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Research report

Digital Transformation of Higher Education Teaching and Learning in Arab Region

October, 2023

Foreword by Director General of ALECSO

The Arab League Educational, Cultural and Scientific Organization (ALECSO) is a governmental organization, that is part of the Arab League. It is concerned with promoting and coordinating Arab joint programs and activities in the field of education, culture and science. ALECSO considers that the use of information and communication technologies (ICTs) to develop education in the Arab world is one of the most important priorities that requires special attention. Therefore, it attaches great importance to the programs and projects it implements, being aware of the benefits of modern technology and its advantages for the advancement of the education sector in order to prepare future generations for advancement and access to the knowledge society.

In reference to this , considering that ICTs are a fundamental pillar of smart learning, ALECSO has been implementing major pioneering projects in the field of artificial intelligence (AI) and its applications in education, with the primary focus of using this technology to help the Arab world face the major challenges in this field, to innovate educational practices and learning, and to accelerate progress towards achieving Goal 4 of the Sustainable Development Goals by addressing the current forms of inequality in terms of access to knowledge, research, and the diversity of cultural expression, and reducing the technological gaps within and between Arab countries.

In the same context, the Arab League Educational, Cultural and Scientific Organization (ALECSO) is glad to collaborate with the International Centre for Higher Education Innovation under the auspices of UNESCO (UNESCO-ICHEI) in this joint research focusing on digital transformation of higher education teaching and learning in the Arab States in order to provide references for higher education policy makers, university administrations, and teachers to promote the digital transformation of higher education, improve the quality and equity of education in Arab States.

I would like to thanks the authors for their diligent work on this study, which further contribute to the friendly relationship between China and the Arab region, a relationship with long tradition. ALECSO will continue to promote collaboration in between the Arab region and China and deepen the friendly relationship reach a more profound level.

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Director-General of the Arab League Educational, Cultural and Scientific Organization -ALECSO

Foreword by Director General of UNESCO ECHEI

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Acronyms

AI	Artificial Intelligence
ALECSO	Arab League Education, Culture and Science Organization
CCK	Khawarizmi Computing Center
CoL	Commonwealth of Learning
Dx	Digital Transformation
e-Club	Entrepreneurship Club
EEI	Educational and Research Institutions
EELU	Egyptian E-learning University
eLCD	eLearning Content Development
eLL	eLearning Leadership
eLL-A	eLearning Leadership -Advanced Level
eLL-F	eLearning Leadership -Foundation Level
eLTS	eLearning Technical Support
ERP	Enterprise resource planning
ESRI	Scientific Research and Innovation
ETS	Education Transformation Summit
FMTC	Faculty Members Training Center
GDP	Gross Domestic Product
HCT	Higher Colleges of Technology
HEI	Higher Education Institution
ICHEI	International Center for Higher Education Innovation
ICT	Information and Communication Technology
IfeL	Online Training Engineering
IIOE	International Institute for Online Education
IITE	Institute for Information Technologies in Education
IS	Information System
IT	Information Technology
ITU	International Telecommunication Union
KSU	King Saud University
LMS	Learning Management System
MHESR	Ministry of Higher Education and Scientific Research
MIT	Massachusetts Institute of Technology
MOOCS	Massive Open Online Courses
N.A.	Not Available
NeLC	National eLearning Center
NRI	Network Readiness Index
ODL	Open Distance Learning Platform
OER	Open Educational Resources
OLEF	Online Learning Evaluation Framework
OTT	Online Teaching/Training
OTT-A	Online Teaching/Training-Foundation Level
OTT-F	Online Teaching/Training-Foundation Level
PC	Personal Computer
QA	Quality Assurance
RNU	National University Network

SDN	Digital Master Plan
SEU	Saudi Electronic University
SGD	Sustainable Development Goal
TICO	Technology Innovation Commercialization Office
T&L	Teaching & Learning
UAE	United Arab Emirates
UFC	University of Continuing Education
UICT	University of Information Technology and Communications (UoITC) in Iraq
UNESCO	United Nation Education, Science, and Culture Organization
UK	United Kingdom
USTY	University of Science and Technology Yemen
UVT	Virtual University of Tunis
VR	Virtual Reality
WHEC	World Conference on Higher Education
XR	Extended Reality
YCIT-HE	Yemen Centre for Information Technology in Higher Education

Executive Summary

The research report on the digital transformation of higher education teaching and learning in the Arab region is a collaborative effort between ALECSO and ICHEI. This report underscores the inevitable trend of digital transformation in higher education's future, providing a careful examination of its definitions, approaches, and the teaching methods that incorporate digital technology. Additionally, the report addresses how international bodies and Arab authorities perceive the digital transformation in education.

The report spotlighted ten Arab countries, showcasing a range of income levels (High, Medium, Low) within the Arab world. It leveraged a literature review, data from official websites of countries and higher education institutions, and expert input from these nations obtained through a February 2023 survey.

This survey delved into diverse aspects of digital transformation in higher education at both the national and institutional levels.

The analysis evaluates digital teaching and learning at the national level, underscoring key indicators, policies, planning, and initiatives. It scrutinizes the challenges related to both the teacher and teaching components, as well as quality assurance in digital education, with a particular emphasis on professional development for teachers engaged in digital teaching.

> **Infrastructure**
>
> • *Lack of home computer ownership in middle- and low-income countries*
>
> • *Insufficient Internet access and use in middle- and low-income countries.*
>
> **ICT skills**
>
> • *Insufficient individual ICT skills in middle- and low-income countries*
>
> **Number of students**

> • *Large current number of students and prospects for increased student enrolment*

The digital teaching and learning landscape was also examined at the institutional level, mirroring the topics covered at the country level.

> - *Inadequacy of digital infrastructures within institutions, especially those in middle- and low-income countries, to the requirements of Digital Transformation and digital teaching and learning (connectivity of spaces within the institution, availability of equipment in rooms, collaborative spaces, library),*
>
> - *Social disparity of students within the institution that may exacerbate inequalities in the face of digital learning requirements (access to personal equipment and Internet connectivity from home),*
>
> - *Very large disparity in the digital skills of students upon arrival at the university,*

The analyses underscored a significant disparity in awareness among different countries regarding the importance of digital transformation in higher education. This disparity was also evident in the resources available to countries and institutions for investing in this transformation and realizing its full benefits.

The report also provides a list of 13 higher education institutions and their positions on specific digital transformation strategies, environment and infrastructure, culture building, institutional support, teachers and teaching, and quality assurance for digital teaching and learning.

The report identified the main challenges facing digital transformation in higher education in these countries, both at national and institutional level, in relation to the various aspects mentioned above.

The development of national digital transformation policies and strategies is not widespread enough in the countries analyzed. Indeed, only 4 countries have developed digital transformation policies and strategies.

The report puts forward 26 recommendations for the future trajectory of digital transformation in higher education, addressing the general situation of the country, institutional policies, planning, initiatives, teachers and teaching, and quality assurance for digital teaching and learning.

R5: Develop policies and strategies for the digital transformation of the higher education sector and develop strong leadership around this project.

These recommendations collectively offer a coherent vision for establishing a foundational strategy for digital transformation in higher education, applicable at both national and institutional levels.

R13: Strengthen and generalize support structures for digital teaching and learning for all countries and network these structures to share and disseminate experiences and good practices.

R15: Generalize and ensure the sustainability of teacher training, enabling them to acquire skills

in digital teaching so that they are in tune with technological and pedagogical developments and thus enable them to meet students' expectations.

In conclusion, the research report underscores the significance of digital transformation in higher education, emphasizing the need for effective strategies and measures to ensure quality and efficacy in digital teaching and learning.

While the report specifically examines 10 Arab countries, its conclusions are applicable to the entire Arab world due to the representative nature of the nations included in the study.

Engaging the Arab world in the Digital Transformation of Higher Education presents an opportunity to foster solidarity and a shared vision among Arab countries. This collaborative approach towards education, is essential for shaping the future of the region and enhancing its competitiveness through the acquisition of 21st-century skills.

Research report on digital transformation of higher education teaching and learning in Arab Region

1. Introduction & Background

The 2018 UNESCO report had already predicted that "major technological breakthroughs over the next ten years will impact forms of work...as well as other aspects of life such as education..."[1].

Indeed, in the field of higher education and with the advances in IT, we are witnessing a transformation of HEIs that affects their modes of governance, organization, and operation. The Digital transformation of higher education is underway.

Digital transformation in higher education is concerned with transforming organizational processes, but also build new competencies and models through digital technologies in a profound and strategic way. Digital transformation refers to a strategic change realized by means of digital technologies and digital teaching and learning approaches with the aim to make higher education accessible and equitable. It contributes to the improvement of HEIs performance and the quality of higher education system. Thanks to IT advancements, it can also be seen at pedagogical level with the emergence of new, innovative pedagogical approaches that are constantly replacing traditional teaching methods.

This transformation became more palpable with the Covid 19 pandemic, which prompted HEIs to switch to distance learning to ensure pedagogical continuity when countries took containment measures.

It is important to note that at the international level, following the vision presented by the UN Secretary General at the summit dedicated to the transformation of education, various initiatives have been launched. These include the collaboration between UNESCO-ICHEI and ALECSO. One of the aims of this collaboration is to understand the needs and challenges facing HEIs in the Arab world as they undergo Digital transformation in general, and Digital transformation in Teaching and Learning in particular. The aim is to develop approaches to reinforce this Digital transformation and avoid widening disparities between countries at the forefront of this revolution and those in the Arab world.

The endeavor prompts a series of important questions:

- o What policies and action plans are necessary to facilitate this transition?
- o What infrastructure do HEIs in the Arab world require?
- o Which experiences offer valuable best practices that can be emulated?
- o What timeline should be envisaged for this transformation?
- o Are educators and students adequately prepared for this shift, and what initiatives should be introduced to support them?
- o How should governance within Arab HEIs be structured to effectively navigate this transformation?

When implementing digital transformation in higher education, it's vital not to overlook the unique specificities and realities of Arab countries. Acknowledging and understanding these specifities allow for the adaptation of digital transformation models and approaches, ensuring they are not only relevant but also effective in this particular context

The Arab region has registered a remarkable trend of growing gains in educational attainment and more equitable access to formal education since the beginning of the millennium. School enrolment and literacy rates in the region have increased, with impressive progress towards gender parity in enrolment. Yet, with political instability and humanitarian crisis starting 2011, access to education has been a challenge and the quality of education has negatively affected youth.

According to UNESCO statistics[2], higher education in the Arab countries will involve more than 13 million students in 2022, an increase of 14.7% compared to 2017. This represents 2.8% of the total population of Arab countries. The number of higher education teachers has risen from 495,000 in 2017 to almost 545,000, an increase of 10%. School life expectancy in higher education in Arab countries has risen from 1.58 in 2017 to 1.75 in 2022 but remains below the world average of 2.03.

The overall advances in higher education have masked striking disparities among countries. In prolonged conflicts, several countries in the region have experienced a disruption in the students' access to education in general. Higher Education systems across Arab countries face considerable challenges particularly concerning equity and access.

1.1. Objectives

The research report aim is to come, over some experiences from Arab representative countries of the Arab region, with a state of main policies, initiatives and plannings taken in Digital Transformation of Higher Education Learning and Teaching. When it is available, the report will highlight the choices made about digital platforms and contents, quality assurance for digital learning and teaching, and their impact in the Digital transformation.

Based on these experiences and others in other regions, the report will identify the challenges, needs and opportunities. The report will present the best and scalable practices in different Arab countries.

The report will come up with a maturity analysis, main challenges, and Future Trajectory of Higher Education Digital Transformation in Arab Region.

1.2. Methodology

The preparation of this report followed the methodology indicated in the "framework of research report on digital transformation of higher education teaching and learning in Arab Region" as submitted by UNESCO-ICHEI & ALECSO.

The study covers the following 10 Arab countries selected by UNESCO-ICHEI & ALECSO: Algeria, Egypt, Iraq, Jordan, Kingdom of Saudi Arabia, Mauritania, Morocco, Tunisia, United Arab Emirates and Yemen.

To this end, this report is based on the reports received in February 2023 and provided by the country experts selected and commissioned by ALECSO according to a framework entitled "Collection of Best Practices For Digital Teaching and Learning" and structured according to the following points: "Summary of the best practice", and "Description of the best practice

The ALECSO team responsible to produce this report operated as follows:

- Use of the data mentioned in the country experts' reports;

- Visit the web sites of institutions indicated in the reports and search for other complementary data - if needed - in order to ensure data quality and completeness.

In addition, the team collected data considered as key indicators of countries to better position them in terms of readiness for the digital transformation of training and learning in the higher education sector.

The table below summarizes the list of documents submitted by the country experts, as well as the list of HEIs considered as examples of good practice in each country:

Tab. 1 Country expert report

Country	Country Experts Reports		HEI
Algeria	Digital Transformation in Algerian HEIs		- Ahmed Ben Bella Oran 1 University, - University of Continuing Education "UFC"
Egypt	Digital transformation in the Egyptian education system		- Egyptian University for e-learning - Arab Open University in Egypt - University of Ain Shams: IIOE Egypt National Centre
Iraq	Digital Education in Iraq during the Covid period	Digital transformation and digitization of curricula in higher education, Iraq	University of Information Technology and Communications
Jordan	Best practices for digital teaching and learning at Aqaba University of Technology		ElAkaba Technology University (private)
Mauritania	Brief on the experience of digital higher education in Mauritania		Polytechnic School "Ecole Supérieure Polytechnique
Morocco	Experiences in the field of digital learning and distance education sectors of national education and higher education Kingdom of Morocco		Mohammadia School of Engineering
Saud Arabia	A collection of best practices for digital teaching and learning	Interdependence and integration between distance education systems	- King Saud University - JEDDAH University - Saudi Electronic University
Tunisia	Digital transformation in the field of Tunisian higher education and scientific research	An incubator for digital educational innovation and open education to achieve the goals of sustainable development	Tunisian Virtual University
United Arab Emirates	A collection of best practices for digital teaching and learning at the Higher Colleges of Technology in the United Arab Emirates		Higher Colleges of Technology
Yemen	Challenges of digital transformation in HEIs in the Republic of Yemen		University of Science and Technology Yemen (USTY)

Following the launch by the International Centre for Innovation in Higher Education under the auspice of UNESCO (UNESCO-ICHEI) of a micro-certification framework to advance the professional development of HEI teaching staff through the International Institute of Online Education (IIOE) network, and in agreement with ALECSO, it was deemed important to supplement this study with a component relating to the professional development of teachers.

To this end, a complementary survey was launched in July 2023 among the same experts in the various target Arab countries, to gather additional information on the following topics:

- Policies relating to the professional development of teachers in relation to digital education,

- The use or non-use of Micro-certifications for teacher professional development in relation to digital education,

- Whether or not Micro-certifications are considered in teacher career advancement in HEIs.

The responses received in September 2023 on the supplementary survey have been analyzed and integrated into the various corresponding parts of the report. The content of the supplementary survey and a syhntesis of the responses received have been appended to this report.

2. The digital transformation of higher education is an inevitable trend in the future of Education

Knowledge and learning are the foundation for a sustainable future. A wide range of stakeholders in education recognize that the world is changing rapidly, and that education must change with it to meet the challenges and opportunities of the 21st century.

With the increasing availability of digital tools and technologies, educational institutions are finding new ways to interact with learners, deliver content, and provide more flexible and personalized educational experiences. The integration of digital technology has revolutionized the way we learn, teach, and interact in education in general and higher education in particular.

2.1. Digital Transformation, definitions and approaches

Many HEIs have embarked on the introduction of digital learning and teaching by relying on digital technologies. However, the use of these technologies within academic institutions and in teaching is not synonymous with digital transformation. Before presenting our definition of digital transformation, it is necessary to clarify how digital technologies can be used in different teaching and learning modalities.

2.1.1. Teaching methods using digital technology

Tony BATES distinguishes and defines the different modalities of digital education. These modalities are taken up by the European Association for Quality Assurance in Higher Education ENQA[3] , as follows:

- **Distance education courses**. Distance education courses are those where no classes are held on campus - all instruction is conducted at a distance. Distance education courses may use a variety of delivery methods, such as video/audio conferencing and those which are internet- or print-based.

- **Online courses**. A form of distance education where the primary delivery mechanism is the internet. These could be delivered synchronously or asynchronously. All instruction is conducted at a distance.
  - o **Synchronous online courses**. Courses where students and an instructor participate at the same time, but at separate locations other than an institutional campus. These

courses may be delivered by video conferencing, web conferencing, audio conferencing, etc.

- o **Asynchronous courses**. Courses where students are not required to participate in sessions at the same time as the instructor. These may be print-based courses or online courses using a learning management system, for instance.

- **Online programs**: A fully creditable program that can be completed entirely by taking online courses, without the need for any on-campus classes. These could be delivered synchronously or asynchronously.

- **Blended/hybrid courses**: These are courses designed to combine both online and face-to-face teaching in any combination.

- **OER (open educational resources)**: Materials are offered freely for use by teachers and learners, i.e., without charge and with few or no restrictions on the way in which the material may be adapted and reused.

- **MOOCS** (massive open online courses): Online courses that are designed for large numbers of participants, often offered for free and without any entry qualifications. They are distinguished from OERs in that they offer a full course experience and content that is not usually free to reuse.

"Digital transformation (Dx) is more than merely migrating paper records to a computer, and it is more than adopting technologies to perform business operations faster and more efficiently[4]". Structural changes in several areas within the academic institution can be induced by Digital Transformation. According to Vial[5], four areas need to undergo radical changes for Digital Transformation: organizational structure, organizational culture, leadership, and the role and skills of employees within the HEI.

2.1.2. Definition of digital transformation

D. Christopher Brooks, Mark McCormack define Digital transformation for learning and teaching in higher education" as "leveraging digital technologies to enable major educational improvements, enhance learner and instructor experiences, and create new instructional models through policies, planning, partnerships, and support."[6] Building on this definition, Florence Martin and Kui Xie[7] propose a Digital Transformation framework for digital learning in higher education that addresses seven components: digital learning technologies, instructional modalities, employees and support services, organizational policies and planning, instructor development, learner development, and partnerships (Figure 1) :

- **Digital Learning Technologies**: These technologies can be used in different learning and teaching modalities. Their effectiveness depends on the quality of the infrastructure that supports them. These technologies include: Learning Management Systems (LMS); synchronous technologies that allow for real-time online meetings; collaborative applications that allow learners to collaborate online with their peers and with the instructor; cloud technologies that allow applications and files to be hosted for use from anywhere on or off campus; and emerging technologies such as Artificial Intelligence (AI), Extended Reality (XR), Virtual Reality (VR), and others;

- **Instructional Modality:** various modalities mentioned above and others that are emerging;

- **Personal and Support Services**: Digital learning and teaching requires a greater investment in personal and support services for successful digital transformation. Examples include instructional designers to assist instructors with course design; technology support specialists to maintain network and technology; student support services (access to library resources, registration, academic advising, etc.); faculty incentives and recognition; and awards to recognize innovators in digital education;

- **Organizational Policies and Planning:** policies and standards need to be put in place, strategic planning with decisions on the resources to be allocated to achieve the objectives, the funding model for the different modalities to be implemented, equitable learning opportunities for all students (cost of facilities and access, accessibility of courses for people with disabilities, ...);

- **Instructor Development:** teachers must be able to develop their pedagogical and technological skills to ensure the best conditions for their mission;

- **Learner Development:** students must be able to follow the different learning modalities and acquire other skills such as time management, the ability to learn from different forms of content; ...
- **Partnerships**: maintaining the quality of digital learning and teaching requires greater capitalization of the knowledge of experts in the field through the development of a network of partnerships with other universities, professional organizations, or industry players.
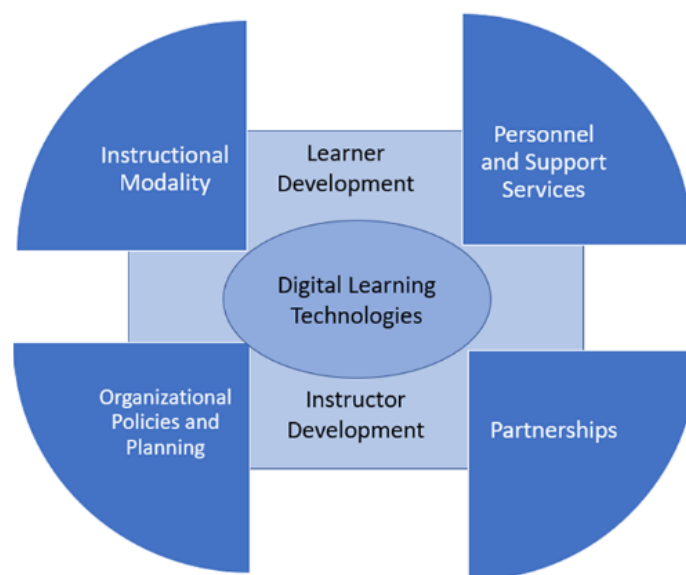
Fig. 1 Digital Transformation for Digital Learning in Higher Education
[https://er.educause.edu/articles/2022/9/digital-transformation-in-higher-education-7-areas-for-enhancing-digital-learning

The framework proposed by Florence Martin and Kui Xie embraces the fundamental components of digital transformation and shows that it cannot be reduced to digital uses.

2.1.3. From Digitization to the Digital Transformation

D. Christopher Brooks and Mark McCormack specify in their 2020 paper[8] the differences between Ditization and Digital Transformation as shown in Figure 2 below.
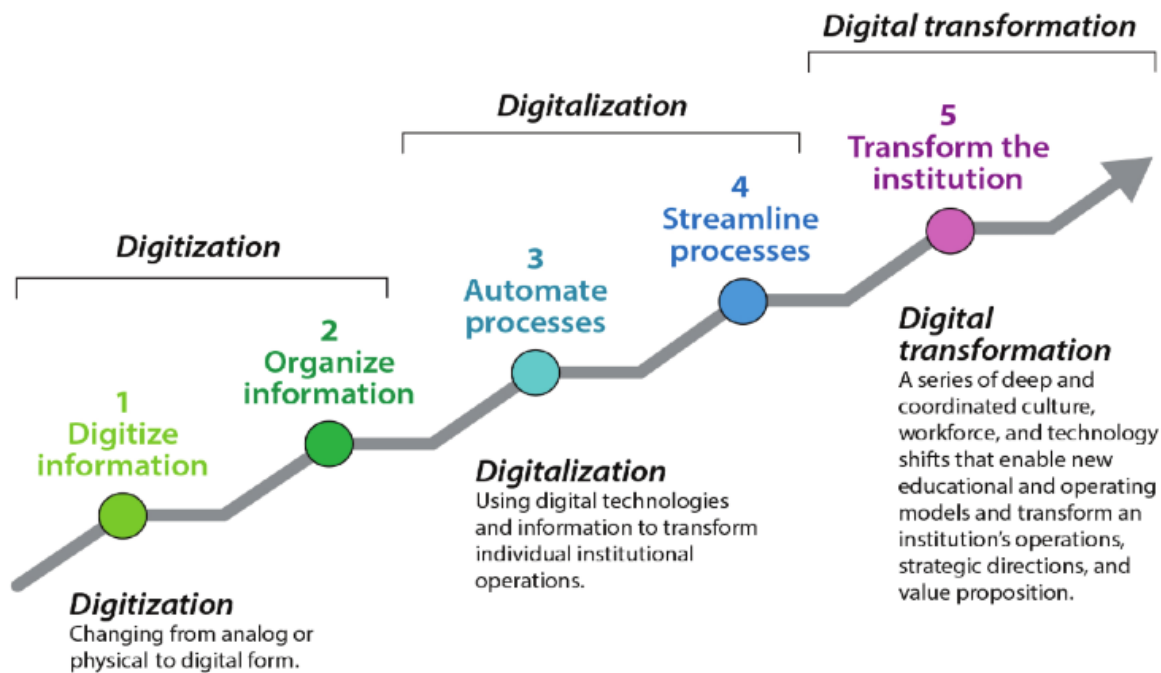
Fig. 2 Digital Transformation vs. Digitization and Digitalization [source: D. Christopher Brooks and Mark McCormack. Driving Digital Transformation in Higher Education. ECAR research report. Louisville, CO: ECAR, June 2020]

Based on a 2020 survey of IT leaders at HEIs in more than 13 countries, D. Christopher Brooks and Mark McCormack say that digital transformation has become more important to the success of higher education in the past two years and is expected to become even more important in the next two years.

To reach this conclusion, respondents were asked to rate the retrospective and prospective importance of Digital Transformation to the success of higher education. Two-thirds (67%) of respondents felt that, compared to two years prior to the survey, Digital Transformation has become more important; nearly another third (31%) said it was as important as two years ago. Looking ahead, three-quarters (75%) of respondents believe Digital Transformation will become more important in the next two years. Sixty-one percent (61%) of those surveyed responded that Digital Transformation has become more important and will continue to do so.

From the above, it appears that embracing digital transformation allows for the development of new and more effective ways to enrich and expand the mission of higher education. It offers the potential to facilitate new and creative pedagogical strategies and to reach a wider and more diverse circle of learners, including many learners seeking new types of skills and credentials.

Digital Transformation also enables institutions to improve their operations, business practices, and their ability to be flexible and proactive.

However, it is important to note that the digital transformation of higher education also presents challenges such as concerns about the quality of online education, the risk of increased inequality for students in access to technology and resources.

In order to support countries and academic institutions in their digital transformation, international bodies such as UNESCO and regional bodies such as ALECSO have launched a series of initiatives and actions.

2.2. The Digital Transformation in Education as seen by international bodies

Given the importance of the digital transformation in higher education, its impacts and the opportunities it offers to the education system, UNESCO and some other international bodies have taken a number of initiatives and actions. These initiatives and actions aim to advance the reflection on this transformation and its requirements and to help member countries and different stakeholders to take part in it and coordinate their actions. Among these initiatives, we can mention:

- In 1997, the publication of a report on "Open and Distance Learning: Prospects and Policy Considerations", updated in 2003, and the creation of the UNESCO Institute for Information Technologies in Education (IITE) hosted by Russia[9].

- In 2011, UNESCO and the Commonwealth of Learning (CoL) developed Guidelines for Open Educational Resources (OER) in Higher Education that provide guidance to governments, HEIs, academic staff, learners, and quality assurance agencies to encourage investment in OER in order to improve educational quality and reduce costs.

- In 2016, the launch of the Unesco-International Center for Higher Education Innovation in Shenzhen, China[10] (UNESCO-ICHEI) whose mission is to harness the potential of information and communication technology (ICT) to support higher education in areas such as quality assurance and equity promotion in developing countries, building on the strength of China's vast higher education system and lessons learned from the progress of higher education innovation in developed nations in the Asia-Pacific region.

- In 2019, ICHEI established[11] the International Institute for Online Education (IIOE) initiative[12] within its HEIs. IIOE is an open educational resources (OER) platform that uses a mechanism for joint contributions and a benefit sharing model to promote the popularization and quality improvement of higher education in developing countries. IIOE's main objective is to improve the capacity of teachers to apply ICT to teaching and learning by providing quality online courses and professional development opportunities. IIOE currently offers a variety of learning services, including courses, training, and webinars.

- In March 2023, ICHEI launches with the IIOE, a Micro-certification project[13] for the Higher Education Teaching Personnel to improve HEI teaching personnels' digital teaching competency and make critical and innovative contribution to SDG4 & Education 2030 Agenda.

- In 2019, the launch of the "Futures of Education" initiative[14] , a global initiative that aims to rethink how knowledge and learning can shape the future of humanity and the planet, to support the development of a new vision of education that can meet the needs of the 21st century. This initiative focuses on four key themes: anticipation of trends and changes, humanistic vision and promotion of values (such as empathy, respect and dignity), inclusion by addressing key issues (such as equity, access and diversity), resilience by developing education systems that are adaptable and responsive to changing circumstances and able to cope with uncertainty and complexity.

- In 2020, UNESCO launches the Global Education Coalition, which aims to support countries in their efforts to mitigate the impact of COVID-19 on education, including through the use of online and distance learning [15]

More recently and in the same framework, the UN Secretary General convened the Education Transformation Summit (ETS), which was held at the UN headquarters in New York on 16-17 and 19 September 2022[16] .

Follow-up of the Summit focused on actions taken, particularly those related to the six calls to action announced at the Summit:

1- Education in Crisis (Partnership for Transformation): a call to Member States, multilateral organizations, donors and education partners to work towards, the implementation of the commitments made at the summit. A progress report is due in 2025,

2- Tackling the learning crisis: ensuring basic learning,

3- Transforming education to transform the world: Partnership for Greening Education,

4- Ensure and improve the quality of public digital learning for all: addressing the three key areas (content, capacity, and connectivity).

5- Advance gender equality and empowerment of girls and women within and through education,

6- Financing education: Invest more, more equitably and more effectively in education,

The ordeal that the global education system went through during Covid-19 reinforced the awareness of all stakeholders on the role that digital transformation can play in strengthening the resilience of the education system to these types of pandemics and crises, particularly through the adoption of digital learning and teaching solutions.

Referring to the 2030 Agenda for Education that addresses the 2030 SDGs, and the strategic and irreplaceable role that higher education plays in building more sustainable, resilient and peaceful societies, the World Conference on Higher Education WHEC2022[17] , held in Barcelona (Spain) from May 18 to 22, 2022 under the auspices of UNESCO, was an opportunity to deepen these reflections and to pave the way for the need to reinvent higher education and to transform it in response to the changing landscape.

The WHEC2022 conference recognizes that digital technologies are playing an increasingly central role in higher education. Technological advances in networking, artificial intelligence, the Internet of Things, and digital learning content are leading to a digital transformation that is a significant trend that has developed over the past few years and is likely to continue to evolve in the future.

The conference also recognized that the COVID-19 pandemic has accelerated the digital transformation in higher education, forcing institutions to move quickly to online and distance learning to ensure educational continuity. This experience has shown the potential of technology to improve the accessibility and flexibility of education, allowing students around the world to access courses and resources.

The roadmap proposed by WHEC2022, reaffirmed UNESCO's vision of higher education and also called for substantial changes and the need to reinvent higher education, with a roadmap based on six major challenges that must be addressed:

1. Equitable and sustainable access to higher education: with particular attention to access and its modalities, to the priority given to equity and non-discrimination, to financing with new financing schemes,

2. Focus on a holistic learning experience (academic and professional life): HEIs need to think of themselves as being, in the first place, educational institutions, but also as institutions that prepare for the labor market which expects students to be exposed to a humanistic educational experience (curiosity and ethical development), the so-called "soft skills."

3. Interdisciplinarity and intradisciplinarity (open dialogue among diverse perspectives): Higher education should equip students with the skills to engage in interdisciplinary dialogue and the foundations, attitudes, and habits to humbly acknowledge and transcend the limitations of their own disciplines and areas of specialization,

4. Lifelong learning approach to serving youth and adults: Higher education must provide multiple entry and re-entry opportunities. Adopting a lifelong learning perspective and offering flexible learning pathways provide a coherent and richer framework for meeting human learning needs,

5. An integrated system with program diversity and flexible learning pathways: Too often, different types of institutions, programs, and program orientations are designed and operate in isolation from other parts of the system, limiting mobility between them.

6. Technology for effective teaching, learning and research: Technology as a platform for innovative approaches to teaching, learning and research. This requires a new mindset among faculty members and appropriate training. These technologies also require new configurations of physical infrastructure (active learning rooms, design studios, etc.) that are better suited to innovative teaching and learning methods.

2.3. The Digital Transformation in Education as seen by Arab authorities

ALECSO[18] , the League of Arab States' education, science, and culture organization, has spearheaded a series of initiatives in support of Digital Transformation in the education sector at various levels. These initiatives reflect ALECSO's commitment to promoting the use of digital technologies to improve access to education and the quality of teaching and learning in the Arab region.

These initiatives include:

- The launch of the Arab OER Hub which is a unified platform for Arab open educational resources available online on the global OER platform[19] . The Hub provides unified access to all OER content developed in Arab countries. It helps to promote, use, develop, share and adapt open educational resources. It also provides extensive opportunities for cooperation, sharing and exchange between Arab teachers and educational content authors in order to produce and share these resources and facilitate access to them by teachers and learners worldwide,

- In 2015, the "ALECSO Mobile App Award" initiative was launched with the aim of providing the appropriate technical and institutional environment to contribute to the growth of an Arab mobile app industry in education, culture and science.

- In 2016, the launch of the Arabic Digital Content Program, which aims to develop and promote high-quality digital educational content in Arabic for students and educators in the Arab region.

- In 2020, ALECSO hosted a virtual training on open educational resources via the interactive ClassIn platform.

- A Forum on Arab digital content has been initiated. It is currently in its fourth edition.

- The launch of the "Smart Learning" project to promote smart learning in the Arab world, in cooperation and partnership with the ITU (International Telecommunication Union) Regional Office for the Arab States in Cairo.

- The adoption of "Guidelines to improve the use of Cloud Computing Technology in Education in Arab Countries"[20] realized by a group of experts mandated by ALECSO in cooperation with ITU. The objectives of this guide include the Development of specific guidelines to ensure a cloud migration taking into account several parameters and national contexts for the Arab countries, the elaboration of a cloud migration policy for decision makers and the definition of a roadmap to develop and deploy Cloud Infrastructure and platforms for education and research. The guide proposes four key policies: High quality network, Always Public cloud first, "Cloudify" the existing local infrastructures and applications at institutional level, Adopt a cloud friendly governance model for IT.

In the WHEC2022 proceedings, which saw the participation of most Arab countries, some good practices in digital transformation and digital learning in Arab countries were highlighted:

- Egypt: The Inclusive and Resilient Digital Open School Model, with support from UNESCO and the Korea International Cooperation Agency. It addresses education in emergencies and presents practical solutions and approaches leading to digital transformation.

- Jordan: Supporting digital learning through UN Women's Second Chance Education program, under the supervision of UN Women. Partners design practical solutions at the local level to address digital learning challenges for this target group.

- Morocco, Tunisia: Assessment and development of digital skills with the Pix platform (developed by a French civil society organization with the support of UNESCO). It is based on an open access platform and a co-construction approach, to allow learners and trainers to gain autonomy in teaching and learning digital skills.

The digital transformation of higher education is an important area of focus for many Arab countries, and several initiatives have been launched to promote this transformation.

3. Country Analysis of Digital Transformation of Higher Education Teaching and Learning in Arab Region

This chapter first presents the country key indicators for the 10 countries and discusses the different components indicated in the framework firstly for the countries and then for the selected institutions:

- Institutional policies, planning, and initiatives;

- Teachers and teaching;

- Digital Learning and transformation;

- Quality Assurance for digital Teaching & Learning.

3.1. Country level analysis

3.1.1. Country Key indicators

The 10 countries selected by ALECSO fall into three categories of high, middle and low income. The table below summarizes the data on population, GDP per capita (current US $) (2021) as well as income category, score and rank in the Network Readiness Index:

Tab. 2 Country Global Data

Country (10)	Population	GDP per capita *	Income Group	NRI 2022 score	Rank
UAE	9,365,145	44,315.6	High	65,64	28
KSA	35,950,396	23,185.9	High	61,09	35
Jordan	11148,278	4 103,3	Middle	48,31	70
Egypt	109,262,178	3,698.8	Middle	47,76	73
Morocco	37,076,584	3,795.4	Middle	46,5	79
Tunisia	11,818,618	3 807,1	Middle	45,46	84
Algeria	44,177,969	3,690.6	Middle	39,48	100
Iraq	43,533,592	4,775.4	Middle	N.A.	N.A.
Mauritania	4,614,974	2,166.0	Low	N.A.	N.A.
Yemen	32,981,641	701.7**	Low	N.R.	N.A.

* current US $, 2021; ** 2018 data

The choice of the Network Readiness Index (NRI) is explained by the fact that it "is a key indicator of how countries are doing in the digital world" and thus gives an indication of a country's ability to engage in digital transformation.

The NRI measures how well an economy is using information and communications technologies to boost competitiveness and well-being. It is composed of 4 pillars (sub-indexes): People, Technology, Governance, Impact.
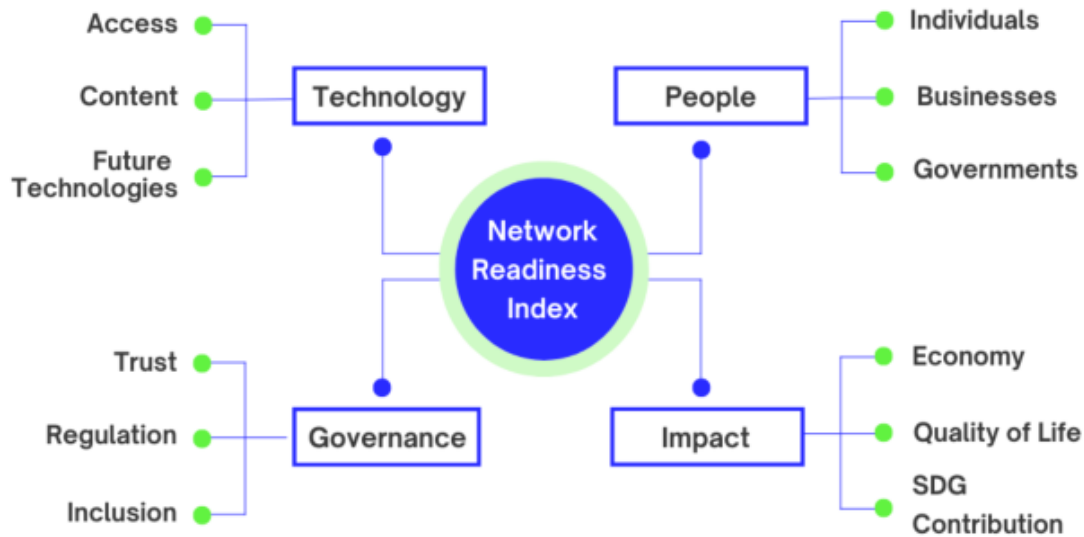
Fig. 3 Network Readiness Index Pillars (*Source: NRI, 2022, Network Readiness Index - Benchmarking the Future of the Network Economy)*

Technology, one of the pillars of the NRI, is considered a necessary condition for digital transformation. The International Telecommunication Union (ITU) has defined a set of indicators for this purpose, including Households with Internet access at home, Households with a computer at home, and Percentage of population using Internet. These three indicators are presented to better understand the state of digital transformation in the 10 countries of the study. The table below summarizes the data for these three indicators for the 10 countries[21] .

Tab. 3 Internet access

Country (10)	Households with Internet access at home	Households with a computer at home	Percentage of population using Internet
UAE	100% (2021)	99% (2021)	100% (2021)
KSA	100% (2021)	99% (2021)	100% (2021)
Jordan	37% (2017)	43% (2017)	83% (2021)
Egypt	73% (2022)	70% (2020)	72% (2022)
Morocco	86% (2021)	68% (2021)	88% (2021)
Tunisia	51% (2019)	52% (2019)	79% (2021)
Algeria	74% (2018)	42% (2018)	71% (2018)
Iraq	65% (2019)	15% (2019)	49% (2021)
Mauritania	3% (2015)	7% (2015)	59% (2021)
Yemen	N.A.	N.A.	27% (2017)

The use of the available technologies also requires individual skills. ITU gives on its website percentages related to individual with basic skills, individual with standard skills, individual with advanced skills.

Tab. 4 ICT Skills

Country (10)	Individual with basic skills	Individual with standard skills	Individual with advanced skills
UAE	89% (2021)	74% (2021)	22% (2021)
KSA	89% (2021)	76% (2021)	25% (2021)
Jordan	NA	NA	NA
Egypt	57% (2022)	36% (2022)	2% (2022)
Morocco	41% (2021)	31% (2021)	10% (2021)
Tunisia	21% (2019)	17% (2019)	16% (2019)
Algeria	18% (2018)	12% (2018)	7% (2018)
Iraq	1% (2019)	1% (2019)	0% (2019)
Mauritania	NA	NA	NA
Yemen	NA	NA	NA

The data in the table above shows that individual ICT skills are relatively low except for the UAE and Saudi Arabia. It would be worthwhile to update the data for some countries.

In order to complete the general data on the 10 countries and given the purpose of this report, it is necessary to present the number of students and academic institutions.

Tab. 5 Higher Education Data

Country (10)	Number of universities	Number of institutions	Number of students
UAE		81[22]	304 439
KSA	25 Public, 43 Private[23]		1 573 268
Jordan	12 Public and 24 Private[24]		333 402
Egypt	Public 24, 26 Private[25]	450 Public, 320 Private	3 965 303
Morocco	12 Public [26]	157 & 198 Privat	1 254 044
Tunisia	13[27]	203 Public 76 Private	270 430

Algeria	54 Public, 9 University centers, 37 National schools of higher education, 11 Normal schools of higher education[28]	111 Public 15 Private	1 536 205
Iraq		406 Public, 75 Private[29]	NA
Mauritania	2[30]	16 Public, 1 School & 1 Private	25 120
Yemen	20 Public, 66 Private[31]		NA

Source ALECSO, 2021 data.

The 10 countries analyzed have invested in training and learning in higher education, as evidenced by the large number of universities, institutions, and student population. The potential increases in student numbers and the internationalization of education fully justify the concern for the use of ICT in higher education.

3.1.2. Institutional policies, planning, and initiatives (country level)

This section deals with the four dimensions:

- Strategies, policies;

- Digital environment (network, smart classes, MOOC...) ;

- Initiatives;

- Supporting institution.

3.1.2.1. Strategies, policies

This section presents strategies and policies at the country level. From the country experts' reports and the research conducted by the team in charge of the synthesis report, it appears that only 4 countries have developed policies and strategies for digital transformation as shown in the table below. It should be noted that these strategies are of two types:

- Comprehensive strategies that address all sectors in the country and dedicate a chapter/part to digital transformation in higher education.

- Specific strategies for digital transformation in higher education.

Tab. 6 Country strategies

	UAE	KSA	Jordan	Egypt	Morocco	Tunisia	Algeria	Iraq	Mauritania	Yemen
Existence of a strategy	0	0	1	0	1	0	1	0	1	0

In the following, the policies, and strategies of the 4 countries are presented.

JORDAN

Jordan has developed an executive action plan for the integration of digital teaching and learning (2021-2023)[32] (in both its full and hybrid electronic forms). The plan first defines the goals of digital education before addressing the goals of the plan itself.

The Digital Education Goals relate to:

- Integrating technology into learning;

- An Organized transition from traditional education to interactive learning;

- The promotion of self-learning;

- The integration with face-to-face learning;

- The reduction of pressure on infrastructure;

- The reduction of effort and cost of transporting students.

The main objective of the plan is to prepare a precise vision of the integration of digital learning in the educational system. It proposes:

- a framework and an organization of digital learning in institutions according to a common scheme;

- digital learning modalities to be applied according to flexible formulas taking into account the differences between HEIs;

- to develop methodologies, curricula, teaching methods, training programs, e-governance, legislation, and technical infrastructure.

The objectives are broken down into strategic axes:

- Axis 1 (Pedagogy): Types of digital learning and the proposed structural formulas;

- Axis 2: Academic programs and study plans;

- Axis 3: Training of trainers and staff;

- Axis 4: E-governance - legislation and administrative structure;

- Axis 5: Technological means proposed at the institutional level;

- Axis 6: Quality assurance;

- Axis 7: Financing.

The implementation of the plan is spread over the period 2021-2023 and foresees reaching the following integration ratios in 2022-2023: 20% minimum of the courses of each training program

provided totally through online distance learning; 30% to 40% minimum of the courses of each training program provided in hybrid form; the rest in face-to-face.

The Jordan Council of Higher Education has adopted guidelines about the professional development of teachers in HEI related to Digital Teaching and providing support to produce digital curricula. Despite the absence of a national professional development program for teachers in relation to digital teaching, universities and educational institutions generally offer training programs for teachers to improve their digital teaching skills. Certificates are awarded to participants in these programs; these certificates are taken into account in professional career development.

At the Monitoring and Evaluation level, the plan calls for the formation of a senior committee in each HEI to communicate and coordinate implementation with the national committee.

MOROCCO

Morocco has developed a National Plan for Accelerating the Digital Transformation of Higher Education and Scientific Research and Innovation ESRI 2030 PACT[33] : among the levers for implementing the national plan we mention:

- Fully digitized university administration;

- Online services for students, professors and researchers active in innovation and human resources management;

- Online teaching platforms;

- Digital platforms open to the general public to receive innovative ideas and projects;

- Digitized scientific production in line with national and entrepreneurial priorities.

The synthesis report team was not able to collect further information on the ESRI 2030 PACT as the website was no longer operational at the time of the report. However, it should be noted that each university is able to establish partnerships with governmental or private institutions to set up initiatives and programs about digital learning and teaching, but no mandatory Micro-certification for digital teaching has been established.

In addition, a framework law on education, training and scientific research and a decree on distance learning were adopted in 2021.

ALGERIA

The Algerian Ministry of Higher Education and Scientific Research (MHESR) has developed a digital master plan[34] (SDN) for the period 2022-2025 to address the following challenges of digital development in higher education:

- The challenge of the universities, occupied by the handling of an important student massification, which prevents them, at times, to approach the reflection of their modernization;

- The challenge of disparities in access to the Internet and digital technology. The implementation of online courses during the Covid-19 pandemic revealed more shortcomings, sometimes with the absence of computers and/or poor internet connections;

- The challenge of developing a digital culture and the conditions necessary to achieve it,
- The challenge of accompanying teachers in order to help them evolve their teaching practices and master the new digital tools;

- The challenge of the need for infrastructure development to support all these transformations;

- The challenge of improving administration to effectively manage all institutional activities.

On this basis and according to the issues at stake, the MHESR has developed a vision that has been translated into 7 strategic axes broken down into programs and projects:

- Axis 1: Digital technology to support teacher training
    - PROGRAM 1: Accompanying teachers, technical-administrative staff and school leaders (e.g. of projects: Distance learning regulations, Teacher pedagogy training
    - PROGRAM 2: Discovery workshops (teachers, technical and administrative staff)

- Axis 2: Digital technology for a coherent training offer
    - PROGRAM 3: Improve the visibility, attractiveness and coherence of the training offer
    - PROGRAM 4: School system

- Axis 3: Digital technology to support student success
    - PROGRAM: 5 Improvement of pedagogy (e.g. projects: Online course platform, including medicine; introduction of flipped classroom; tutoring platform)
    - PROGRAM: 6 Student Achievement (e.g. projects Portfolio Platform of Student Achievements (public); Language Learning Training Platform

- Axis 4: Digital technology at the service of research activities
    - PROGRAM 7: Research and visibility of the research work
    - PROGRAM 8: Innovation

- Axis 5: Digital to support permanent infrastructures
    - PROGRAM 9: High Performance Network Infrastructures (ex. of projects: High Performance Infrastructure Acquisition; Improvement of Wifi Coverage).
    - PROGRAM 10: Securing infrastructures and data (e.g. projects: Developing cloud services)

- Axis 6: Digital technology in support of a modern administration
    - PROGRAM 11: Steering, Schooling, Human Resources, Heritage (e.g. projects: Create a Digital Strategy Office).
    - PROGRAM 12: Dematerialization and digitization
    - PROGRAM 13: Strengthen communication and data/information sharing tools

- Axis 7: National and international relations
    - PROGRAM 14: National and international visibility and openness
    - PROGRAM 15: International Cooperation
    - PROGRAM 16: Modernization of society (Lifelong learning) (e.g. projects: Open Distance Learning Platform (ODL)

The MHESR has created steering, monitoring and support committees for the implementation of the SDN (digital master plan) at the national, regional, and local levels.

From the academic year 2022-2023, the provisions of the executive decree N° 22-208 of June 05 relating to the modes of teaching (distance, hybrid, localized, by waves and by mobility) come into application.

MAURITANIA

Mauritania has developed a National Digital Transformation Agenda[35] 2022-2025. This agenda classifies digitization and innovation as essential means to modernize management and social integration and strengthen the competitiveness of the national economy. It outlines sectoral objectives for digital transformation.

The plan is broken down into 4 strategic orientations (infrastructure, digital administration, support for sectoral digital transformation, e-business & innovation), which in turn are broken down into 44 projects. Higher education is included in the strategic orientation "support for sectoral digital transformation". The plan aims to move from 10% of students regularly using distance learning tools in 2021 to 60% in 2025.

The OS3.I2.P3 project, which is part of the strategic orientation "support for sectoral digital transformation", concerns the implementation of an Information System (IS) and platforms for higher education and research. It consists of 3 components: the establishment of an IS within the administration allowing the management of documents, human resources and monitoring of activities via an interactive dashboard, the expansion of digital services within the Educational and Research Institutions (EEI), the expansion of digital services offered to students, teachers and researchers.

Among the levers for achieving the strategic objectives, the "digital skills" lever includes two projects related to higher education:

- the project " LM2.I2.P4 Promoting complementary digital distance education (MOOCs, eLearning, ...) " : Creation of the Mauritania E-learning Center (CEM) whose objective is to offer online learning tools (MOOCs, e-learning, free educational resources) for primary, high school and university students, as well as vocational, continuing education and original education (Mahadhra). The CEM would notably ensure the continuity of teaching through distance learning in times of crisis;

- The project " LM2.I2.P5 Implementing work-study training in the digital sector " : The objective is to implement a work-study (alternate) training program in the digital sector (alternating university and professional courses with work experience).

The strategies developed by the 4 countries are quite ambitious with quantitative objectives. In some cases structures and mechanisms for support, monitoring and evaluation are defined.

In addition, the UAE has developed partial strategies by domain, including:

- The National Plan for Intelligent Governance Objectives (Telecom Authority 2015);

- The Innovation Strategy 2015;

- The AI Strategy 2017;

- The 50-year pact 2019.

Regarding higher education, the UAE has developed a Digital Transformation Strategy for Higher Colleges of Technology.

However, it should be mentioned that even countries that have not developed a strategy have taken action to ensure the continuity of higher education during the Covid period based on digital technology.

3.1.2.2. Digital environment (network, smart classes, MOOC,...)

Digital education requires a fairly well-developed infrastructure at the country and university levels as well as Internet access and personal computers and ICT skills.

Examination of Table 3 shows that among the countries in the study, 2/9 countries have a rate of home Internet access less than 50%, 4/9 countries have a home computer ownership rate of less than 50%, and 2/10 have an Internet use rate of less than 50%.

Furthermore, the examination of individual ICT skills shows that in 3/7 countries more than 50% of individuals have basic skills, in 2/7 countries more than 50% individuals have medium skills and the highest rate of individuals with advanced skills is 25% (see tab.4) in Saudi Arabia.

These data for countries are general ones; data specific to the different stakeholders in higher education is not available.

Some countries such as Algeria, Morocco, Tunisia, and Yemen have made specific arrangements at the level of higher education to create a specific university network. As examples:

- The Center for Scientific and Technical Research in Algeria ensures the proper functioning of digital platforms and manages the Algerian research network that connects all HEIs across the nine major poles of Algeria; it is expected that all institutions with a bandwidth of 100 megabytes will move to 1 gigabyte, institutions with a bandwidth of 10 megabytes will be transferred to 100 megabytes, and the national poles will be increased to 10 as of the beginning of the 2022/2023 academic year;

- In Morocco all academic institutions are connected through the Moroccan National Research and Education Network 'MARWAN';

- In Tunisia, the National University Network (RNU) allows all public HEIs to connect to high-speed Internet (fiber optic connection); the RNU is managed by the Khawarizmi Computing Center (CCK) as an Internet service provider for public HEIs and administration;

- Yemen established the Yemen Centre for Information Technology in Higher Education[36] (YCIT-HE) in 2007 to provide information services and infrastructure to educational institutions. The main focus was on networking among universities, followed by a focus on support services and applications.
  Among the center's missions are the following[37] :
  - Provide a high quality and fast data transmission infrastructure through local and international service providers.
  - To facilitate and support the necessary information technology infrastructure in all institutions of higher education to enable the provision of electronic services to these institutions.

o Contribute to the creation of information technology services, such as library information services, e-learning and others in all institutions of higher education, enabling them to access and contribute to local and international data banks.

All countries have implemented LMS platforms such as MOODLE, Google Classroom, Open EDX and have used video conferencing tools such as Microsoft teams, Google Meet, Zoom, etc., especially to provide distance learning courses. Some countries such as Egypt have carried out evaluations of e-learning in 92 faculties belonging to 27 universities.

To provide teachers and students with access to library resources, some countries have set up virtual libraries including access to scientific journals such as the Digital University Library in Iraq, the Iqraa Digital Library in Algeria, the Biruni Academic Resources Library in Tunisia and the Unified Catalog Portal for Yemeni Libraries.

3.1.2.3. Initiatives

Covid 19 was indeed a trigger that accelerated countries' commitment to the digital transformation of higher education. The 10 countries in the report were forced to move to online education due to restrictions imposed to fight the spread of the virus. They have set up online digital teaching platforms and initiated training for teachers to empower them to provide online teaching. Some countries have created support structures for teachers and students to accompany them in the digital transformation of higher education. In addition, some countries have initiated training for administrative staff in order to ensure the operation of computerized training systems. These actions are to be considered as fundamental elements of the diffusion of the digital transformation culture.

3.1.2.4. Institutional support for Digital Teaching and Learning

Five of the 10 countries in the study have created support structures for digital teaching and learning. Their purpose is to support universities in their digital teaching transformation. These structures are presented below:

EGYPT

The e-learning and distance education system is based on three governmental and private institutional patterns represented in the following:

- **The National E-Learning Center** (with its 23 sub centers), created in 2015 with the following mission:
    - Spread the culture of E-learning in HEIs and its integration with the traditional face-to-face education method,
    - Formulation of general plans and technical supervision of the production of electronic content for universities,
    - Follow-up on its implementation and ensuring its quality in accordance with approved international standards;

- **Open education centers in public universities:**
    - Their main purpose is to provide Education to students who are unable to attend school considering the financial income or family requirements or geographical distance;

- **IIOE Egyptian National Center** hosted Ain Shams University as a center to support innovation in higher education and digital transformation by striving towards achieving the following goals[38]:
  - Establish the IIOE national hub to facilitate the process of digital teaching and learning, and enhance the quality and inclusiveness of higher education through digital transformation.
  - Build a national network of HEIs and construct a national platform of dialogue and mutual exchanges for higher education teachers, leaders and relevant stakeholders.
  - Coordinate the co-construction and mutual sharing of digital courses and programmes among IIOE partner HEIs nationally and internationally.
  - Conduct joint research of OBTL and digital transformation in collaboration with UNESCO-ICHEI and apply research outcomes into practices locally

.

TUNISIA: The Virtual University of Tunis (UVT)

UVT was created in 2002. Its main mission is to develop online courses and programs for Tunisian universities. In addition, UVT provides its students with professionalizing courses adapted to the needs of the economic, social, national and international environment.

It has a dual pedagogical and technical mission.

The pedagogical mission includes the following main tasks:

- to provide a non-presential training to students registered at the UVT within the framework of the continuous training and the lifelong learning;

- to ensure a non-presential training addressed to the students registered at other public universities;

- to produce digital and innovative pedagogical content;

- to train professors, trainers, technicians, and managers.

 UVT's technical missions include:

- hosting digital educational content to meet the needs of non-presential education;

- creating and developing curriculum-related web sites and applications and other applications as needed;

- provide services in the field of non-presential training based on the experiences and skills available at the university.

In addition, the virtual university of Tunis is responsible for coordinating the various activities relating to non-presential training with other universities. This is realized within the framework of an integrated system unifying the efforts and resources of all parties so that non-presential education is a complement to higher education.

SAUDI ARABIA: National eLearning Center[39]

A National eLearning Center has been established in 2018. The center is the competent authority for all matters relating to e-education and training and is the national reference in its affairs. Its objectives are as follow:

- Ensure recognition of all forms of online learning;

- Ensure quality of online learning;

- Ensure equitable access to online learning;

- Improve agility in online learning;

- Improve efficiency in online learning,
- Provide adaptive online learning opportunities that are increasingly relevant to individual learning needs;

- Lead digital transformation in education;

- Investing in new technologies (AI, Data Analytics, Blockchain) to meet changing needs and solve complex educational problems through online learning;

- Facilitate co-creation of value in education through innovation-driven online learning,

JORDAN: National Center of E-Learning and Open Educational Resources[40] (OER)

The creation of the National Center for Online Training and Open Educational Resources was approved in 2020.

The Center for E-Learning and Open Educational Resources supports and promotes technological initiatives that enhance student access and engagement in the classroom, as well as faculty excellence in the integration of educational technology into their teaching and research agendas.

The center also contributes to reviewing and evaluating the educational methods used in the university from a technical point of view. In addition, the center aims to keep abreast of the latest educational technologies in order to integrate them with the university's educational system and develop the experience of both students and faculty members[41] .

The main focus of the center is on the following areas:

- The next generation of digital learning resources and environments;

- ICT-based tools for learning analytics;

- Scientific research;

- Encouraging the increase of open learning resources and open online courses for collective attendance;

- Applying inclusive education in classrooms to ensure the involvement of all students in the teaching and learning process.

YEMEN: The "**Yemen Centre for Information Technology in Higher Education**" (YCIT-HE) mentioned in the environment and infrastructure section also has the mission to contribute to the creation of information technology services, such as information services for libraries, e-learning and others in all HEIs, enabling them to access and contribute to local and international data and information banks

In addition, Algeria has designed a Project of the Algerian Open University: The missions of the Algerian Open University are in line with the sectoral recommendations, they aim:

- ✓ To promote and generalize distance learning within the national system of higher education;
- ✓ To develop degree and/or qualification courses adapted to distance learning and continuing education.
- ✓ Production and distribution of educational content using digital and virtual technologies
- ✓ Design of resources, supports and computer applications necessary for the development of distance learning,
- ✓ To meet the growing demand for higher education from diverse groups in society through flexible and adaptable training;
- ✓ To provide knowledge and techniques related to distance learning for the benefit of the different actors of the sector, teachers, students, managers and technicians;
- ✓ To give a global return to all the possibilities of technological transformation within the framework of the international cooperation of the sector in order to ensure a permanent empowerment,
- ✓ To provide expertise, advice and services to universities, colleges, organizations and large companies with training programs, upon request

As for Iraq, The Ministry of Higher Education and Scientific Research adopted UNESCO's recommendations in launching the Open Science methodology, including Open Educational Resources. In November 2021 a specialized committee was formed to research the development of mechanisms that help Iraqi universities, educational and research institutions in adopting those recommendations.

3.1.3. Teachers and Teaching

As mentioned above, all 10 countries have launched initiatives to help teachers train for online teaching. Ministries in the different countries have launched online training platforms for teachers or provided teachers with resources for this purpose. Some countries have organized teacher training workshops.

The following are the initiatives for which the team has more detailed information.

SAUDI ARABIA

- A eLearning Leadership(eLL) Certificate includes 6 domains: Digital Literacy, Leadership, Pedagogy, Assessment, Communication and Collaboration, Professional Learning. Two levels are offered:
  - o Professional Certificate in eLearning Leadership -Foundation Level (eLL-F);
  - o Professional Certificate in eLearning Leadership -Advanced Level (eLL-A);

- A eLearning Content Development (eLCD) certificate consists of six domains (competences): Design Process, Leadership, Pedagogy, Assessment, Communication and Collaboration and Professional Learning. Two levels are offered:

- o Professional Certificate in eLearning Content Development -Foundation Level (eLCD-F);
- o Professional Certificate in eLearning Content Development -Advanced Level (eLCD-A);

- A professional certificate in Online Teaching/Training (OTT) includes the same domains as eLL Certificate and also offers two levels;

- Professional Certificate in Online Teaching/Training-Foundation Level (OTT-F);

- Professional Certificate in Online Teaching/Training-Advanced Level (OTT-A).

No information was available on whether these certifications are compulsory for teachers in Saudi Arabia. However, it should be mentioned that, following training, accredited certificates are issued to teachers, supervisors and head teachers through the university to which the institution belongs. These certifications are taken into consideration in the teacher's professional career development.

TUNISIA

UVT has launched a hybrid online training in Online Training Engineering (IfeL) whose objectives are:

- Design a training system that is adapted to the context and takes advantage of the added value of technology;
- Script your course (plan the detailed temporal sequence);
- Build mediated learning resources adapted to your course;
- Implement your project on an e-learning platform;
- Design the tutoring of your learners;
- Analyze the effectiveness of teaching practices.

This training allows learner to acquire the following skills

- Competency C1: Becoming familiar with e-learning;
- Competency C2: Search and use OER;
- Competency C3: Scripting an e-learning course;
- Competence C4: Mediating an e-learning course;
- Competence C5: Teaching with Moodle;
- Competence C6: Evaluating online learning;
- Competence C7: Tutoring an online course.

These online trainings are provided to all HEI teachers through the UVT eLearning platform as an option. They are not mandatory for the teachers' professional career development. However, some universities have set up specific training courses for digital teaching (e.g. the CEC-IPEN diploma at the University of Sousse-Tunisia), which are taken into account in competitive examinations for the promotion of university hospital faculty members, as well as in competitive examinations for the recruitment of faculty in other disciplines, as part of their pedagogical training.

3.1.4. Digital Learning and transformation

Digital pedagogy refers to the use of technology and digital tools to enhance and transform teaching and learning practices.

In order to ensure continuity of teaching, the 10 countries have moved to the use of digital for teaching during the Covid period. To this end, and despite sometimes insufficient preparation of teachers and students, they moved to online teaching. Both synchronous and asynchronous forms of online teaching have been adopted.

After this first experience that accelerated the digital transformation, several countries or institutions have adopted online and hybrid forms of education. It is worth noting that Jordan has set as a target in its executive action plan for the integration of digital-learning for the academic year 2022-2023: a minimum of 20% of the courses in each training program provided entirely by online distance learning; a minimum of 30% to 40% of the courses in each training program provided in hybrid learning; the rest in face-to-face

Some institutions have made available to teachers and students a diversity of digital content, including texts, audio, visual materials, and interactive content to achieve a single learning objective to meet the learners' different needs and consider their individual differences. They have also facilitated access to other open educational resources (OER) such as MIT OpenCourseWare. Some countries such as Iraq, Saudi Arabia, and Tunisia have designed policies on Open Educational Resources and set up OER platforms. In addition, in Saudi Arabia each HEI must allow 15% of its digital content to be open to enrich digital content and contribute to the development of community members.

Some countries have produced MOOCs and have benefited from the offers of international platforms (MOOCs) for online training such as Coursera, Edx, France Université Numérique, etc.

Many universities in the 10 states have invested in online learning platforms, such as Moodle, Open Edx or Blackboard, to facilitate remote learning and provide students with access to course materials, assignments, and communication tools. Some universities have used these tools to assess student performance and adjust instruction accordingly.

In addition, they have used video conferencing tools such as Zoom, Google Meet, Teams, etc. Virtual classrooms have become a popular tool for delivering lectures and facilitating discussions among students and instructors.

The Digital Learning and transformation part will be presented in more detail in the section dealing with academic institutions.

3.1.5. QA for digital T&L

Few countries have developed a quality assurance framework that relates directly to digital teaching and learning. Indeed,

- Iraq has published an e-learning quality guide for implementation and accreditation in 2020, prepared by an Iraqi specialized scientific committee based on international specifications and standards: "the guide was designed to provide all the requirements of modern e-learning and its various technologies and transform HEI into Digital Educational Institutions according to the specifications of fourth-generation universities";

- Saudi Arabia has published an Online Learning Evaluation Framework (OLEF) Handbook, created by the National eLearning Center (NeLC). It provides HEI (both public and private) guidelines to understand and participate in enhancing performance in online learning, in line with internationally recognized good practices. The Handbook includes a set of Online Learning Standards for Higher Education. As part of this endeavor, NeLC has created a Professional Certificate In eLearning Technical Support.

Iraq and Saudi Arabia, however, have not published results on the quality assessment of online learning.

In addition, Algeria has developed a general quality assurance framework and Tunisia has organized seminars and trainings for the adoption of a quality approach in higher education.

Only Saudi Arabia has entrusted the mission of quality assurance of digital learning to NeLC. As such NeLC regulates and controls the quality of e-learning outputs provided by the entities and support their integration to achieve reliable e-education for all. Furthermore, NeLC provides (Institutions & Programs) Licenses for institutions which provide eLearning and training programs based on approved Licensing Regulations.

Other countries (Algeria, Mauritania, Egypt, Tunisia, Yemen) have bodies in charge of the quality of higher education in general, but no information specifies that they dealt with the quality of online education.

3.2. Analysis at the institutional level

As mentioned in the methodology section, we decided to enrich the study conducted on the approaches to Digital Transformation in Higher Education in the 10 selected Arab countries, with a more specific research in a number of academic institutions in these same countries, identified by the experts as representative examples of best practices, advances, and possibly challenges in each of these countries.

The approach followed in the collection of information was based on the different components indicated in the country framework, namely

- Institutional policies, planning, and initiatives;

- Teachers and teaching;

- Digital Learning and transformation;

- Quality Assurance for Digital Teaching & Learning.

The information collected differs from one institution to another in terms of its richness, consistency and adaptation to the above-mentioned breakdown, mainly due to the content available on their respective websites.

Our analysis therefore focuses on a set of 15 HEIs as shown in Table 7 :

Tab. 7 List of Higher Education Institute

Country	Higher Education Institute
Algeria **	- Ahmed Ben Bella Oran 1 University [42] - University of Continuing Education "UFC" [43]
Egypt **	- Egyptian E-Learning University[44]

Country	Higher Education Institute
	- Arab Open University in Egypt[45] - IIOE Egypt National Centre[46]
Iraq **	University of Information Technology and Communications [47]
Jordan **	Akaba University of Technology (private) [48]
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique [49]
Morocco **	Mohammadia School of Engineering [50]
Saudi Arabia ***	- King Saud University (KSU)[51] - JEDDAH University[52] - Saudi Electronic University (SEU) [53]
Tunisia **	Tunisian Virtual University (UVT) [54]
United Arab Emirates ***	Higher Colleges of Technology (HCT) [55]
Yemen *	University of Science and Technology Yemen (USTY) [56]

*** High Income   ** Middle Income   * Low Income

3.2.1. Institutional policies, planning and initiatives:

3.2.1.1. Strategies and Policies

Most academic institutions in countries with a global vision have a Digital Transformation strategy/policy aligned with this vision. However, academic institutions retain a certain latitude in relation to the country strategy to adapt it to their particularities and objectives. Moreover, it has been observed, particularly during the Covid-19 period, that all countries, or almost all of them, have put in place plans and initiatives to ensure the continuity of education.

Table 8 below shows the positioning of the target institutions with respect to the adoption or not of a specific strategy for Digital Transformation:

Tab. 8 Positioning of HEI on specific Digital Transformation strategy

Country	Country HE Digital Transformation Strategy	Higher Education Institute	Status Public/Private	Institutional Digital Transformation Strategy/Policy
Algeria **	Yes	Ahmed Ben Bella Oran 1 University	public	No
		University of Continuing Education "UFC"	public	No
Egypt **	No but an Egypt Digital Strategy 2030	Egyptian E-learning University	public	No
		Arab Open University in Egypt	private	Strategic plan 2022-2027
		IIOE Egypt National Centre	public	Strategy Vision 2018-2023
Iraq **	Yes	University of Information Technology and Communications	public	No
Jordan **	Yes	Akaba University of Technology	private	No
Mauritania *	Yes	Polytechnic School "Ecole Supérieure Polytechnique	public	No
Morocco **	Yes	Mohammadia School of Engineering	public	e-learning Plan

Country	Country HE Digital Transformation Strategy	Higher Education Institute	Status Public/Private	Institutional Digital Transformation Strategy/Policy
Saudi Arabia ***	No but a Country Vision 2030	King Saud University (KSU)	public	No
		JEDDAH University	public	Yes
		Saudi Electronic University (SEU)	public	Yes
Tunisia **	No but a National Strategic Plan Digital Tunisia 2020	Tunisian Virtual University (UVT)	public	Yes, e-learning Plan
United Arab Emirates ***	No but a Country Digital Transformation Vision 2020	Higher Colleges of Technology (HCT)	public	Strategic plan 2017-2021
Yemen *	No	University of Science and Technology Yemen (USTY)	public	No

*** High Income   ** Middle Income   * Low Income

The analysis of the Digital Transformation strategies and/or policies established by the different institutions reveals that:

- Only 7 of the 15 institutions have actually displayed a clear orientation in this area and initiated a Digital Transformation process;

- Of the 7 academic institutions with a Digital Transformation strategy/policy, only one institution derives its strategy from a stated and published national strategy for Digital Transformation in the higher education sector. All other institutions are part of a declared overall National Digital Strategy;

- Only one of the two private universities in the sample, the Arab Open University in Egypt, has a Digital Transformation strategy/policy. The AOU is part of an Arab network of private universities with a strong tradition in the field of e-Learning due to its partnership agreement with the United Kingdom Open University;

- 6 of the 8 academic institutions that do not have a Digital Transformation strategy/policy, belong to a country where a strategy for Digital or Digital Transformation of the higher education sector has been adopted;

- Three institutions stand out for the quality and completeness of their strategies for Digital Transformation: Arab Open University in Egypt (AOU), Saudi Electronic University (SEU - KSA), Higher Colleges of Technology (HCT - UAE).

3.2.1.2. Digital Environment & Infrastructure

The infrastructure and the digital environment are fundamental elements for the success of the Digital Transformation (Dx) of a HEI. The proposed framework for collecting information from academic institutions focused on three components:

- Network connectivity;

- Digital equipment available to students;

- Digital equipment used for teaching.

From the information gathered, it appears that the advent of Covid-19 had challenged the academic institutions to better assess the situation of their infrastructure and the digital environment for teaching and for students. The obligation to switch to a non-presential mode of teaching in a few days has put a lot of stress on most institutions, especially because of:

- The situation of the network infrastructure, which was sometimes non-existent for some, and not adapted to the important demand in bandwidth, for others. Internet access for students from their places of residence posed the double problem of network availability and the cost of bandwidth;

- The non-availability of appropriate digital equipment in sufficient quantity to allow students to follow the courses in a non-presential manner;

- The non-availability of technological tools and the teachers' poor mastery of these tools was also a considerable obstacle to ensuring continuity of teaching.

Low-income countries faced ethical issues of equity for students, between those who could afford and were equipped to move to non-presential learning, and those who could not afford it.

Through the analysis of the institutional records of the various HEIs selected for this study, Table 9 below shows the positioning of these institutions in relation to the three components of the Digital Environment and Infrastructure component:

Tab. 9 Positioning of HEI on Environment and Infrastructure

Country	Higher Education Institute	Digital Environment and Infrastructure		
		Network Connectivity	Digital Equipment for students	Smart Classroom
Algeria **	Ahmed Ben Bella Oran 1 University	N.A	N.A	N.A
	University of Continuing Education "UFC"	N.A	N.A	N.A
Egypt **	Egyptian E-learning University	High-speed connectivity, Labs	PCs,	Virtual Classrooms, e-Courses, Videoconferences
	Arab Open University in Egypt	Data Center, Online connection, Virtual Labs	PCs, Mobile,	Virtual Classroom, Zoom, Teams
	IIOE Egypt National Centre	Full High-speed connectivity, Labs	PCs, Mobile, Tablets	Smart Classroom
Iraq **	University of Information Technology and Communications	N.A	N.A	N.A
Jordan **	Akaba University of Technology	Wifi	PCs, Smartphones, Tablets	Virtual Classroom
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique	N.A	N.A	N.A
Morocco **	Mohammadia School of Engineering	N.A.	N.A.	Interactive educational content, lecture videos, online

Country	Higher Education Institute	Digital Environment and Infrastructure		
		Network Connectivity	Digital Equipment for students	Smart Classroom
				exams
Saudi Arabia ***	King Saud University (KSU)	Full High-Speed, Cloud,	PCs, Mobile, Software package	Blackboard, Zoom, Teams, Webex
	JEDDAH University	Full High-Speed Connectivity	PCs, Mobile,	Blackboard
	Saudi Electronic University (SEU)	Full Broadband Connectivity, Data center, Cloud, Virtual Labs	PCs, Mobile, Smart Suitcase	Blackboard system
Tunisia **	Tunisian Virtual University (UVT)	Full optic fiber connectivity, Data Center, Labs	PCs, Mobile	MOOCs, Virtual Classroom
United Arab Emirates ***	Higher Colleges of Technology (HCT)	Full optic fiber connectivity, Labs, Digital Campus	PCs, Mobile,	Blackboard Learn, Virtual Classroom
Yemen *	University of Science and Technology Yemen (USTY)	N.A	N.A	N.A

*** High Income   ** Middle Income   * Low Income

It should be noted that country reports and the websites of the involved institutions did not provide complete data on all institutions.

Table 9 shows the 3 HEIs in Saudi Arabia (KSU, Jeddah University and SEU) and HCT in UAE as the best in terms of environment and infrastructure followed, to a lesser extent, by UVT in Tunisia, the Egyptian E-learning University, the Arab Open University and the University of Ain Shams: IIOE Egypt National Centre.

3.2.1.3. Initiatives for Digital Transformation Culture Building

Table 10 below summarizes the initiatives undertaken by the institutions analyzed:

Tab. 10 Positioning of the HEI on the Culture Building component

Country	Higher Education Institute	Initiatives for Digital Transformation Culture Building
Algeria **	Ahmed Ben Bella Oran 1 University	N.A
	University of Continuing Education "UFC"	N.A
Egypt **	Egyptian E-learning University	EELU has established specialized centers in Digital Transformation: Digital Transformation Center, Entrepreneurship Club (e-Club), Technology Innovation Commercialization Office (TICO), E-Testing Center, Continuing Learning Center,
	Arab Open University in Egypt	- online libraries, - Electronic exam assessment,
	University of Ain Shams: IIOE Egypt National Centre	- Digital Services Portal, - University Management System,
Iraq **	University of Information Technology and Communications	- Digital Content,
Jordan **	Akaba University of Technology	- e-Resources, - Development of a training and mentoring program for the university community, including staff and students regarding the

Country	Higher Education Institute	Initiatives for Digital Transformation Culture Building
		ethical, safe and healthy use of digital learning technologies,
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique	N.A
Morocco **	Mohammadia School of Engineering	- digital tools for communication with faculty and other students.
Saudi Arabia ***	King Saud University (KSU)	- Electronic Training Platform, - e-service portal, - Rassen: ERP System, - Electronic Student Assessments, - Electronic Signature,
	JEDDAH University	- Technical support portal, - Live Chat support, - Electronic Exam System,
	Saudi Electronic University (SEU)	- Develop programs/curricula using e-learning methods, - Automate students' services to improve their experience at the University, - Improve interaction in classes using advanced techniques,
Tunisia **	Tunisian Virtual University (UVT)	- Plans to create and animate collaborative spaces and online communities focused on the exchange of best practices between trainers,
United Arab Emirates ***	Higher Colleges of Technology (HCT)	- Digi Campus platform provides the following online and interactive services: Smart Learning Planning Guide & Manual, Student e-Competitions, E-sports, Health, Nutrition & Fitness, E-Life Skills & Counselling, E- Volunteering, E-Reading Spaces, Online Happiness, Students' e-Clubs, Employability Hub (E-Work Placement workshops, E-Interview skills, E-CV writing, E-Personal branding, E-Job search techniques, Kawader online job portal for HCT graduates). These services are provided throw MyHCT mobile application.
Yemen *	University of Science and Technology Yemen (USTY)	- Integrated Smart Student System: e-Learning Student Portal - Student Portal On-Campus, - Student Portal-Regularity - Electronic library,

*** High Income   ** Middle Income   * Low Income

The analysis of Table 10 shows that the experiences in developing digital literacy among the different stakeholders within universities are quite disparate, not taking into consideration the institutions for which information was not available.

EELU in Egypt has established specialized centers around Digital Culture such as: Digital Transformation Center, Entrepreneurship Club, e-Club, Technology Innovation Commercialization Office (TICO), E-Testing Center and Continuing Education Center.

The most complete and relevant experience, in our opinion, is that of HCT (UAE) with its "Digi Campus" platform which contributes significantly to the development of digital culture among students. In addition, HCT offers its students a mobile application called "MyHTC" which allows students to access in a secure and personalized way all the e-services to which they are entitled concerning their academic career, their activities within the student community, and life at the university.

Another initiative undertaken by Akaba University of Technology (Jordan) seems very relevant to us which consists of the development of a training and mentoring program for the university community, including staff and students, regarding the ethical, safe and healthy use of digital learning technologies.

3.2.1.4. Institutional Support

Table 11 summarizes the information collected from the HEI institutional records about the existence of a support body for digital teaching and learning in these institutions:

Tab. 11 Positioning of HEIs on the institutional support component

Country	Higher Education Institute	Institutional Support
Algeria **	Ahmed Ben Bella Oran 1 University	N.A
	University of Continuing Education "UFC"	N.A
Egypt **	Egyptian E-learning University	- E-Courses Production Center, - Faculty Training Center,
	Arab Open University in Egypt	Online courses are developed by multi-disciplinary course teams comprising: - Academics, educational technologists, and media specialists contributing pedagogic and technical expertise, - Respected academics from other universities working alongside Open University colleagues, - External examiners.
	University of Ain Shams: IIOE Egypt National Centre	- IIOE network
Iraq **	University of Information Technology and Communications	- Computer Center of the university
Jordan **	Akaba University of Technology	- Computer Center
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique »	N.A
Morocco **	Mohammadia School of Engineering	N.A
Saudi Arabia ***	King Saud University (KSU)	- Deanship of Electronic Transactions and Communications
	JEDDAH University	- E-Learning & Distance Learning Center at the University of Jeddah
	Saudi Electronic University (SEU)	- Deanship of information technology: role in building the infrastructure of the university's technology, especially that the applied learning method at the university. It includes the following departments: Department of E-Learning (Blackboard), Department of Student Information Systems (Banner), Department of Administrative Applications, Department of Portal, and Software, - Launch and activate a local digital production center specialized to produce the educational e-content, - Launch an e-learning innovation center to develop local e-learning capabilities,
Tunisia **	Tunisian Virtual University	- UVT provides support to all HEI in Tunisia in their Digital

Country	Higher Education Institute	Institutional Support
	(UVT)	Teaching & Learning projects, - CCK (Khawarezmi Computing Center) as an infrastructure provider for all HEIs in Tunisia
United Arab Emirates ***	Higher Colleges of Technology (HCT)	The Education Technologies Division, led by the Vice President, Education Technologies, oversees three key areas: - Intelligent Learning Systems, - Digital Technologies, - Knowledge Management,
Yemen *	University of Science and Technology Yemen (USTY)	- Deanship of Electronic & Distance Learning

*** High Income   ** Middle Income * Low Income

Of the 15 institutions, we were only able to obtain information on 11 of them.

Among these 11 institutions the approach was as follows:

- 4 institutions (King Saud University, Saudi Electronic University, Higher Colleges of Technology and University of Science and Technology Yemen) have chosen to set up a structure headed by a Vice-Dean in charge of technology and infrastructure within the university, which guarantees the service provided to the various stakeholders within the university;

- 3 institutions have chosen to create an internal center in charge of technological aspects, even more than one center per institution (case of Egyptian E-learning University);

- 2 institutions rely on structures that belong to the network of which they are members: University of Ain Shams (IIOE), and Arab Open University in Egypt;

- 2 institutions have a different approach, UVT for Tunisia and Saudi Electronic University for Saudi Arabia. They have been entrusted to take charge of the distance learning activity in the whole country and to offer support to other universities for the development of digital contents and the management of distance learning platforms;

3.2.2. Teachers and teaching:

As proposed in the framework, this component is interested in identifying HEI approaches to preparing teachers for Digital T&L practice in terms of training and skills to be acquired. The information gathered is quite sparse at this level.

Table 12 below summarizes the information we were able to access on this component:

Tab. 12 Positioning of HEIs in the Teachers & teaching component

Country	Higher Education	Teachers and teaching

	Institute	Digital teaching training	Competences covered	Micro-Certification program for digital teaching	Micro-Certification considered in TPD
Algeria **	Ahmed Ben Bella Oran 1 University	Training of more than 700 teachers (2013-2023)	N.A	N.A	N.A
	University of Continuing Education "UFC"	N.A	N.A	N.A	N.A
Egypt **	Egyptian E-learning University	Faculty Members Training Center (FMTC) designs and implements training programs for EELU faculty members, and university leaders	A set of training programs covers: - use of ICT tools, - teaching & evaluating strategies with various eLearning methods	Yes	Yes
	Arab Open University in Egypt	N.A.	N.A.	N.A	Yes
	University of Ain Shams: IIOE Egypt National Centre	Training & Development Center oversees developing the skills of senior and junior faculty at the university,	ICT in higher education teaching and learning courses, provided by the IIOE platform	Yes	Yes
Iraq **	University of Information Technology and Communications	N.A	N.A	N.A	N.A
Jordan **	Akaba University of Technology	Training of faculty members is provided	- Digital tools for Digital Learning & Teaching	Yes	No
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique	More than 61 teachers have participated in accelerated training during the Covid-19	N.A.	No	No
Morocco **	Mohammadia School of Engineering	Training of teachers organized internally or in collaboration with external partners.	Training on ICT to enable teachers to effectively use digital tools in their courses	N.A	No
Saudi Arabia ***	King Saud University (KSU)	Faculty members training	- the use of digital tools for e-Learning, - the use of adaptive learning and artificial intelligence,	Yes	N.A
	JEDDAH University	Qualifying 150 faculty members	Skills to develop online courses,	Yes	N.A
	Saudi Electronic University (SEU)	Training program to enhance individual digital competencies,	N.A	Yes	N.A
Tunisia **	Tunisian Virtual University (UVT)	All HEI teachers (in public universities) are encouraged to pursue the training IFEL program (a blended learning in	The IFEL program covers the following competencies: - Competency C1: Becoming familiar with e-learning	Yes	Yes

Country	Higher Education Institute	Teachers and teaching			Micro-Certification program for digital teaching	Micro-Certification considered in TPD
		Digital teaching training	Competences covered			
		"e-learning engineering")	- Competency C2: Search and use OER - Competency C3: Scripting an e-learning course - Competence C4: Mediating an e-learning course - Competence C5: Teaching with Moodle - Competence C6: Evaluating learning online - Competence C7: Tutoring an online course			
United Arab Emirates ***	Higher Colleges of Technology (HCT)	All faculty members undergo the eTeacher program	The eTeacher program is a certified professional development initiative that delivers world-class training and certification for HCT faculty, and associated support staff, in the use of digital learning technologies. There are three levels of certification.		Yes	Yes
Yemen *	University of Science and Technology Yemen (USTY)	N.A	N.A		No	No

*** High Income   ** Middle Income   * Low Income

Regarding the content of micro-certification programs adopted by certain countries/HEIs, we have summarized in the following table the main information gathered on this subject from 5 Arab countries, in comparison with the program proposed by the IIOE:

Tab. 13 Micro-certification programs

Item	IIOE	KSA - NeLC	UAE - HTC	Tunisia - UVT	Egypt - ASU	Morocco - CAU
Courses	-How to Make an Online Course -Teaching and Learning with Digital Technologies -Empowering Teachers' Digital Teaching and	-eLearning Leadership(eLL) Certificate (2 levels) -eLearning Content Development (eLCD) certificate (2	-Course A: Fundamentals of Digital Teaching and Learning -Course B: Designing for Digital Teaching and Learning	- Cycle 1: Pedagogy and Technology - Cycle 2: Mastering OER research and exploitation strategies	-Smart classroom	- Design and production of education videos (4 modules – 5 weeks training)

	Learning Series -Enhance Teaching and Learning with Digital Educational Tools -ICT-supported Project-based Learning -Video-based Learning Content Development for e-Learning and b-Learning -Student Engagement in Blended Learning	levels) -Professional certificate in Online Teaching/Training (OTT) (2 levels) -eLearning Technical Support (eLTS) (2 levels)	-Course C: Excellence in Digital Teaching and Learning	- Cycle 3: Writing an Online Course - Cycle 4: Mediating an Online Course - Cycle 5: Teaching with Moodle -Cycle C6: Assessing learner learning - Cycle 7: Tutoring an Online Course		
Copyright / Cooperation	ICHEI – IIOE (UNESCO)	National eLearning Center (KSA)	Blackboard Company	UVT (Tunisia) (French speaking)	IIOE - ASU	IIOE – CAU (French speaking)

It appears from this synthesis (tables 12 and 13) that:

- Most HEIs (even if the information is not explicitly mentioned or absent) have set up training actions in digital and online teaching tools, especially during the Covid-19 period, if only to be able to deliver virtual courses with tools such as Teams, Meet or Zoom;

- It is also very likely that the HEI's that provide fully distance learning have provided training to their teachers to meet the requirements and standards in this area;

- Most teacher training is limited to the use of digital tools for online teaching;

- Two institutions (UVT-Tunisia and HCT-UAE) have established well-structured teacher training programs with well-defined target competencies leading to certificates that recognize the skills acquired. The National eLearning Center in KSA also provides a well-structured teacher training programs leading to micro-certification, but there's no information available on the extent to which this program is taken up, or whether it is compulsory for higher education teachers.

- Majority of HEI that have adopted a micro-certification digital teaching program for TPD, have done it internally with the support of experts (from HEIs or other external institutions). Only HCT-UAE has used a private company to handle the entire training and micro-certification process.

3.2.3. Digital Learning and transformation

The aim here is to synthesize information on the approaches and methods used by different institutions to deliver distance learning and advance the Digital Transformation of the learning process.

The framework proposes a structuring according to the following 5 dimensions:

- the digital pedagogy adopted & the percentage of courses in hybrid mode (insured or planned);

- initiatives adopted for curriculum-aligned resources that are open or open access;

- micro- certifications in program design and teacher professional development;

- Platforms used to deliver distance education and learning,

Table 14 summarizes the information collected for the different institutions on the four dimensions mentioned. The micro-certification dimension will be dealt with separately as we have very little information on this subject.

Tab. 14 Positioning of HEIs on the Digital Learning and transformation component

Country	Higher Education Institute	Digital Learning & Transformation		
		Digital Pedagogy, % blended courses	Init. Open, Free, Curriculum aligned Digital Resources	Platform for Digital T&L
Algeria **	Ahmed Ben Bella Oran 1 University	N.A	N.A	- Moodle platform, - 8,544 Online Courses
	University of Continuing Education "UFC"	N.A	N.A	N.A
Egypt **	Egyptian E-learning University	The main learning features of the EELU concepts are: -Virtual Classroom, - Resource-Based Learning, - Face-to-Face Lectures, - Credit-Hour System, 100% blended	N.A	LMS
	Arab Open University in Egypt	The AOU teaches through its own unique method of distance learning, called 'supported open learning'. 100% blended	N.A	- LMS - Pearson platform - McGraw-Hill platform

Country	Higher Education Institute	Digital Learning & Transformation		
		Digital Pedagogy, % blended courses	Init. Open, Free, Curriculum aligned Digital Resources	Platform for Digital T&L
	University of Ain Shams: IIOE Egypt National Centre	- blended - Learning tools that meet the professional development needs of the teachers,	- Open online learning platform with 600 multilingual (Chinese, English, French and Arabic) higher education courses (focused on developing ICT-related competencies),	- LMS Moodle
Iraq **	University of Information Technology and Communications	- Adaptive learning, - Two-Way conversations in e-learning, - Mobile-based learning, - Video-based learning, - Open Educational Resources	- Open Educational Resources - MOOCS	-LMS Moodle
Jordan **	Akaba University of Technology	- Blended learning	Adoption of a Guide to Digital Competences & Abilities	- LMS Moodle
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique	- 132 distance learning courses during Covid-19	N.A	N.A
Morocco **	Mohammadia School of Engineering	- blended - virtual classroom	N.A.	- LMS Moodle - Zoom, Teams
Saudi Arabia ***	King Saud University (KSU)	- blended - virtual classroom	N.A	N.A
	JEDDAH University	- Jeddah Education 4.0 Initiative: 10% distance learning, 30% blended learning, 60% regular learning,	N.A	LMS
	Saudi Electronic University (SEU)	- Blended Learning with balance between face-to-face and e-Learning, -100% blended for SEU programs	- 10% of e-contents are produced inside the HEI	N.A
Tunisia **	Tunisian Virtual University (UVT)	- mainly blended learning - some new MOOCs - Fully eLearning degrees with blended learning	- OER: Open Education Resources - MIT OpenCourseWare	- LMS for all public HEI based on MOODLE,
United Arab Emirates ***	Higher Colleges of Technology (HCT)	- Classroom-based, online, and blending Teaching & Learning, flipped -classroom pedagogy, - VR & AR tools, - Learning games	N.A	Online Learning platform

Country	Higher Education Institute	Digital Learning & Transformation		
		Digital Pedagogy, % blended courses	Init. Open, Free, Curriculum aligned Digital Resources	Platform for Digital T&L
Yemen *	University of Science and Technology Yemen (USTY)	- Virtual classroom, - Videoconference,	N.A	N.A

*** High Income   ** Middle Income   * Low Income

The analysis of table 14 suggests the following comments:

- 4 HEI provide 100% blended learning for their training programs (Egyptian E-learning University, Arab Open University in Egypt, Saudi Electronic University and Tunisian Virtual University) through an LMS;

- Most institutions have used an LMS platform to deliver online education and more specifically the LMS Moodle;

- Initiatives to promote open resources aligned with academic curricula are not numerous, apart from those of IIOE (Egypt), UICT (Iraq) and UVT (Tunisia);

- The pedagogical approach used by HEI is multifold. We find blended learning, Virtual Classroom, Videoconference. The predominant approach used by all institutions is the "blended" approach;

- The University of Information Technology and Communications (Iraq) proposes an innovative approach to adaptive learning;

- UAE's HCT offers new approaches based on flipped classroom pedagogy, virtual and augmented reality tools, and game-based learning approaches;

- AOU (Egypt) offers its own method of distance learning, called "open assisted learning", which is characterized by:

  o Flexible learning: students work where and when they want to accommodate their work, family and other commitments,
  o All-inclusive learning: students receive all the high-quality materials they need to study,
  o Supported learning: personal tutors provide academic expertise, advice and feedback and organize group tutorials,
  o Social learning: students come together in tutoring sessions, externships, and informal study groups, as well as through online conferences, study networks, and course forums.

3.2.4. Quality Assurance for Digital Teaching & Learning :

The question here is to identify how the target institutions have addressed the issue of quality assurance along two dimensions: the framework followed to establish quality assurance; and the organization adopted to carry out the quality assurance policy.

Table 15 below summarizes the information gathered on this aspect, mainly from the websites of the concerned institutions:

Tab. 15 Positioning of HEIs on Quality Assurance for Digital Teaching & Learning

Country	Higher Education Institute	Quality Assurance for Digital Teaching & Learning	
		Quality assurance framework and standard	Dept./Team responsible for
Algeria **	Ahmed Ben Bella Oran 1 University	N.A	N.A
	University of Continuing Education "UFC"	N.A	N.A
Egypt **	Egyptian E-learning University	N.A	N.A
	Arab Open University in Egypt	Open University of UK: Quality Assurance Agency,	Open University of UK
	University of Ain Shams: IIOE Egypt National Centre	online learning quality assurance framework and mechanisms, provided by IIOE,	Quality Assurance & Accreditation Center
Iraq **	University of Information Technology and Communications	N.A	Department of Quality Assurance and University Performance
Jordan **	Akaba University of Technology	- Plan to monitor and evaluate the digital learning model through faculty and technical support team meetings, - Qualitative assessment through faculty meetings, - Need for objective and quantitative evaluation tools,	Department of Accreditation and Quality Assurance
Mauritania *	Polytechnic School "Ecole Supérieure Polytechnique	N.A	N.A
Morocco **	Mohammadia School of Engineering	N.A	N.A
Saudi Arabia ***	King Saud University (KSU)	Quality assurance policy (Standards and Measurements)	Digital Transformation and Quality Management Unit under the Deanship of Development and Quality
	JEDDAH University	Guide to Quality Assurance and Academic Accreditation Policies at the University of Jeddah	Academic accreditation and Quality assurance Center within University of Jeddah,
	Saudi Electronic University (SEU)	Quality Assurance System	Quality and Academic Accreditation Department under the Vice Rector for planning, Development and Quality
Tunisia **	Tunisian Virtual University (UVT)	N.A	Internal evaluation by specific committees
United Arab Emirates ***	Higher Colleges of Technology (HCT)	HCT academic quality assurance and review framework	Commission for Academic Accreditation (UAE)
Yemen *	University of Science and Technology Yemen (USTY)	N.A	N.A

*** High Income   ** Middle Income * Low Income

The analysis of Table 15 shows that:

- Arab Open University in Egypt, University of Ain Shams: IIOE Egypt National Centre, Akaba University of Technology, King Saud University (KSU), JEDDAH University, Saudi Electronic University (SEU) and Higher Colleges of Technology (HCT), have established a framework of standards and quality assurance, with an appropriate body within the institution for monitoring and evaluation;

- The bodies set up for Quality Assurance are of different levels of importance from one institution to another: Center, Department or Vice Presidency;

- No information is available on the working methods of these bodies, nor on the internal monitoring and evaluation procedures within the institutions, nor on the tools that may be used as part of this quality approach;

- Institutions that operate within a network of institutions refer to the structures of the parent institutions.

4. Analysis, Challenge Identification, and Future Trajectory of Higher Education Digital Transformation in Arab Region

This chapter summarizes and analyzes the situation of digital learning in the 10 countries of the study, based on the findings of chapter two, which are derived from the country experts' reports and from consultation of other documents published by the different countries. On this basis, the main challenges are deduced and presented in boxes. The chapter is structured in three parts: the first part focuses on the analysis, challenges at the country level, the second at the level of academic institutions, and the third on the recommendations.

4.1. Analysis of the digital learning situation, main challenges and recommendations at country level

This section presents the analysis based on the Country Key indicators of the 10 countries and the different components indicated in the framework:

- Institutional policies, planning, and initiatives;

- Teachers and teaching;

- Digital Learning and transformation;

- Quality Assurance for digital Teaching & Learning.

4.1.1. Analysis of the situation based on key indicators and main challenges

It should be recalled that the choice of the Network Readiness Index (NRI) is explained by the fact that "is a key indicator of how countries are doing in the digital world" and thus gives an indication of the ability of a country to engage in digital transformation.

There are 3 groups of countries in relation to the revenue High, middle, low; the 2 countries in the high class have a score above 60 and the others taken into account by the NRI have a score between 40 and 50. These scores show that the 10 countries have heterogeneous situations of preparation for online education.

Examination of Table 2 attests to this heterogeneity and shows that among the countries in the study, 2/9 countries have a home Internet access rate of less than 50%, 4/9 countries have a home computer ownership rate of less than 50% and 2/10 have an Internet use rate of less than 50%.

Furthermore, this is confirmed by examining individual ICT skills; indeed, Table 4 shows that in 3/7 countries individuals have basic skills, in 2/7 countries individuals have average skills, and the highest rate of individuals with advanced skills is 25%. This data shows that individual ICT skills are relatively low, except for UAE and Saudi Arabia.

However, it should be noted that these data are general for countries; data corresponding to the above-mentioned indicators and specific to the different stakeholders (teachers, students, and administrative staff) in higher education are not available. Such ICT skills are essential for digital transformation especially in situations of massification of higher education.

If we look at the number of students in the Arab world, according to ALECSO, it was 11,869,190 in 2020, and it is likely that this number will increase in the coming years in relation to the improvement of the standard of living, which may create a challenge for academic institutions.

Tab. 16 Challenges related to the environment and ICT skills

Infrastructure

- Lack of home computer ownership in middle and low income countries
- Insufficient Internet access and use in middle and low income countries

ICT skills

- Insufficient individual ICT skills in middle and low income countries

Number of students

- Large current number of students and prospects for increased student enrolment

4.1.2. Analysis of the Institutional policies, planning, and initiatives component and key challenges

The development of national digital transformation policies and strategies is not widespread enough in the countries analyzed. Indeed, only 4 countries have developed digital transformation policies and strategies. It should be noted that the countries that have developed strategies have chosen to define fairly ambitious objectives, even in terms of quantity and quality. In some cases, they have defined structures and mechanisms for support, monitoring and evaluation.

The strategies were developed for the four countries based on their mutual concerns. Each country has taken the components that concern it according to its readiness for online higher education. As a result, their strategies are difficult to compare.

In addition, the UAE have developed partial strategies by domain. The UAE would benefit from integrating the elements of its partial strategies while ensuring that all the dimensions of the framework we propose (see paragraph 4.3.2) are covered.

At the level of the digital environment, some countries such as Algeria, Morocco, Tunisia, and Yemen have taken specific measures at the level of higher education to create a specific university network. This type of network is used to ensure the interconnection between academic institutions as well as with the outside world, to ensure access to the network to teachers, students and administration, to pool hardware, software and human resources.

To manage the network, each of these countries has set up a specialized entity that provides hosting, storage, cloud, common platforms and other services necessary for digital transformation.

The Covid pandemic that prompted the rapid shift to online distance learning has exposed the digital divide and inequity in student computer ownership and home Internet connections.

About Digital transformation culture building, the Covid pandemic has also revealed the lack of dissemination of digital culture.

However, some initiatives have been taken to:

- train teachers, students and administrative staff;
- create support structures for teachers and students to accompany them in the appropriation of digital culture.

Spreading the culture of digital transformation requires efforts on a larger scale.

At the level of the Institutional support for Digital Teaching and Learning dimension, support structures have been created in 5 countries:

- in Egypt: The National E-Learning Center, Open education centers in public universities, IIOE Egypt National Centre;

- in Tunisia: the Virtual University of Tunis;

- in Saudi Arabia: National eLearning Center;

- in Jordan: National Center of E-Learning and Open Educational Resources;

- in Yemen: "Yemen Centre for Information Technology in Higher Education" (YCIT-HE).

These centers have been entrusted with one or more missions that go beyond being a support center for digital learning. They have played an important role in the support activities of Digital Teaching and Learning and in its dissemination because of their capacity to have human resources who have acquired experience and know-how that is beneficial to the entire higher education system.

Tab. 17 Challenges related to the Institutional policies, planning, and initiatives component

Policy and strategy
• 6 out the 10 countries lack policies and strategies for the digital transformation of higher

education
- Lack of regulatory framework for organizing and accounting for digital learning in most countries

Digital environment

- Absence in 7 countries of a specific university network and a specialized entity for its management
- Inequity in student computer equipment and home Internet connection

Digital transformation culture building

- Insufficient dissemination and appropriation of digital culture

Institutional support for Digital Teaching and Learning

- Inexistence in 5 countries of entities responsible at the national level for Digital Teaching and Learning support

4.1.3. Analysis of the Teachers and Teaching component and key challenges

Within this component, countries have launched teacher training programs to acquire skills in digital education. For example:

- In Saudi Arabia, the training is sanctioned by certificates; each of the following 3 certificates is achieved at two levels: eLearning Leadership (eLL) Certificate, eLearning Content Development (eLCD) certificate, in Online Teaching/Training (OTT) professional Certificate;

- In Tunisia, the training in Online Training Engineering (IfeL) is carried out in hybrid mode and allows to acquire 7 skills;

- In UAE within HTC, a partnership with a private company has been adopted to provide 3 training courses with certification.

In addition to these actions at the national level, academic institutions have taken initiatives in this area (see paragraph 3.2.2).

Tab. 18 Challenges related to the Teachers and Teaching component

- Generalize digital teaching training and certification opportunities for all teachers
- Insufficient incentives for teachers to engage in digital teaching

4.1.4. Analysis of Digital Learning and Transformation Component

All 10 countries have gone digital and have implemented e-learning platforms and support tools. However, little information is available on the feedback and more particularly on the pedagogical aspects. It is worth mentioning that digital L&T requires moving away from traditional pedagogy to adopt new pedagogical approaches such as active pedagogy and especially flipped classes, project-based pedagogy, problem-based pedagogy, etc.

Digital learning and transformation requires the definition of clear and measurable objectives that can provide a framework for monitoring and evaluation. For example, Jordan has set a target in its

Executive Action Plan for the Integration of digital learning and teaching for the academic year 2022-2023: a minimum of 20% of the courses in each training program to be delivered entirely through online learning; a minimum of 30% to 40% of the courses in each training program to be delivered through hybrid learning; and the remainder to be delivered face-to-face. However, the objectives must be defined realistically according to the resources and the level of preparation of the country while leaving room for maneuver to the institutions.

Tab. 19 Challenges related to the Digital Learning and transformation component

- Lack of feedback, especially on the pedagogical aspects of digital teaching
- Little adoption of new pedagogical approaches more adapted to digital teaching
- Lack of clear and measurable objectives for digital teaching in most countries

4.1.5. Analysis of the QA for digital T&L component and key challenges

Two countries, Iraq and Saudi Arabia, have developed quality assurance frameworks specific to digital teaching and learning, and Saudi Arabia has tasked the National eLearning Center with quality assurance.

Other countries have bodies in charge of the quality of higher education, but they are generalist without concern for the quality of online education.

However, no published results on the quality assessment of online learning are available.

Tab. 20 Challenges related to the QA for digital T&L component

- 8 countries lack specific quality assurance frameworks for digital teaching and learning
- Absence of bodies responsible for the quality of digital teaching and learning in most countries
- Lack of publication of results on the evaluation of the quality of online learning

4.2. Analysis of the digital learning situation, main challenges and recommendations at the institutional level

This section presents the analysis based on the data collected on the 15 academic institutions mentioned in section 3 and related to the 10 countries defined for this study.

The analysis refers to the different components indicated in the framework:

- Institutional policies, planning, and initiatives;

- Teachers and teaching;

- Digital Learning and transformation;

- Quality Assurance for digital Teaching & Learning.

4.2.1. Situation Analysis on Institutional policies, planning, and initiatives :

The analysis of the information available on this component for the 15 institutions leads us to make the following observations:

In relation to **Digital Transformation strategies/policies** within institutions:

- The country's commitment to Digital Transformation as a whole is not a determining catalyst for academic institutions to embark on the Digital Transformation path. However, the existence of a specific national Digital Transformation strategy for higher education does support the emergence of institutional strategies/policies;

- The fact that an institution is private is not a determining factor for it to have a Digital Transformation strategy/policy;

- Institutions in low-income countries do not have a Digital Transformation strategy/policy;

- Institutions in high-income countries have ambitious strategies. The issue of financial means can be a determining factor for an institution to adopt and implement a Digital Transformation strategy.

Tab. 21 Institutional challenges related to the Policy and Strategies component

- Lack of a strategy for Digital Transformation at the institutional level in most institutions,
- Very large disparity in the digital skills of students upon arrival at the university,
- Inadequacy of the institutional regulatory framework organizing the teaching profession in higher education, to the new practices dictated by digital teaching and learning,

In relation to the digital environment and infrastructure within institutions:

- Institutions in high-income countries are well positioned on the 3 components related to the Digital Environment and Infrastructure, helped by the fact that students have the appropriate equipment off campus;

- Institutions in the middle-income group are not on the same level of equipment to move to Digital T&L. The institutions of Egypt and Tunisia seem to be the best equipped and prepared among the other institutions in the group;

- Although information is not available for institutions in the low-income country group, it appears that these institutions are experiencing difficulties in this area.

Tab. 22 Institutional challenges related to the Environment and Infrastructure component

- Inadequacy of digital infrastructures within institutions, especially those in middle and low income countries, to the requirements of Digital Transformation and digital teaching and learning (connectivity of spaces within the institution, availability of equipment in rooms, collaborative spaces, library),

- Social disparity of students within the institution that may exacerbate inequalities in the face of digital learning requirements (access to personal equipment and Internet connectivity from home),

- Very large disparity in the digital skills of students upon arrival at the university,

In relation to Culture Building:

- The experiences of the different institutions are diverse but remain basic for the most part. The "Digi Campus" experience is very interesting and should be remembered as an example of good practice,

Tab. 23 Institutional challenges related to the Digital Culture component

• Staff, faculty and students within institutions could become a barrier to Digital Transformation if they are not digitally literate,

In relation to the institutional support component:

- Not having detailed information on the different experiences, it is difficult to draw precise lessons. However, it seems that the experiences of the UVT (in Tunisia) and the Saudi Electronic University (KSA) are relevant in order to have a critical mass and to capitalize on the lessons learned and skills acquired for the benefit of the entire sector. This observation is true for institutions that are part of a network of institutions that benefit from the accumulated experience and know-how of the network,

Tab. 24 Institutional challenges related to the Institutional Support component

• The absence of a support structure within the institution that accompanies the stakeholders in the Digital Transformation process and ensures the monitoring, can be extremely detrimental to the progress of the transformation project and its advancement with the required efficiency

4.2.2. Analysis of the institutional situation at the Teachers and teaching level:

Analysis of the information gathered on the experiences of the different institutions shows that:

- The nature of the skills covered by the training provided to teachers (if any) depends on the institution's policy on online course production: teachers produce online courses by themselves, or have access to online courses produced by other organizations inside or outside the institution,
- Most institutions have not provided training in online teaching pedagogy and the different approaches that the technology allows,
- Three experiences seem to be the most comprehensive in this respect: those of UVT (Tunisia) with the IFEL programme, of HCT (UAE) with the eTeacher programme and NeLC (KSA). These institutions have adopted comprehensive teacher training programs with different levels that lead to recognized certifications. These experiences deserve to be studied closely for possible examples of good practice.

Tab. 25 Institutional challenges related to the Teachers and teaching component

• The evolution of digital technologies and pedagogical practices risks rendering teachers' skills obsolete if there is no framework to ensure continuous adaptation and training in a

recognized format within and outside the institution,
- The adoption of digital teaching and learning and its implementation requires a great effort from teachers that the traditional framework governing the teaching profession cannot value

4.2.3. Analysis of the institutional situation on Digital Learning and transformation

Analysis of the information gathered on the experiences of different institutions suggests the following observations:

- The use of LMS is a given for most institutions. The LMS Moodle is the LMS of choice for most, especially since it is the world leader, in addition to being open source with features that are constantly evolving;

- The pedagogical approaches used show a strong bias in favor of the blended approach. However, very few institutions explore other more innovative approaches, or diversify the pedagogical approaches according to the learning objectives;

- The use of MOOCs seems to be a direction that is slowly taking hold in some institutions;

- The experience of HCT (UAE) on new pedagogical approaches should be closely analyzed and could be an example of good practice, both regarding the tools used as well as the analysis of the adequacy of the pedagogical approach in relation to the learning objectives,

Tab. 26 Institutional challenges related to the Digital Learning and transformation component

- Lack of ongoing evaluation of new technological and pedagogical practices,
- Producing online courses is very expensive and may not be sustainable for institutions in middle- and low-income countries. The use of Open Education Resources is a way to capitalize on experiences and reduce the cost for all.
- The relative scarcity of quality online courses in Arabic can be a handicap for the development of digital teaching and learning in some university programs,

4.2.4. Institutional Situation Analysis on Quality Assurance for Digital Teaching & Learning

The analysis of the information available on this component within the various institutions leads us to make the following observations:

- 8 of the 15 target institutions do not have a quality assurance policy or associated standards for assessing the quality of education provided. Let alone a quality assurance framework for distance education;

- The seven institutions that have a quality assurance framework for distance education either belong to the group of high-income countries or are part of a university distance education network. This suggests that the demands of implementing a quality assurance framework may be daunting for some institutions that cannot afford to have adequate qualified staff or to carry out the necessary reflections and assessments;

- The institutions that have a quality assurance framework for distance education have a specific structure that ensures the definition of policies and the monitoring of their implementation. All of these structures are part of the institution's organizational chart, but some are elevated to the highest level of the hierarchy and headed by a Vice-Dean or Vice-Rector.

Tab. 27 Institutional challenges related to the Quality Assurance for Digital Teaching & Learning component

- Lack of policies, strategies and quality assurance framework
- Lack of expertise in quality assurance
- Lack of quality assurance structures
- Lack of involvement of academic institutions in international partnerships in the field of quality assurance

4.3. Recommendations

The recommendations presented in this section are based on all the previous sections of this report and more specifically on the good practices. The recommendations are to be considered according to the situation of the country in the process of digital transformation of higher education in relation to the components of the Dx framework (see Fig. 4). They will be presented according to the components indicated in the framework for both the country and the academic institutions.

4.3.1. Recommendations on the general situation of the country

Two essential aspects without which digital transformation cannot take place: the infrastructure and the skills of the stakeholders.

R1: Accelerate access to broadband Internet throughout the country.

R2: Undertake initiatives to provide families with home computers and affordable access to the Internet.

R3: Develop new and strengthen existing initiatives to enable individuals to acquire ICT skills.

R4: Expand ICT skills to all high school students in preparation for college.

4.3.2. Recommendations for Institutional policies, planning, and initiatives

For countries that have not yet developed strategies, there are several reasons for developing a strategy, including:

- Technological change: academic institutions often embrace digital technology to improve their teaching and reputation, reduce costs, improve agility and flexibility, and provide better services to their students;

- The change in culture: students belong to increasingly connected generations, and it has therefore become imperative for universities to adapt their teaching to their expectations, to provide them with a better academic experience and to support them in their efforts to succeed;

- Changes in professions due to digital technology: the digital transformation of higher education allows students to be better prepared for changes in professions and the professions of the future.

Policy and strategy

R5: Develop policies and strategies for the digital transformation of the higher education sector and develop strong leadership around this project.

In order to have a framework for the development of their policies and strategies, it is proposed that countries that do not have one use the Digital Transformation Framework for Digital Learning in Higher Education developed by EDUCAUSE[57] (called Dx framework). This framework consists of seven components: digital learning technologies, instructional modalities, personnel and support services, organizational policies and planning, instructor development, learner development, and partnerships as shown in the figure below.
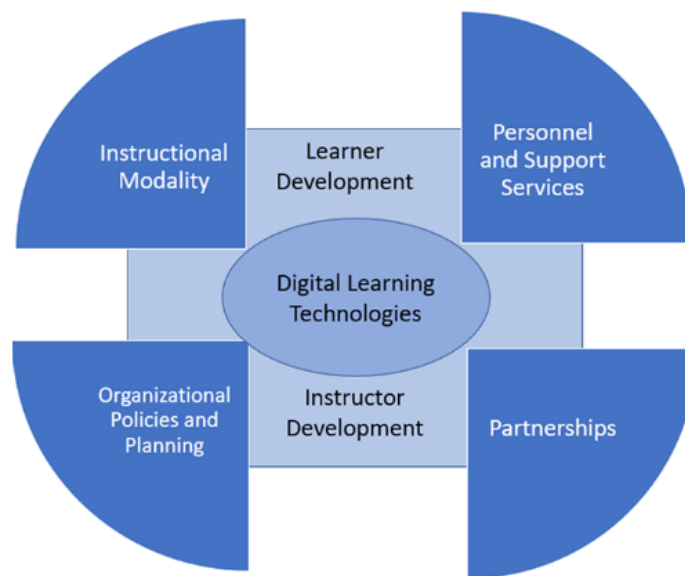
Fig. 4 Digital transformation policy and strategy development framework for digital learning (Dx framework)

R6: Invite all academic institutions to adopt a Digital Transformation strategy, in line with the national strategy and taking into account their specificities.

R7: Develop a regulatory framework for organizing and accounting for digital learning at the country level.

Digital environment

R8: Create a specific inter-university network with appropriate bandwidth and entrust its management to a specialized entity.

R9: Strongly encourage universities to equip classrooms and libraries with workstations for greater equity among students.

R10: Develop agreements with ICT equipment suppliers to enable students to acquire PCs at favorable conditions.

R11: Develop agreements with Internet service providers and telecommunications operators to provide students with Internet access on favorable terms.

Digital transformation culture building

R12: Undertake new training initiatives and strengthen existing ones to intensify and generalize the culture of digital transformation among teachers, students and administrative staff that covers technological, pedagogical, ethical, and regulatory aspects.

Institutional support for Digital Teaching and Learning

R13: Strengthen and generalize support structures for digital teaching and learning for all countries and network these structures to share and disseminate experiences and good practices.

R14: Strengthen and generalize support structures for digital teaching and learning within each academic institution and encourage the sharing and dissemination of experiences and good practices.

4.3.3. Recommendations for the Teachers and Teaching component

R15: generalize and ensure the sustainability of teacher training, enabling them to acquire skills in digital teaching so that they are in tune with technological and pedagogical developments and thus enable them to meet students' expectations.

R16: Provide teachers with the opportunity for certification upon completion of training to gain skills in digital teaching; For this purpose, the IIOE framework can be taken into account.

R17: Provide incentives for teachers to develop their digital teaching skills and contents.

4.3.4. Recommendations for the Digital Learning and transformation component

R18: Define clear and measurable objectives for the integration of digital teaching and learning at the national level (ratios of online, blended, face-to-face teaching) while leaving room for flexibility to institutions.

R19: Encourage academic institutions to practice new pedagogical approaches more adapted to digital teaching and learning and to share good practices with other institutions.

R20: Develop and implement evaluation guides for digital teaching and learning practices and encourage the dissemination of good practices.

R21: Encourage academic institutions to join the Open Education Resources initiative and contribute to its development.

4.3.5. Recommendations for the QA for digital T&L component

R22: Develop a quality assurance framework for digital teaching and learning in consultation with stakeholders.

R23: Mandate a body to monitor and evaluate digital teaching and learning.

R24: Publish the results of the digital teaching and learning quality assessment.

R25: Develop partnerships with other countries and organizations specializing in digital teaching and learning quality assurance to share best practices and ensure continuous upgrading.

R26: Encourage academic institutions to establish a specific body for the development, monitoring and evaluation of digital education quality assurance within the institution and provide it with the necessary leadership to involve and mobilize all stakeholders within the institution.

5. Appendix: Teacher Professional Development in Digital Teaching

The International Centre for Innovation in Higher Education under the auspices of UNESCO (UNESCO-ICHEI) has recently launched a micro-certification framework to advance the professional development of HEI teaching staff through the International Institute of Online Education (IIOE) network.

In this context, and following exchanges between ALECSO and UNESCO-ICHEI, we add this appendix on the professional development of teachers to the above-mentioned study.

The team responsible for drafting this report drew up a supplementary questionnaire which was sent to the country experts and is presented below. The findings are presented in paragraph 5.2.

5.1. Additional questionnaire about Teacher Professional Development in Digital Teaching

Thank you for the information you provided in connection with the study on "digital transformation of higher education teaching and learning in Arab Region" initiated by UNESCO in cooperation with ALECSO.

We would like to inform you that the International Centre for Innovation in Higher Education under the auspices of UNESCO (UNESCO-ICHEI) has launched a micro-certification framework to advance the professional development of HEI teaching staff through the International Institute of Online Education (IIOE) network.

In this context, and following exchanges between ALECSO and UNESCO-ICHEI, we would like to add a section on the professional development of teachers to the above-mentioned study.

We therefore kindly ask you to complete the additional questionnaire below and return it to us as soon as possible.

Question 1: Have you devised a policy for teachers' professional development in relation to digital teaching?

- At national level:

    Yes ☐   No ☐

If yes, please give a brief description and provide references.

……

……

- At the level of the university to which your institution is attached:

        Yes ☐   No   ☐

If yes, please give a brief description and provide references.

……

……

- At the level of your institution:

Yes ☐   No ☐

If yes, please give a brief description and provide references.

……

……

Question 2: Is the teacher's professional development program for digital teaching certified by a Micro-Certification?

Yes ☐   No ☐

If yes, please give a brief description and provide references.

……

……

Question 3: Is this micro-certification taken into account in the teachers' professional career development?

Yes ☐   No ☐

If yes, please specify how the micro-certification is taken into account in the teacher's career development and provide references.

……

……

5.2. Synthesis of country expert responses about Teacher Professional Development

The questionnaire was sent to all 10 country experts. Only 2 respondents did not complete the questionnaire. The table below summarizes the responses from the 8 country experts.

Item	Egypt	Jordan	Mauritania	Morocco	KSA	Tunisia	UAE	Yemen
Policy for teachers' professional development in relation to digital teaching:								
- National Level	No	Yes	Yes	Yes	Yes	No	Yes	No
- University Level	No	Yes	Yes	Yes	Yes	Yes	Yes	No
- HEI level	No	Yes	Yes	Yes	Yes	No	Yes	No
Professional development program for digital teaching certified by a Micro-Certification	No	Yes	No	Yes	Yes	Yes	Yes	No
Micro-certification considered in the teachers' professional career development	Yes	Yes	No	No	Yes	Yes	Yes	No

The country experts' responses have largely been incorporated into the main text of the report. The comments below serve to highlight and summarize the main findings of the survey.

The responses show that the majority of countries (6/8 respondents) have adopted a policy for teachers' professional development in relation to digital teaching. Such policies have also been drawn up by the majority of universities and institutions (5/8 respondents). However, respondents did not always give official references to these policies.

In addition, the majority of countries (5/8 respondents) issue micro-certifications to participants in digital teaching training courses. As in the case of question 1, respondents did not always provide official references.

As for the consideration given to micro-certification in the career development of teachers, 7/8 respondents indicated that it is taken into account in the recruitment/promotion of teachers and most often as part of the criteria relating to pedagogy, even though it is not compulsory in all cases.

Finally, it should be mentioned that some respondents added new references. These references are : Mauritania[58], [59], Morocco[60],[61], KSA[62], UAE[63],[64],[65],[66],[67].

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