previous studies integrated into the current research, which assessed the digital transformation capabilities of Arab universities and the challenges they faced. The main barriers are the following:

- Administrative and organizational barriers: Challenges within the administrative and organizational structures of universities and colleges that hinder the smooth transition to digital transformation.
- Infrastructure and technology barriers, alongside financial resource constraints: Issues related to the technology infrastructure of educational institutions, including financial limitations, which obstruct the adoption of digital transformation.
- Social and Cultural Barriers, Change Resistance, Coupled with a Shortage of Skilled Human Resources in Higher Education: Obstacles stemming from the prevailing culture and change resistance within higher education institutions, as well as a deficiency in well-trained personnel, which impedes digital transformation efforts.
- Barriers to implementing modern technologies: The difficulties faced when incorporating and utilizing state-of-the-art technologies in the context of higher education, including issues such as resistance to change or outdated systems. As a result, the researcher has formulated several criteria that hinder digital transformation in Arab universities listed in Table 1.

Table 1. Barriers facing Arab Universities

Criteria	The situation at Arab Universities	Sources
Administrative and organizational barriers.	Most universities in Arab countries suffer from the absence of a vision for digital transformation, and they also suffer from a weak organizational structure that supports work to improve education (except in some Gulf countries). Most studies have generally shown weak readiness for transitioning to online education in Arab universities.	(Bennage, 2020; Al-Hassi, 2022; Al-Sayed, 2022; Lassoued, et al., 2020)
Infrastructure and technology barriers, alongside financial resource constraints.	Most universities in Arab countries suffer from major infrastructure problems (weak Internet and frequent outages, as well as power outages), especially in Yemen, Libya, and Sudan, which suffer from security unrest and instability. These universities also suffer from weak financial resources and the inability to enhance the modern technology needed for digital transformation, and once again the Gulf countries are an exception to this obstacle.	(Al-Hassi, 2022 ; Al-Sayed, 2022; Eltahir, 2019; Aung & Khaing, 2016; (Zarei, & Mohammadi, 2022 ; (AlMunifi, & Aleryani, 2023 ; Al-Hassi, 2022)
Social and Cultural Barriers, Change Resistance, Coupled with a Shortage of Skilled Human Resources in Higher Education.	Cloud computing, artificial intelligence, big data, and the Internet of Things, as well as augmented reality technologies necessary to enhance the digital transformation project, are still absent from the culture of Arab universities, including Gulf universities. Also, awareness is still weak among teachers and students, as well as senior management in universities, about the importance of digital tools in teaching and exchanging information. Due to the lack of required skills, most teachers prefer not to deviate from the traditional approach to teaching and find it difficult to teach. Modern environment.	(Al-Sayed, 2022 ; Al-Muslimani, 2022 ; Zarei, & Mohammadi, 2022 ; AlMunifi, & Aleryani, 2023 ; (AlMunifi, & Aleryani, 2021 ; Al-Baadani, & Abbas, 2020 ; Lassoued, et al., 2020 ; Alahmari, et al. 2019 ; Aleryani, 2016 ; Ashour, 2020)
Barriers to implementing modern technologies.	Traditional education and the usual methods still prevail in universities in Arab countries, and although there are computer systems that manage the registration process and issue student certificates, few universities have systems that allow students to self-register and track their academic records. Modern technology, including cloud computing, has not been fully employed in Arab universities, and even social and academic media have not played a vital role in universities. Although most universities have Facebook pages, they are not updated and there is no follow-up or response to students' participation and interaction with them. Their role is often limited to advertising and promoting university registration, and some of them publish college events and activities. University teachers do not interact on academic networks except on a personal basis and not within the university's interest.	(Al- Rasheedi, & Khan, 2021 ; (Jaradat, et al., 2020 ; El Khatib, et al. 2019 ; Jalamneh & Moaiad 2021 ; Alfaiakawi, 2021 ; Alotaibi & Alshehri 2023 ; Aldosari 2020 ; Alahmari, et al., 2019 ; Alghali et al., ; Alghizzawi et al., 2019 ; Aleryani, 2016 ; Aleryani et al., 2017a ; Aleryani et al., 2017b)

A road map toward digital transformation

Before presenting the roadmap towards digital transformation to achieve comprehensive sustainability, it is necessary to identify and prepare the human element participating in this plan in terms of full awareness of the importance of digital transformation, and in particular, awareness that digital transformation is not optional and does not fall under the concept of technological luxury, but rather a necessity to protect resources from the waste that occurs in the use of traditional methods in the educational process, as well as preparing the human element with the necessary qualifications and experience.

Actors' roles and responsibilities

Digital transformation projects for universities are complex endeavors that involve multiple stakeholders. To ensure a successful and effective digital transformation, a wide range of individuals and groups should be involved in the planning, implementation, and management of such projects.

University leaders are one of the key players, important players, including the president, dean, and other senior leaders, and then the IT department. They are responsible for technology infrastructure, systems, and cybersecurity, and academic deans and faculty must be involved to ensure that the digital transformation is in line with University Educational Objectives Administrative staff, including registrars, finance officers, and human resources, are crucial to integrating digital systems into administrative processes and ensuring smooth operations.

On the other hand, students and alumni are end-users of many digital systems and tools, so their feedback is essential to creating a user-friendly experience and understanding their needs, external partners such as technology vendors, can bring expertise, resources, and support to the digital transformation effort, professionals in data analysis and research can help with data-driven decision-making, which is crucial for assessing the impact of digital initiatives. Moreover, a project management team should be established from the starting point, for planning, coordinating, and monitoring the progress of digital transformation projects, along with advisory Committees with representatives from different university departments who can provide ongoing guidance and feedback on the project's implementation. Quality assurance and testing teams are responsible for testing new systems and technologies to ensure they meet quality and performance standards (Benavides et al., 2020).

Roadmap towards Digital Transformation

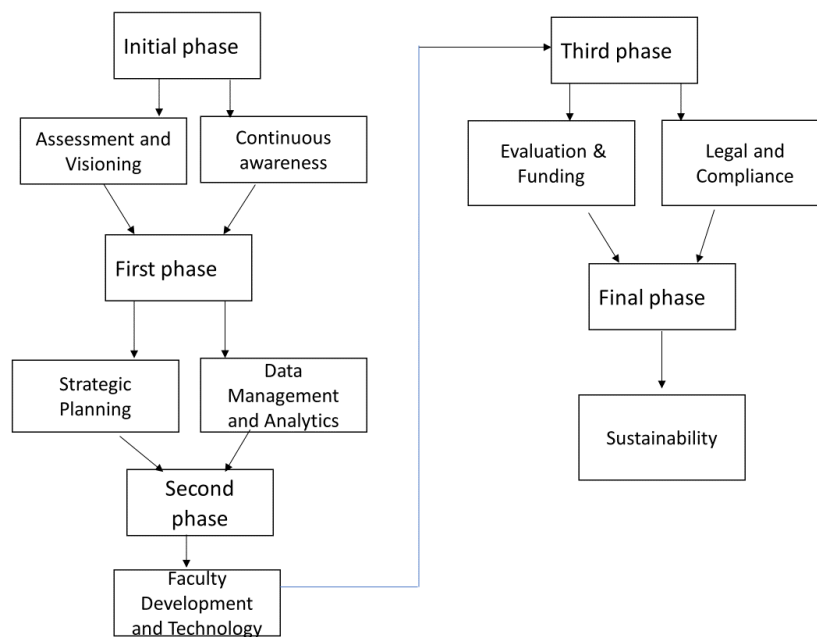


Figure No 1. Roadmap Towards Transformation

Initial Phase

The initial phase serves as an introductory stage and comprises two sub-stages. The first sub-stage involves assessment and vision, with the primary objective of conducting a comprehensive assessment of the university's existing conditions, encompassing its digital infrastructure, resources, and internal operations. Subsequently, a well-defined vision for digital technology and the objectives to be accomplished through digital transformation are established. The second sub-stage, continuous awareness, emphasizes the engagement of faculty, staff, students, and administrators in the decision-making process. Their contributions are pivotal for the success of digital transformation. For this purpose, some important courses and awareness lectures should be made to establish a healthy environment.

Phase One

The first phase also includes two sub-stages. The first one is strategic planning, which entails two main tasks: creating an all-encompassing digital transformation strategy that aligns with the university's mission and goals, complete with a clear roadmap featuring milestones and timelines. The second task is the investment in robust IT infrastructure, encompassing high-speed internet, secure networks, and cloud services. Scalability to accommodate future growth is ensured. The second sub-stage is data Management and analytics, which encompasses several activities: implementing data-driven decision-making processes, including data collection and analysis for insights into university performance, resource allocation, and operational efficiency. Additionally, cybersecurity measures are implemented to safeguard sensitive data and ensure the integrity of digital systems. Regular updates to security protocols are made, and users are educated on best practices. Finally, the implementation of learning management systems (LMS) and other digital tools to facilitate online learning, collaboration, and assessment.

Phase Two

The second phase revolves around qualifying faculty members and upgrading technology. This is achieved by providing training and support to faculty to embrace digital teaching methods, promoting the use of technology for innovative and engaging pedagogy, and improving the digital experience for students through user-friendly online portals for registration, course materials, and support services. Moreover, the creation and curation of easily accessible digital content and resources for both students and faculty and the implementation of digital communication and collaboration tools like video conferencing and social media platforms to facilitate remote collaboration and real-time communication.

Phase Three

The third phase consists of two sub-stages. The first sub-stage encompasses evaluation, as well as funding. This entails the continuous assessment and evaluation of the impact of digital transformation initiatives, making data-informed adjustments to the strategy as necessary, and allocating resources for these initiatives within the university's budget. Additionally, it involves seeking external funding sources, grants, or partnerships when applicable. The second sub-stage pertains to Legal and Compliance, which ensures the university's adherence to relevant data protection and privacy regulations.

Final Phase

The final phase centers around sustainability and entails one primary task. Planning for the long-term sustainability of digital initiatives. Additionally, it involves considering the environmental impact and cost of digital infrastructure, along with engaging with the local community and industry partners to promote collaboration, resource sharing, and the utilization of external expertise. At this phase, the process of educating the health practices of the university's resources is also continued by all members and raising awareness of the concept of sustainability and its importance at the present time and for future generations, the nation, and the entire world.

V. CONCLUSION

Through the conducted research, it becomes evident that one of the foremost challenges facing Arab universities is a shortage of budget and a weakness in managing the educational process. This results in a general decline in performance and a depletion of many university resources. Additionally, there is a notable neglect of human resources in terms of qualification and training, leading to a deficiency in the skills of both academic and administrative staff. Some universities fail to grasp the importance of building students' knowledge in a manner aligned with contemporary requirements, restricting the educational process to outdated traditional methods. Consequently, there is a squandering of human and material resources, as well as time and effort.

The research endeavors to shed light on these issues that have already been studied by many researchers, aiming to compile and categorize them to distinguish the obstacles hindering digital transformation and supporting sustainability in Arab countries.

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