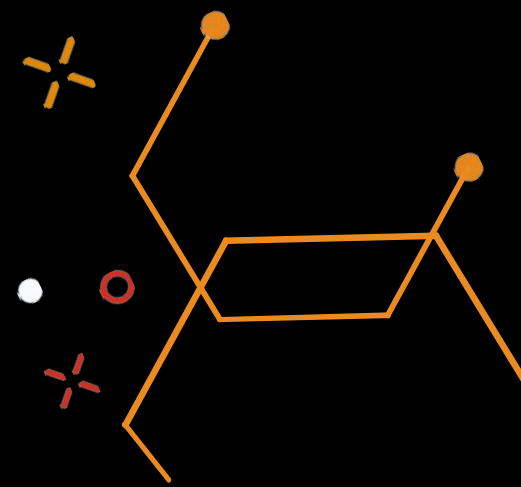# Elevating education with emerging technologies:

## why the GCC should prioritise adoption

pwc

Contents

Executive summary

Over time, emerging technologies have demonstrated their staggering capabilities across multiple spheres of activities. Globally, many sectors have already integrated emerging technologies into their operations to significantly boost growth and development. Within educational settings, their careful integration has been proven to enhance learners' experience substantially.[1]

In today's rapidly digitising world, we argue that countries within the Middle East, including the Gulf Cooperation Council (GCC) countries (Saudi Arabia, the UAE, Qatar, Kuwait, Oman, and Bahrain), can benefit immensely by adopting these advancements to transform their education ecosystems. These benefits, however, must be seen in conjunction with risks and challenges which warrant careful consideration.

GCC countries have, over time, been gradually integrating digital technologies into education. However, long-term digital transformation depends on a robust ecosystem where stakeholders collaborate to enhance the quality of education through emerging technologies. The road to this ambitious goal has several challenges hindering the process of digital integration with education in the **GCC:**
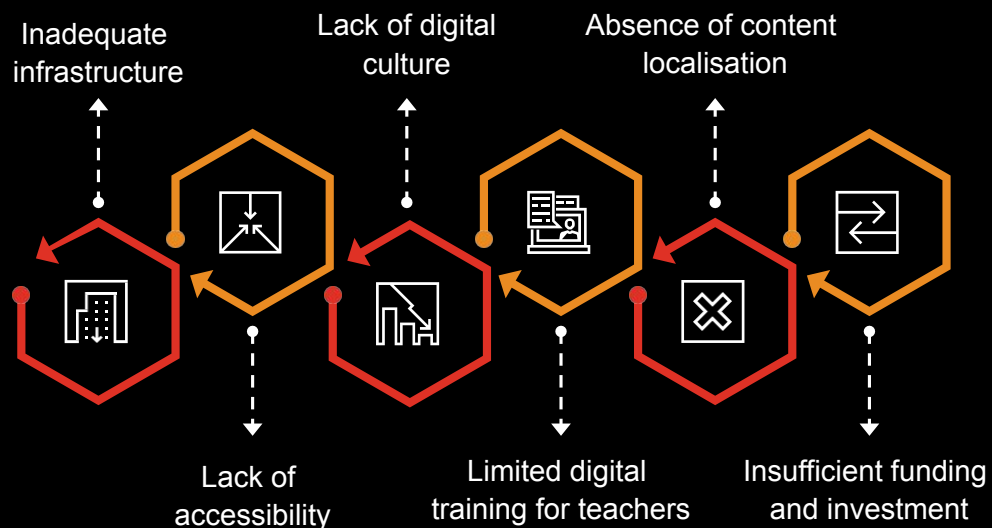
With the objective of addressing these challenges and simplifying the planning and execution of a tech-enabled education strategy, we at the Education and Skills practice at PwC Middle East designed the PwC digital education wireframe, a meticulously structured framework built using five pivotal pillars, each representing a key domain crucial for enabling the sustainable transformation of digital education within the region.

This Wireframe helps us provide policymakers and other primary stakeholders with five key recommendations towards a holistic approach for this transformation. It is enabled through consistent engagement with the interconnected pillars focussing on strategic enablement, requisites identification, education delivery, operational enablers, and educational outputs. Educational institutions and decision-makers can, by utilising this framework, harness the transformative power of emerging technologies and foster an educational ecosystem that not only addresses the present needs but also shapes the future of learning and development in the GCC.

Inadequate infrastructure

Lack of digital culture

Absence of content localisation

Lack of accessibility

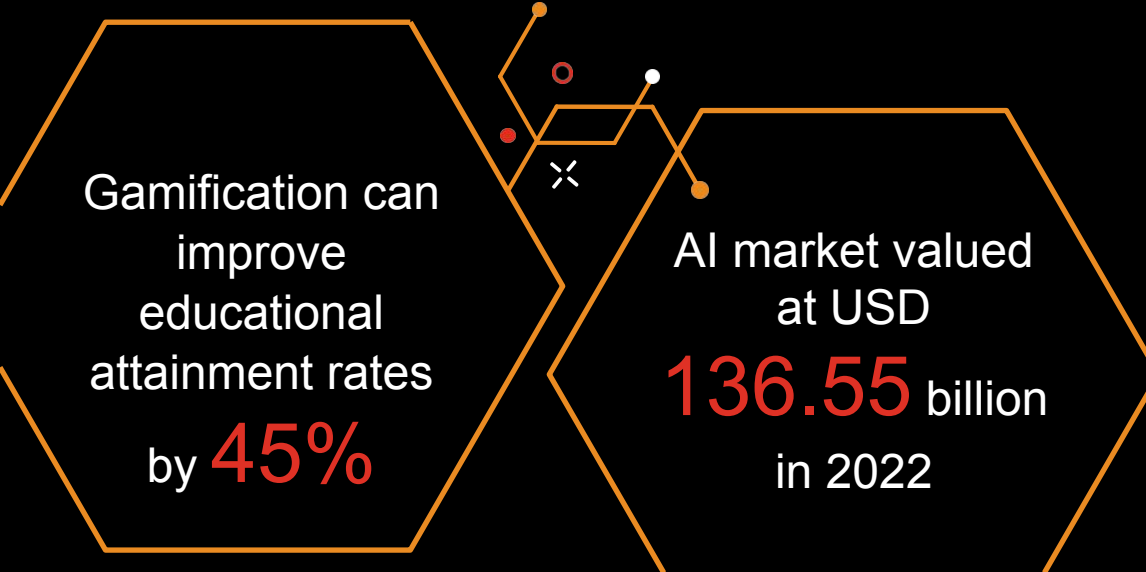Limited digital training for teachers

Insufficient funding and investment

A message from Roland Hancock
Education and Skills Leader, PwC Middle East

Step ① Open your device camera

Step ② Scan the QR code

Step ③ Point your camera at the image and enjoy

3

1 Transformative influence of EmTech

Over the past few years, the growth of emerging technologies has accelerated, bringing in unprecedented change across a wide variety of fields and industries. Generative Artificial Intelligence (GenAI) tools like ChatGPT, which can craft cover letters, breathe life into poetic verses, and even impersonate literary giants like Shakespeare; Generative Adversarial Networks (GAN)-based tools like DALL·E, which can design captivating images and videos from textual descriptions; and collaborative research platforms like Overleaf, which enable collaborative writing and sharing of research papers, have created a presence that cannot be ignored.

Along with the metaverse, augmented reality (AR) and virtual reality (VR), these emerging technologies are significantly impacting the way we work, interact, and learn. Not surprisingly, their exciting range of outcomes, from the mundane to the wildly imaginative, have captivated the minds of the digitally-enabled across the world. Many sectors, from healthcare to entertainment and retail, have already integrated emerging technologies into their operational frameworks to boost growth and development. In fact, the relatively young global AI market was valued at a massive USD 136.55 billion in 2022 and is projected to record a CAGR of 37.3% from 2023 to 2030.[2]

Within educational settings, the integration of immersive technologies such as AR and VR to provide digitally constructed environments has already been proven to enhance learners' experience through curriculum diversity, a broadening of access to resources, and an increase in flexibility and adaptability to learner types and styles. A recent study shows that gamification alone can improve attainment rates by 45%; this rises even further to over 60% when combined with reading in a blended approach.[3]

The European Commission's recent Digital Education Action Plan includes guidelines that aim to facilitate more personalised, flexible, student-centred teaching and calls for greater cooperation on digital education at the European level.[4]

Besides institutions of higher education, schools worldwide are integrating these technologies into their curricula to deliver interactive experiences that provide the dual benefit of immersive learning and a level of connection with students and their modern lives that traditional, paper-based learning can no longer deliver by itself. The next decade is likely to see these emerging technologies become mainstream tools that are used 'live' in classrooms to provide a level of experience and customisation currently in nascent stages.

Worldwide, educational institutions and affiliated enterprises have begun incorporating immersive technologies not only to provide digitally constructed environments to enhance learning but also to streamline enrolment and administrative processes due to substantially reduced costs associated with storage, transaction, management and maintenance of educational records, and reduced risk of error and security.

Gamification can improve educational attainment rates by 45%

AI market valued at USD 136.55 billion in 2022

How educational institutions are harnessing emerging technologies

Education

Harvard University has been using virtual immersion to allow French learners to 'join' native speakers in parties, cafes, and homes to 'feel' the culture.[5]

The University of Westminster has constructed a virtual space for criminal law students to examine a crime scene and identify possible discrepancies.[6]

Lifeliqe is leveraging AR to help students visualise complex scientific concepts and VR to take them on field trips to inaccessible locations.

Labbaik VR has developed a VR Hajj application to prepare young Muslims before they undertake their first pilgrimage by experiencing 'actual conditions' of what to expect in Mecca.[7]

Enrollment

New York University has developed Element451 to analyse students' interactions with its website to predict their potential for success.[8]

Georgia State University is using a custom virtual assistant to send timely prompts and reminders about enrolment tasks, as well as answer students' questions, thereby reducing enrolment errors.[9]

Funderful has piloted alumni chatbots in universities such as Georgetown and La Verne to engage alumni, encourage donations, increase participation in events, and recruit volunteers.[10]

Administration

The University of Auckland has saved 23,000 hours annually, representing a 96.2% success rate for orchestration across all processes, through the adoption of Robotic Process Automation (RPA).[11]

Many other educational institutions are using RPA to orchestrate activities like scheduling meetings, tracking productivity and managing fees to improve execution, minimise human error and enable the performance of monotonous high-volume tasks more efficiently and at a lower cost.

Lastly, we argue that in our post-pandemic world where technological awareness and skills are quickly becoming indispensable towards the future of work and life, emerging technologies unlock the potential for the overall improvement of education quality, and consequently, learner performance and capabilities. Emerging technologies and their continuous advancement offer opportunities for new kinds of knowledge and skills to develop and provide more avenues for the development of interdisciplinary thinking – a key skill in today's world. As we continue to invest in -and build on- these technologies sustainably, keeping learner and educator well-being in mind, these technologies may help us push the boundaries of traditional teaching and learning and help prepare citizens for an increasingly uncertain future. In the GCC, while an interest in these technologies exists, various challenges have restrained their growth and adoption rates, leading to a cautious pace of development.
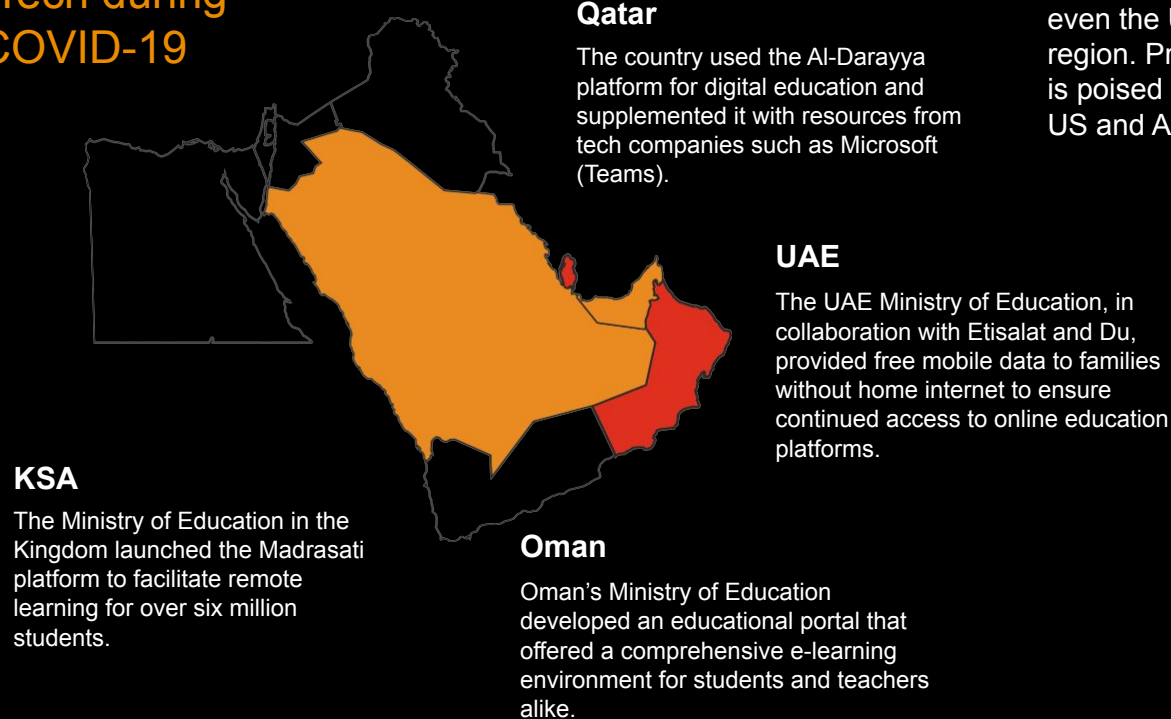
2 Challenges to adoption of educational technology in the GCC

Before the COVID-19 pandemic, educational entities in the GCC had been gradually integrating digital technologies in education. Challenges such as unequal access to technology, lack of digital literacy among teachers, and infrastructural limitations often posed significant hurdles, but the sudden onset of the pandemic necessitated an accelerated adoption of digital learning practices, prompting governments across the region to devise and implement a range of innovations, mostly driven by technology.
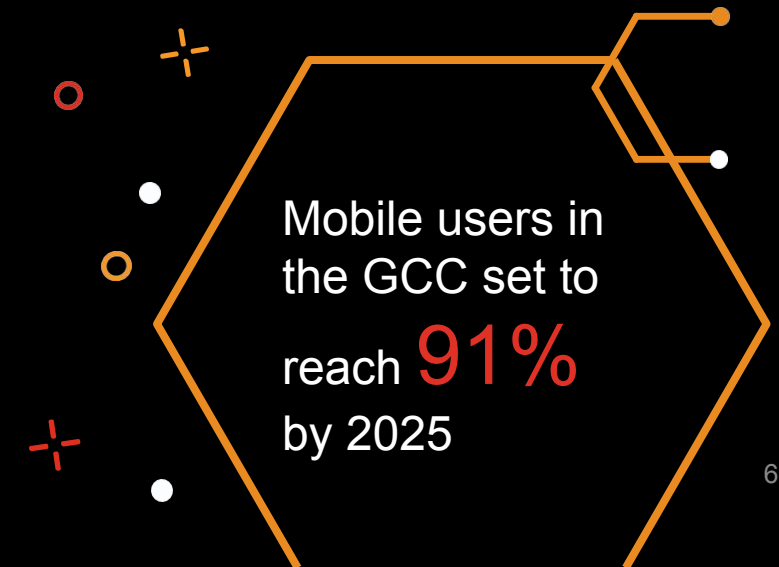
However, with the gradual return of students to classrooms, the role of learning platforms and educational technologies (EdTech) fell substantially. The ministries of education, which had established specialist tech-focussed departments during the pandemic, brought them back under the umbrella of general education. While it tempered the adoption of technology in education across GCC countries and the participation of the private sector in EdTech, this move helped refocus global efforts in education towards a more sustainable blended learning approach with effectively utilised technologies within the classroom.

Over time, an increase in technology adoption for educational purposes confirmed this move. For instance, smartphone adoption rates in GCC countries have surged with Bahrain at 97% and UAE at 96%, surpassing even the US's 86.6% in 2023 and ranking as the highest in the GCC region. Projections indicate that mobile penetration in the GCC countries is poised to reach 91% by 2025, outpacing rates of 87% and 85% in the US and Australia, respectively.[12, 13, 14]

Tech adoption in the GCC amid the pandemic

EdTech during COVID-19

Qatar

The country used the Al-Darayya platform for digital education and supplemented it with resources from tech companies such as Microsoft (Teams).

UAE

The UAE Ministry of Education, in collaboration with Etisalat and Du, provided free mobile data to families without home internet to ensure continued access to online education platforms.

KSA

The Ministry of Education in the Kingdom launched the Madrasati platform to facilitate remote learning for over six million students.

Oman

Oman's Ministry of Education developed an educational portal that offered a comprehensive e-learning environment for students and teachers alike.

Mobile users in the GCC set to reach 91% by 2025

The comparatively slower rate of successful digital integration with education in the GCC when analysed with the higher rates of smartphone penetration presents a curious picture of the present wherein the two don't seem to be positively correlated. While a higher number of smartphones points to a potential increase in access to digital education, the quality of digital integration with education seems to have more factors at play – factors which may be identified and addressed using the digital education wireframe.
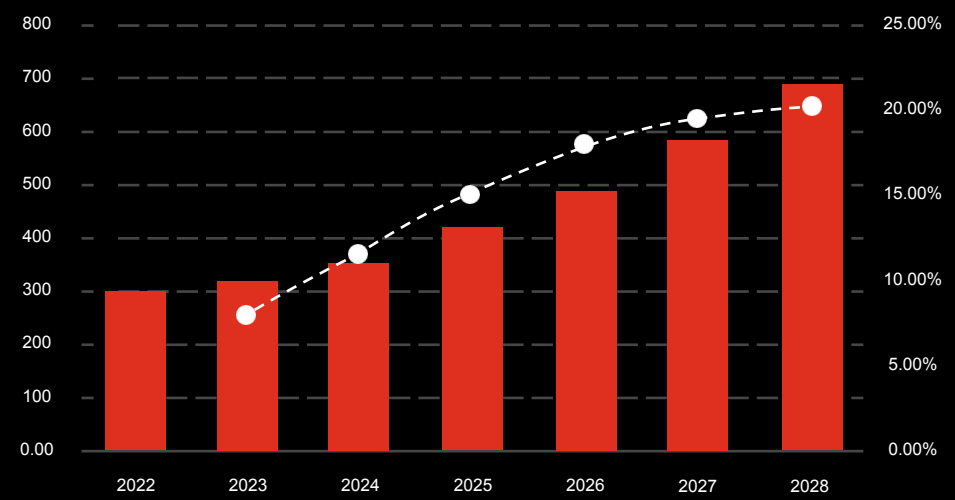
$ **The GCC EdTech market mirrors global growth trends**

Figure 1. GCC EdTech Market 2022-2028 ($ billion) CAGR 15.21%
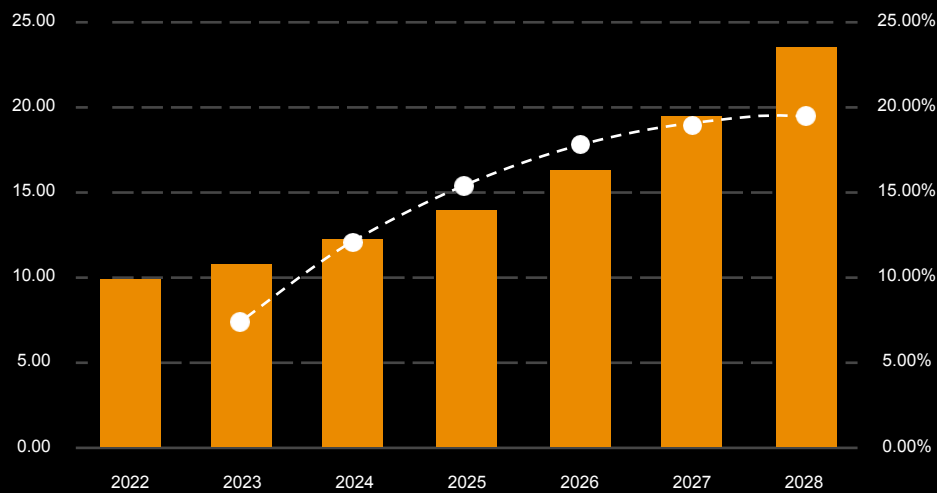
Source: Arizton, 2023.[15]

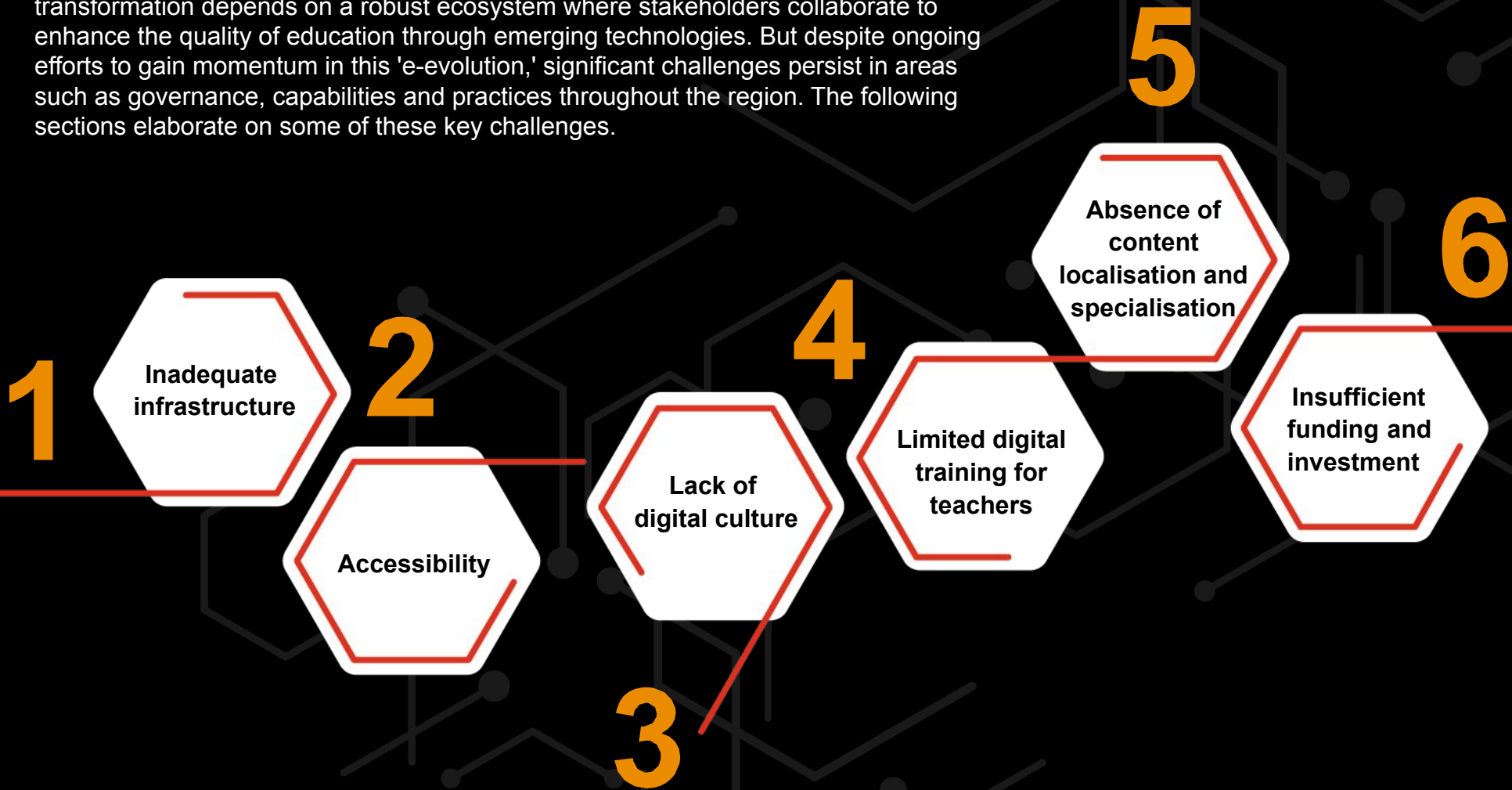**Figure 2. Global EdTech Market 2022-2028 (in $ billion)** CAGR 15.22%

Source: Arizton, 2023.[15]

The GCC region market of digital education providers saw a steady growth of 54% CAGR between 2018 and 2021, with a year on year jump of 103% in 2021, largely fuelled by the COVID-19 pandemic. Interestingly, a closer look into the region shows developments across EdTech, through government expenditure and venture capital investments
on infrastructure. For instance, the UAE Ministry of Education has expanded its budget for quality digital education integration to USD 2.7 billion in 2023.[16]

In recent times, many companies have experienced success in this space – Saudi based Noon Academy for example, is an on-demand online tutoring platform with over 9 million registered students; Abu Dhabi based Alef Education works with over 11,000 schools and 850,000+ students to augment in-classroom learning with digital platforms. However, investment in the industry has been fairly low compared to their global peers. There are other critical challenges to implementing EdTech-based learning in the region as well.

Key barriers

Many GCC nations grapple with issues related to the equitable distribution of educational resources as well as unequal access to technology. Successful digital transformation depends on a robust ecosystem where stakeholders collaborate to enhance the quality of education through emerging technologies. But despite ongoing efforts to gain momentum in this 'e-evolution,' significant challenges persist in areas such as governance, capabilities and practices throughout the region. The following sections elaborate on some of these key challenges.

5

Absence of content localisation and specialisation

6

1

Inadequate infrastructure

2

4

Limited digital training for teachers

Insufficient funding and investment

Accessibility

Lack of digital culture

3

Inadequate infrastructure

A prominent challenge is related to infrastructure availability and affordability, encompassing not only internet connectivity, but also devices required to utilise AR/VR, metaverse, and other technologies. While urban centres and elite institutions may have access to better infrastructure, schools in remote areas frequently lag behind, resulting in an uneven educational landscape.

Accessibility

Another related challenge lies around creating accessible and inclusive options and spaces for those with different needs. From a socio-economic perspective, those more privileged may have resources and opportunities otherwise inaccessible to the socio-economically disadvantaged, widening gaps in learning outcomes and, consequently, knowledge and skills. For people of determination, a lack of accessibility in EdTech that may be readily available for them is an area of concern. Designing inclusive spaces in EdTech along a number of criteria is a tedious task but should take priority if these technologies are to be sustainable and human-centric.

Lack of digital culture

Many countries in the GCC have made substantial investments in digital infrastructure. Yet, they struggle with the challenge of building digital capabilities and fostering a digital culture, and this negatively affects technology adoption across the region. On a global scale, only one in four university leaders have a digital strategy in place, with over 56% of them having isolated digital transformation initiatives.[17]

The figure is likely to be more concerning in the GCC. This lag in technology adoption hinders the development of an effective digital education infrastructure. Nevertheless, there is a reason for optimism as digital natives begin to enter the teaching profession. A 10 year longitudinal study has shown that new teachers demonstrate faster adoption of student-centred approaches with technology, outpacing their more experienced counterparts.[18]

Limited digital training for teachers

Historically, digitisation initiatives have primarily focussed on transferring traditional classroom materials into online formats, without comprehensive adaptation of teaching and learning theories, pedagogical methods and accommodating diverse learning differences. Public schools and universities worldwide are deficient in providing essential teacher training and support for ICT-based teaching methods. The situation is particularly alarming in the Middle East, where ineffective use of technology creates the risk of learner disengagement, misidentification of at-risk students and compromised concentration levels, ultimately impacting learning outcomes.[19]

Absence of content localisation and specialisation

Arab learners report that the majority of online Arabic courses fail to cater to different learning styles and levels. In comparison to foreign websites, online Arabic platforms lag behind both in terms of the range of topics they cover and their use of technology.[19]

Insufficient funding and investment

Despite the burgeoning interest in the tech start-up space, the EdTech sector in the GCC frequently struggles to garner the same level of investor attention and financial backing. This lack of financial support is slowing down the pace of innovation and adoption, hindering the ability of start-ups to scale up, and limiting the development of educational technologies tailored to the specific needs of the region.

We argue that addressing the above challenges requires, at minimum, the development of a new strategy for education systems, a body of teachers equipped with the requisite skills, and judicious use of technology to complement and enhance the teaching and learning processes.
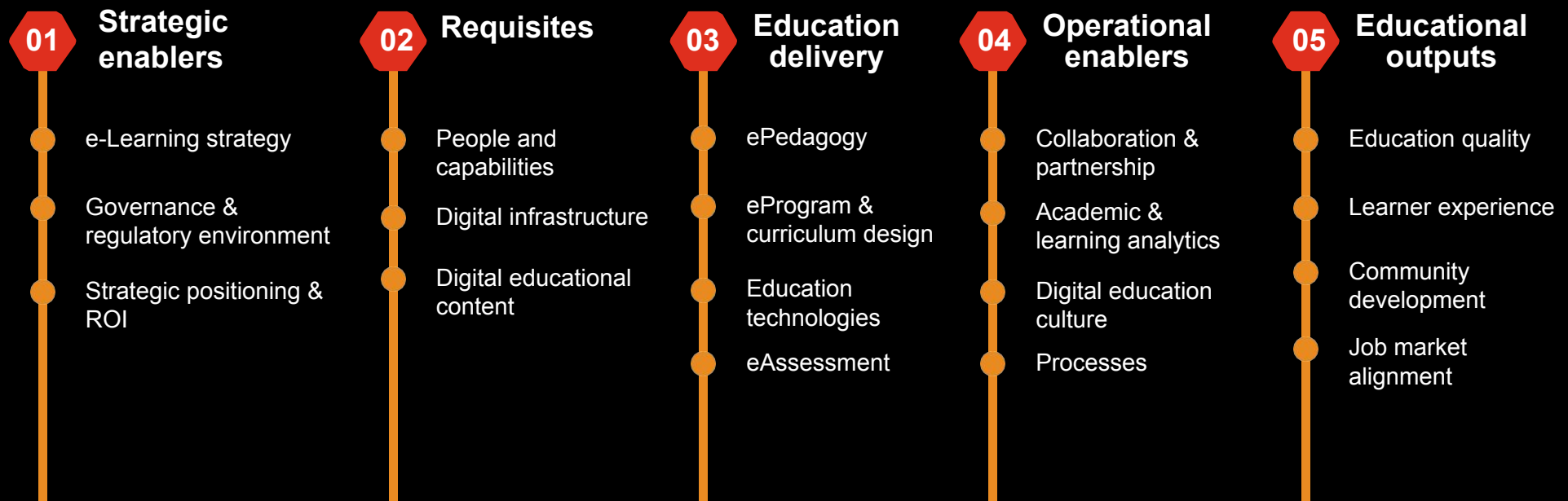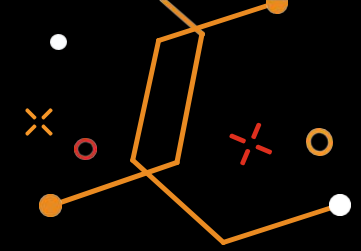
3 Strategic enablers for government and educational institutions

The educational landscape in the GCC calls for a carefully structured strategy that tackles the region's specific challenges. To simplify planning and execution, PwC has developed a structured process framework that consists of five essential pillars, each representing a critical area necessary for fostering sustainable educational progress in the region through the adoption of technology. It is designed to help governments and educational institutions in the GCC unlock the transformative capabilities of emerging technologies and cultivate an educational environment that not only caters to current requirements but also shapes the future of learning and development across the region.

PwC's digital education wireframe

01 Strategic enablers	02 Requisites	03 Education delivery	04 Operational enablers	05 Educational outputs
e-Learning strategy	People and capabilities	ePedagogy	Collaboration & partnership	Education quality
Governance & regulatory environment	Digital infrastructure	eProgram & curriculum design	Academic & learning analytics	Learner experience
Strategic positioning & ROI	Digital educational content	Education technologies	Digital education culture	Community development
		eAssessment	Processes	Job market alignment

01. Strategic enablers:

This pillar emphasises the importance of developing well-thought-out e-learning plans and strong governance and regulatory frameworks to guide them. It also addresses the challenge of insufficient funding and investment in educational technology and recommends a strategic positioning of the EdTech industry to attract investors and generate a robust return on investment (ROI). For instance, the Government of Qatar has prioritised the development of a national e-learning strategy and governance framework to ensure proper oversight of all digital education efforts in the country.

02. Requisites:

The second pillar draws attention to critical challenges related to the nurturing of skills and knowledge, such as limited digital training for teachers and inadequate infrastructure and accessibility. It underlines the need to focus on both learners and educators to create a strong digital structure that fits the region's technology landscape and develop digital educational materials that match modern pedagogical methods. For example, the Ministry of Communications and Information Technology in Egypt has led an initiative titled "National Broadband Plan" to strengthen and expand internet connectivity across the country and ensure that both students and teachers are equipped with the needed infrastructure required for e-learning.[20]

03. Education delivery:

This pillar highlights the need to create a strong "ePedagogy" that combines new teaching methods and technology while following regional curricula to deal with the absence of content localisation. It emphasises the use of emerging technologies to deliver learning as well as track students' progress. It also suggests a comprehensive digital approach to the dissemination of learning, so that GCC education systems can operate seamlessly in a tech-centric world.

The UAE has been implementing EdTech in the education sector through the implementation of AR, VR, and AI in curricula and across classes. Recently, the Minister of Education of the UAE announced plans towards developing GPT-powered AI tutors as a way to elevate the UAE's educational system.[21]

04. Operational enablers:

The fourth pillar underlines the need for collaboration and partnerships to foster educational innovations across the region. To address the lack of a robust digital culture, it refers to the establishment of academic and learning analytics to enhance delivery, as well as a culture of digital education and strong processes to ensure agility and efficiency in the education landscape. To illustrate, the Ministry of Education in Saudi Arabia has implemented a flexible learning path initiative by developing a national e-learning platform "FutureX" in collaboration with Future Learn, Udacity, Coursera, and EdX to develop professional skills in education.[22]

05. Educational outputs:

The fifth pillar centres on the outcomes of a successful implementation of educational technology within the GCC. It aims to enhance education quality, elevate the learner experience, contribute to community development, and align education with the regional job market. This pillar empowers institutions to assess and improve their impact, ensuring that GCC education aligns with the evolving needs of the region. From an academic standpoint, e-learning has been proven as an effective tool that increases the quality of education and increases the learner's self motivation, self discipline and responsibility overall.[23]

In the US, there were 2.79 million students enrolled in online universities and colleges in 2021, which represents 15% of postsecondary students in the country. Additionally, 8.5 million students register in online classes at public higher education institutions annually.[24]

01 Strategic enablers   **02** Requisites   **03** Education delivery   **04** Operational enablers   **05** Educational outputs

Analysing existing ecosystems

In order to action the Wireframe and support governments and educational institutions respond to the growing need for sustainable educational technologies, we envision the use of the Wireframe to be able to support in:
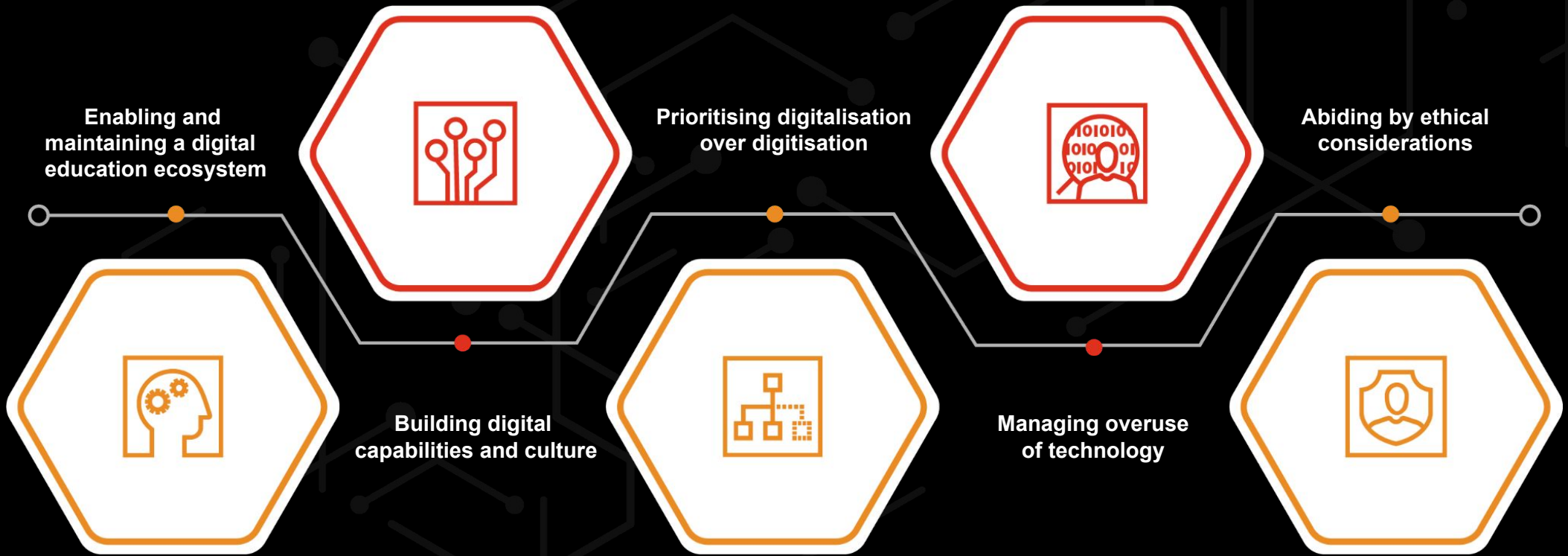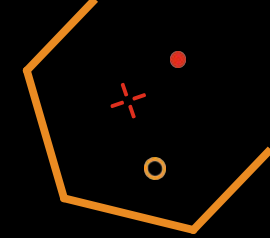
Building new ecosystems

The Wireframe may be used to assess the current state of technology adoption within EdTech ecosystems and recognise best practices across entities and countries, which could further help identify gaps across the five pillars. The gaps thus identified may be then addressed carefully to help in closing them effectively and permanently.

The Wireframe may also be used to build an entirely new and successful ecosystem for digital education and to exhaustively define entities and their roles within the ecosystem. This would include a complete overhaul of current systems and the accommodation of new, out-of-the-box thinking within the EdTech world – something that may require more investments of time and resources.

4 Recommendations: what ecosystem stakeholders need to do

Building on the strategic pillars outlined in the Wireframe, stakeholders across the GCC must place a strong emphasis on the following critical factors to enable success:

Enabling and maintaining a digital education ecosystem

Prioritising digitalisation over digitisation

Abiding by ethical considerations

Building digital capabilities and culture

Managing overuse of technology

Enabling and maintaining a digital education ecosystem

The digital education ecosystem refers to the interplay of several components. To work effectively and achieve common goals, each component needs dedicated stakeholders who own and guide them at a national or institutional level. This puts the onus of strategically enabling and maintaining the digital education ecosystem on governments and institutes vested with policy-making and administrative authority. It also calls for a clear, national-level digital education strategy and the implementation of suitable regulatory frameworks and policies.
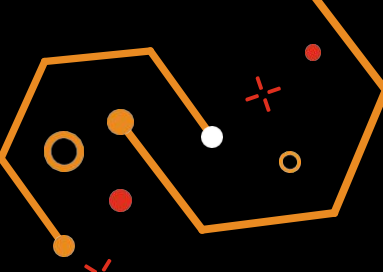
Redesigning learning environments with integrated technology not only allows for data-driven decision-making but also for improved analysis of curriculum effectiveness, resulting in a better outcome for stakeholders. Encouraging education stakeholders to use emerging technologies requires a combination of strategies and can be facilitated by providing relevant professional development, showcasing success stories and sharing achievements, offering incentives and collaborating with the existing EdTech community.

Building digital capabilities and culture

A key requisite for the successful delivery of digital education is the capacity to leverage technology for an active digital learning approach. Institutions must promote changes in teaching practices, develop teachers' technological skills and build digital capabilities among all stakeholders, including the leadership, administrators, instructors, learners and parents. Moreover, they must focus on developing a range of skills related to cybersecurity and information management, communication and collaboration, critical thinking, and creativity and innovation to enable students to navigate and interact effectively with digital tools.

Managing overuse of technology

Managing the overuse of technology in schools and universities is crucial to ensure that the educational goals are met while maintaining a healthy, engaging, and inclusive learning environment. School systems and institutional leaderships need to support a balanced approach to technology use, promoting traditional educational methods alongside digital tools. There is also a need to educate teachers, students, and parents about the potential risks associated with the overuse of technology and the ways in which they can manage screen time and use of tech devices to learn. Finally, there is a need to regularly evaluate the impact of technology on student engagement, learning outcomes, and well-being to make informed decisions.

Prioritising digitalisation over digitisation

Where digitisation is a simple process of converting physical information into a suitable digital format, digitalisation leverages data to enable intelligent decisions and provide recommendations for successful educational experiences.

Abiding by ethical considerations

The development of an ethical framework for emerging technologies encourages their safe and responsible use, which can be provided through guidelines and standards that govern the design, development, and deployment of these technologies in education systems across schools and universities. The framework should cover aspects such as privacy, transparency, accountability, and fairness.

In order to effectively implement the above recommendations and maximise the positive impact of emerging technologies in education, each stakeholder group has a dedicated part to play – without which, technology adoption within education in the GCC may fall behind international standards and development.

While governments and/or authorities must be able to set sound regulations and policies to enable the ideal environment for implementation, educational institutions and end users must recognise the importance of the set policies, supporting in the actual implementation and providing honest, unfiltered feedback. As these technologies further develop, it is estimated that this timely and honest feedback would be essential to adapting policies to ensure not only the growth of technology in education, but also the overall well-being of the beneficiaries.

Along with the creation and implementation of such policies, there is an urgent need to embrace the digital age in education across stakeholder groups. As such, recognising and accounting for the human side of EdTech is not just crucial – but critical. Issues of accessibility, wellbeing, equity, and quality lie at the heart of the promise EdTech makes to bridge disparities and empower learners. Prioritising investing in and adopting emerging technologies in education, while ensuring equitable resources, accessibility, and learner wellbeing form but the starting point in the long road ahead for stakeholders to effectively utilise the benefits that the digital age promises to offer. As contributors and active agents in this process, all stakeholder groups must work in collaboration with each other – be it governments, educational institutions, private sector entities, or the learners themselves. Using the right tools, including but not limited to the Wireframe, the GCC can revolutionise its education system and prepare its youth to become globally competitive, innovative, and skilled leaders of tomorrow.
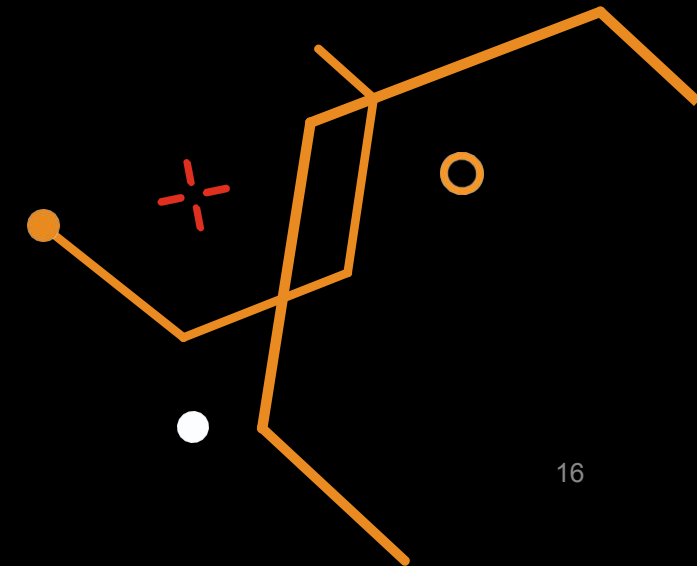
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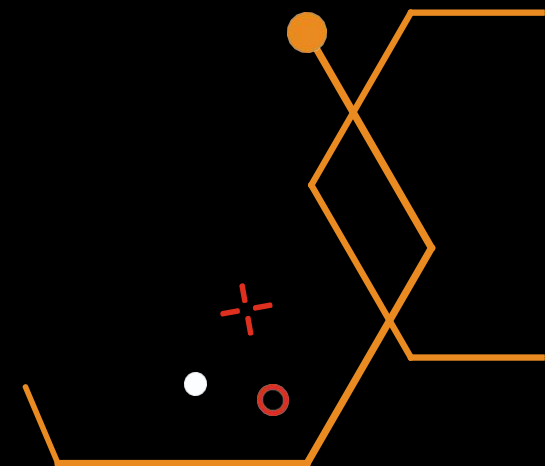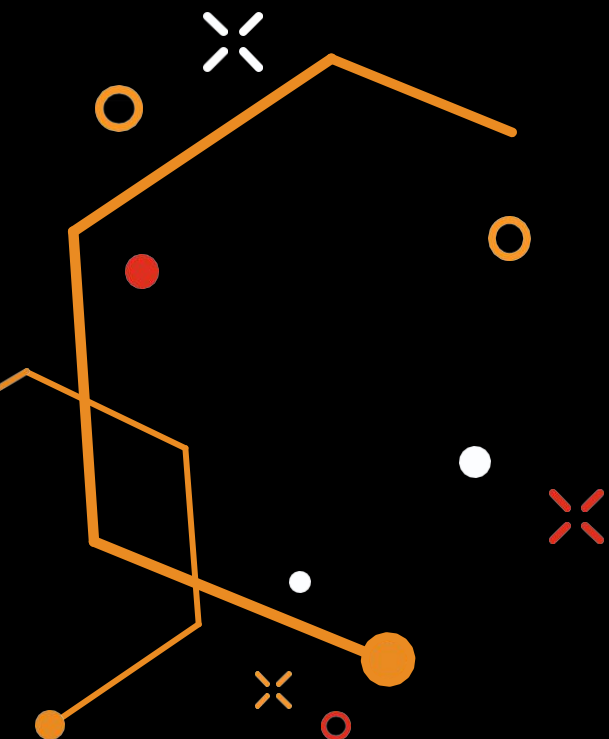
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