

WORKING PAPER

***DIGITAL TRANSFORMATIONS IN THE
MIDDLE EAST AND NORTH AFRICA:
A REVIEW OF EGYPT, SAUDI ARABIA,
AND THE UNITED ARAB EMIRATES***

Karim Merhej, IFI-Google Policy Fellow



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العامة والشؤون الدولية



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LIST OF ACRONYMS

CITC	Communications and Information Technology Commission (Saudi Arabia)
DIC	Dubai Internet City
EGDI	E-Government Development Index
EGPO	Egyptian Patent Office
EU	European Union
FDI	Foreign Direct Investment
GDPR	General Data Protection Regulation
ICT	Information and Communications Technology
IoT	Internet of Things
IP	Intellectual Property
ITIDA	Information Technology Industry Development Authority (Egypt)
KSA	Kingdom of Saudi Arabia
MASD	Ministry of State for Administrative Development (Egypt)
MBS	Mohammed bin Salman, Crown Prince of Saudi Arabia
MCIT	Ministry of Communications and Information Technology (Saudi Arabia)
MENA	Middle East and North Africa
MIIC	Ministry of Investment and International Cooperation (Egypt)
NTRA	National Telecom Regulatory Authority (Egypt)
OECD	Organization for Economic Cooperation and Development
SAMA	Saudi Arabian Monetary Authority
SDAIA	Saudi Data and Artificial Intelligence Authority
SMEs	Small and Medium Enterprises
STEM	Science, technology, engineering and mathematics
TRA	Telecommunications Regulatory Authority (United Arab Emirates)
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

As the COVID-19 pandemic ravaged the world and disrupted the way societies and economies function, the ubiquitous role that digital technologies play in our lives has become more prominent than ever. Studies on how Arab countries are undergoing digital transformations – in other words, how their economies, societies and public sectors are becoming more connected through the Internet and using the latest digital tools and technologies – remain sparse.

The recently developed Going Digital Integrated Policy Framework by the Organisation for Economic Cooperation and Development (OECD) is a comprehensive tool that examines several policy dimensions that are crucial for successful digital transformations. These policy dimensions deal with access to and usage of the Internet by citizens and businesses, tech-enabled innovations and their impacts on the labor market, the dividends that society is obtaining from digital technologies, the trust (or lack thereof) that citizens have regarding these technologies, as well as the ability of businesses to use digital technologies to their benefit (via e-commerce etc.). Each policy dimension consists of a set of indicators.

This study seeks to loosely apply the OECD framework on three Arab countries – Egypt, the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE) – in an attempt to not only broaden our understanding of the digital transformations that these three countries are going through and hence contribute to the existing literature on digital transformations in the Arab world, but to also understand policy challenges these countries encounter and what should be done to address them effectively. As the indicators of the OECD framework are very specific and data on the three case studies could not be obtained for every indicator, the study examines the existing literature to try to find an adequate substitute.

The study shows that the three countries have made significant strides since the 1990s, enacting much needed digital policies and regulations. However, much untapped potential exists which could allow the countries to make the most out of the dividends accrued by the usage of digital technologies.

In the case of Egypt:

- ▶ Currently, a significant segment of the population is not benefiting from the tremendous potential that the Internet holds. Specific efforts have to be made to ensure that access to the Internet improves across all socioeconomic levels and that the gender digital divide is reduced.

- ▶ Egypt's e-government trajectory has not reached its full potential, and much more needs to be done to digitally transform the public sector. A whole-of-government approach is needed for Egypt's public sector to transition into a digital government offering all kinds of services and procedures to citizens online. This transformation needs to be accompanied by long-overdue structural administrative reforms in the Egyptian public sector. This will not only simplify administrative procedures for investors and entrepreneurs but will also be very beneficial for the country's tech startup scene.
- ▶ In tandem with the digital transformation of the public sector, an open data portal that publishes all sorts of datasets that public bodies collect, particularly data pertaining to digital transformation-related issues, should be launched, as this open access to data would not only allow policymakers to monitor the country's digital transformation, but also allow for usage of the data by the private sector.
- ▶ Efforts must be exerted to ensure that Egyptian youth have the knowledge and digital skills necessary to partake in the digital economy, which entails reforming Egypt's public education system so that it provides digital skills to the youth and encourages critical inquiry.
- ▶ Partnerships with the private sector to develop digital skills among the youth are fragmented with seemingly little coordination. These partnerships must be placed within an overarching long-term framework to be able to properly evaluate whether they are reaching the targets and are leading to the digital transformation of Egypt, and where improvements need to be made.
- ▶ E-commerce and cloud computing in Egypt have much room to grow, and efforts to encourage citizens and businesses' engagement in e-commerce and adoption of cloud computing services should be exerted.
- ▶ Channels for academia-industry collaboration are lacking, which indirectly impacts Egypt's tech startup ecosystem. Efforts must be made to improve such linkages so that a much-needed boost can be given to the startup ecosystem.

In the case of the KSA:

- ▶ Businesses and startups in the kingdom struggle with finding Saudi employees armed with the technical and soft skills, such as leadership, critical thinking and problem-solving skills, that are in need in the digital economy. The kingdom's public education system needs to be revamped and must

include components related to digital skills as well as non-technical skills.

- ▶ Scientific collaboration across research institutes and universities must be strengthened, while breakthroughs and ideas coming out of academia must find a welcoming home in the private sector. In other words, both intra-academia and academia-industry linkages must be strengthened and supported in order to reap the most dividends out of the digital transformation.
- ▶ Existing public-private partnerships to develop youths' digital skills and encourage them to partake in the digital economy must be increased and placed within an overarching framework with clear goals so as to better be able to monitor progress made in KSA's digital transformation.
- ▶ Government-led efforts must be exerted in order to encourage the private sector to increase trust in online transactions and cloud computing services, and to assist them in their transition online and engagement in e-commerce and cloud computing.
- ▶ Data collection on digital transformation-related indicators should be improved so as to better monitor the kingdom's digital transformation, identify and highlight the gaps and challenges, and tackle them appropriately.

In the case of the UAE:

- ▶ The UAE's ICT sector has the potential to absorb Emirati nationals, particularly the youth. The country's public education system needs to be revamped and Emirati students must not only be properly equipped with the digital skills needed for the 'Fourth Industrial Revolution' but they should also be encouraged to pursue STEM disciplines, while the obstacles that bar them from doing so – such as inadequate schooling in the English language and poor preparation for such disciplines at the school level – should be tackled.
- ▶ The UAE has built an impressive scientific research ecosystem, and in recent years, efforts have been exerted to make Emirati universities more research oriented. More efforts should be exerted to ensure that intra-academic collaboration and cooperation takes place, and that linkages between academia and the private sector are established.
- ▶ Public-private partnerships to boost digital skills among the private sector and the youth in the UAE have been taking place for several years, and many Emirati businesses have benefitted and undergone digital transformations. These initiatives must be

expanded and should have components focusing on digital skills training to the youth.

- ▶ The UAE has established impressive user-friendly federal- and emirate-level open data portals. However, data on digital transformation-related indicators is not always easily accessible. The UAE's agencies devoted to conducting statistical research and gathering data should focus on gathering such data as this would allow policymakers and the private sector to better measure the country's digital transformation, identify existing gaps and act on them.

INTRODUCTION

a. Digital Technologies Changing Our World

Digital technologies have become a ubiquitous part of everyday life, impacting the way interactions within society are carried out, how organizations function, how public services are delivered, and how information propagates. Throughout history, countless intellectuals observed their surroundings and the technological developments taking place and theorized how the future might look. While some worried about the potential dangers that such technological developments could have in store, many of the predictions of the future were often utopian in nature and involved quasi-sentient machines playing a role in society. Today, in the second decade of the 21st century, such a vision is no longer as far-fetched as it might have appeared in the past. The quantum leap in digital technologies that took place since the advent of the Internet in the early 1990s has dramatically altered virtually every facet of our lives, and the full socioeconomic and political impacts of ongoing digital transformations are still being studied (West, 2011).

Generally speaking, the terms ‘digitization’, ‘digitalization’ and ‘digital transformation’ have hazy definitions and are often used interchangeably. One useful distinction which this paper will adopt is that of the Organization for Economic Cooperation and Development (OECD), which defines digitization as ‘the conversion of analogue data and processes into a machine-readable format’, digitalization as ‘the use of digital technologies and data [...] that results in new or changes to existing activities’, and digital transformation as ‘the economic and societal effects of digitization and digitalization’ (OECD, 2019, p.18).

One view of digital transformations is that of technology-driven changes from a ‘glass half full’ perspective, focusing on the positives that are generated from the usage of such technologies and how they would improve the overall quality of life. When it comes to the public sector, according to this view, governments have become leaner, more efficient and responsive, while the delivery and access of essential public services has become much easier thanks to the adoption of digital technologies by public sectors across the world. Citizens can now communicate with governmental bodies and voice their opinions and concerns with much ease thanks to social media platforms. When it comes to reducing corruption and ensuring that public funds are not wasted or embezzled, governments can use the latest digital tools to enhance transparency and provide as much information as

possible through easily accessible online portals, through which citizens and judicial authorities can then scrutinize and hold the corrupt to account. Essential social services such as education and healthcare can be irreversibly enhanced with the advent of digital technologies, with technologies giving hope that even the remotest and most downtrodden could have access to these services. Such optimistic views of technology-empowered public sectors have gained much prominence since the 1990s, and indeed, many governments across the world have become ‘digital governments’ (see Box 1), governments managed through a two-way relationship in which interactions with citizens are carried out via the latest digital tools (such as social media platforms or mobile applications) (Katsonis & Botros, 2015), and in which governments make use of cloud-based technologies and big-data to “boost operational efficiency” and “[change] the business services landscape for production, marketing, provision, access and utilization” of services and outputs (Bounabat, 2017, p.14).

Digital transformations do not happen only in the public sector. As a matter of fact, such transformations have often happened first in the private sector, with the public sector catching up belatedly. Companies in the private sector undertaking such a transformation would drastically change their modus operandi, be it through the adoption of cloud computing for better and more efficient internal management, or for delivering and advertising their products and services to as wide an audience as possible, to name but a few ways through which technology-driven changes take place in the private sector. The digital transformation of the private sector has impacts on the wider society, affecting citizens and businesses alike, with tremendous potential for positively ameliorating their lives and general well-being (OECD, 2019). For instance, e-commerce has the potential to significantly transform the economy and make it more inclusive. Defined as ‘the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders’, e-commerce paves the way for freelancers, entrepreneurs and micro and small businesses to make usage of the latest digital technologies to find potential customers or build partnerships with like-minded businesses (OECD, 2011).

Box 1: E-government and Digital Government – What’s the Difference?

In the 1990s, the notion of ‘electronic government’ (e-government in short) began to take shape, and its proponents argued that governments that became ‘e-governments’ and thus used information and communications technology (ICT) extensively in the public sector would be able to deliver services more efficiently by de-bureaucratizing public entities and improving intra-governmental links, as well as cutting costs and stimulating economic growth (Chadwick, 2016). As the Internet evolved and began to include interactive and collaborative features, and as new technological innovations became commonplace, the concept of e-government evolved as well, transforming into the term ‘digital government’ (Katsonis & Botros, 2015). While e-government was considered as mainly a one-way relationship whereby the government would provide information and services to citizens via websites, digital government is a far more encompassing concept. It is considered a two-way relationship in which citizens and governments interact with one another via the latest digital tools (such as social media platforms or mobile applications) (Katsonis & Botros, 2015), and in which governments make use of cloud-based technologies and big-data to “boost operational efficiency” and “[change] the business services landscape for production, marketing, provision, access and utilization” of services and outputs (Bounabat, 2017, p.14). Thus, governments would go through a long, complicated and obstacle-ridden process of ‘digital transformation’ in order to become a digital government so that governmental services would be provided to citizens in a very efficient and timely manner, and in turn, citizens could better access key information and governmental data in a highly transparent manner, and be able to voice their concerns, grievances and opinions to governmental organizations – all via digital tools (Sandoval-Almazan et. al., 2017).

The Coronavirus pandemic came as a sort of shockwave which highlighted how ubiquitous digital technologies are to our everyday lives. As economies all across the world halted, and as citizens quarantined themselves at home, digital technologies proved to be a lifeline to many. Students in schools and universities managed to continue their studies thanks to digitally enabled remote learning; many workers managed to work remotely from home; and businesses rapidly scrambled to ‘go online’ and sell their goods and services through e-commerce. It is widely believed that such significant technologically enabled behavioral changes in the way we live our lives, engage in work and produce and consume, will outlast the pandemic (Standage, 2020).

With this being said, critically understanding the implications that digital transformations have on our lives is of the utmost importance.

b. Digital Technologies and the Middle East and North Africa Region: An Understudied Area

The Middle East and North Africa (MENA) region has not been insulated from global technological developments. Since the early 2000s, Internet diffusion rates in Arab countries have steadily increased, with several Arab governments rapidly seeing the commercial potential of the Internet and its ability to boost economic growth, and thus striving to reduce the ‘digital divide’ and ensuring that a proper Internet infrastructure is in place (Abdulla, 2007). Over the

past decade, and especially following the 2008 global financial meltdown, numerous Arab governments have called for undertaking drastic digitally empowered transformations in both public and private sectors, and for transitioning towards a ‘knowledge economy’, a term that is as popular as it is hazy in the discourses of governments and international organizations. Undergoing digital transformations in the public and private sectors is seen by Arab governments as a means for boosting economic diversification, foreign investments and economic growth. Much has been written on the digital transformations that the MENA region is and has been undergoing over the past decade, focusing on the economic dimensions of such transformations and the obvious benefits that are to be accrued.

The road towards properly transitioning to a digital government and to a digital economy whereby the private sector by and large operates through the usage of the latest digital technologies and where e-commerce is omnipresent is not easy. In the MENA region, countless internal and external chronic barriers to such transformations exist, such as poor intra-governmental coordination and inadequate infrastructure (Jreisat, 1997), as well as lack of support offered to scientific research and knowledge production, which often leads to a ‘brain drain’ phenomenon (Ayubi, 1983). Nonetheless, many hopeful signs have manifested themselves in the past decades. For starters, when it comes to transitioning

to a digital government, several Arab countries have made remarkable progress since the early 2000s (see Box 2), creating user-friendly websites that provide much-needed information to citizens and businesses alike, and adopting the latest digital technologies to enhance intra-governmental operations. Concerning the private sector, Arab startups in the tech sector have been rising in numbers and impact significantly over the past decade. While the initial hopes that these startups would revolutionize Arab economies and lead to sustainable job creation have not materialized, there is no denying that tech startups offering innovative products and services across a wide array of sectors have become a permanent fixture of the economies of several Arab countries, often thanks to targeted governmental policies such as special economic zones or business incubators (Schroeder, 2013; Christidis, 2019). Similarly, while the Arab region's share in global e-commerce remains low when compared with other regions, the number of citizens and businesses engaging in e-commerce has been on the rise, due to Arab governments passing legislations and policy initiatives to facilitate e-commerce and encourage citizens and businesses to partake in it (ESCWA, 2019a).

Box 2: E-government in the Middle East and North Africa Region

The UN E-Government Development Index (EGDI) is a useful framework that assesses how developed governmental websites are, how e-government policies are applied, and the extent to which public services and governmental procedures can be carried out through the Internet. It is calculated by weighting the average “of three normalized scores on three [of the] most important dimensions of e-government, namely (1) scope and quality of online services (Online Service Index, OSI), (2) development status of telecommunication infrastructure (Telecommunication Infrastructure Index, TII) and (3) inherent human capital (Human Capital Index, HCI).” The closer the EGDI score is to one, the more developed the country's e-government is.

From 2003 to 2020, Arab countries' EGDI scores have varied significantly. Several Arab countries have made impressive strides, such as the Gulf Cooperation Council members. Saudi Arabia, for instance, began with a low score of 0.3376 in 2003, rising all the way to 0.7991 in 2020. Kuwait, Oman and Qatar similarly began with relatively low EGDI scores, but have developed impressive e-government apparatuses since. The United Arab Emirates and Bahrain began with commendable scores of 0.5345 and 0.5097 respectively in 2003, rising all the way to an impressive 0.8555 and 0.8213 respectively in 2020. Other Arab countries, such as Algeria, Egypt and Morocco began with low EGDI scores and improved at a relatively slow pace, while Lebanon began with the score of 0.4236 in 2003, relatively acceptable at the time, and stagnated throughout the years, obtaining a score of 0.4955 in 2020.

This variation between countries highlights how some Arab governments have prioritized e-government and passed the necessary policies and strategies to rapidly develop their public sectors, while others either neglected this aspect of public governance or belatedly began to engage in

METHODOLOGY

a. Case Studies

Broadly speaking, this paper will seek to review the digital transformations taking place in three Arab countries, and to put these digital transformations within their wider socioeconomic and political contexts. The case studies chosen are: Egypt, Saudi Arabia (KSA) and the United Arab Emirates (UAE). These three countries are key actors in the regional and global stage. Egypt is the Arab world's most populous country and the third most populous country in Africa. It has historically played a very important role in the region as a hub for culture, commerce and trade, as well as a geopolitical heavyweight. KSA is a regional power whose influence extends far beyond its borders. The Saudi economy has long been oil-reliant, and this reliance and slow process of economic diversification has pushed Saudi authorities to prioritize digitally transforming the public sector and pushing for a transition to a digital economy in recent decades. As for the UAE, similar to KSA, it has become a powerful regional player, controlling strategic ports across the world and becoming a global trade hub. As oil prices have plunged in recent years, and particularly following the advent of the COVID-19 pandemic, it has become increasingly clear for the two Gulf states under review that diversifying the economy is an urgent matter, and that a transition to a digital economy is one way through which this can be done. The populations of all three of these countries are increasingly digitally connected, while their economies are becoming 'digital economies' – in other words, private sector companies are increasingly using the latest digital technologies to carry out their operations and engaging in e-commerce.

b. Objectives

This paper reviews the status of the digital transformations of the three aforementioned case studies by reviewing the key policies implemented by these governments to usher in a digital transformation, providing an overview of the digital regulatory framework in each country, exploring the drive behind undergoing a digital transformation in each country and how the discourse around digital transformation and digital government was framed, as well as assessing the various facilitators and barriers to implementing a digital transformation in each of these cases. The status of the digital transformation in each of these countries is reviewed using the OECD's (OECD) Going Digital Integrated Policy Framework (more below; see also, Appendix 1) as a guide. Data collection is based

entirely on a desk review of the available literature. The three countries have significantly different political and economic systems, and are at different stages of their digital transformations. The heterogeneity of the cases allows for useful cross-case comparisons to better understand what policy challenges are encountered and what potentials for success exist.

c. The OECD Going Digital Integrated Policy Framework and its associated 'Going Digital Toolkit'

Established evaluative frameworks will be used to review the status of each of the multifaceted digital transformations in the selected case studies. Since the advent of e-government, numerous frameworks have been developed by a wide array of organizations, from international organizations to consulting firms. A recently developed all-encompassing framework that will be applied, to the best extent possible, to each of the case studies in this paper is the OECD's Going Digital Integrated Policy Framework and its associated 'Going Digital Toolkit' (OECD, 2019). This framework was chosen as it is very comprehensive and looks at several policy dimensions that are essential for a successful digital transformation. The framework also paves the way for uncovering existing gaps and crafting cross-cutting policies that would fill in these gaps. This report does not attempt to compare these three case studies to the OECD average nor to any of the OECD member states, nor does it attempt to come up with a score or averages for these countries, noting that much of the necessary data and indicators are not available or outdated. Rather, it will broadly examine each country by considering the framework's cross-cutting policy dimensions, where applicable. Below is an overview of the framework's policy dimensions which are used for the assessment:

- ▶ **Enhancing access:** This policy dimension looks at the extent to which the population of the country has access to telecommunications networks.
- ▶ **Increasing effective use:** This policy dimension looks at the extent to which citizens and businesses are using basic and advanced digital tools, and how much awareness there is regarding the existence of such tools and their potential to drive innovation and productivity.
- ▶ **Unleashing innovation:** This policy dimension looks at the extent to which innovation drives economic growth, as innovative services, goods and business models lead to increased efficiency and job creation.
- ▶ **Ensuring good jobs:** This policy dimension looks at the extent to which workers are properly equipped

with the skills to engage in the digital economy so that no one is left behind. Given that digital transformations create new jobs while eliminating others due to the advent of new technologies, it is essential that digital transformations do not lead to higher unemployment.

- ▶ Promoting social prosperity: This policy dimension looks at the extent to which society as a whole is benefitting from digital technologies.
- ▶ Strengthening trust: This policy dimension looks at the extent to which citizens have trust in digital technologies and believe that their privacy and personal data will not be violated or stolen. This dimension is particularly crucial, as without trust in digital technologies, the positive socioeconomic developments that accrue will be squandered.
- ▶ Fostering market openness: This policy dimension looks at the extent to which businesses are engaging in cross-border e-commerce, as digital technologies not only allow for ideas and information to be easily diffused, but also facilitate global trade.

d. Limitations

Several limitations manifest when attempting to assess the three chosen case studies using the OECD framework. Firstly, this framework was designed to be applied to OECD members, whose political and socioeconomic context is significantly different from that in the three case studies. Furthermore, in most instances, data for the indicators in the framework was not readily available or was outdated for all three countries. In such instances, and where available, approximate (or proxy) data was selected. Where data for the indicators or approximate data was not available, an assessment was attempted based on a review of the available literature on the topic. Lastly, and considering the paucity of data on the digital transformation of each of these countries, it is imperative to undertake more primary research to gather information on each of the policy dimensions, and to gauge the points of view of key stakeholders, including governmental officials, the private sector, particularly the technology industry, civil society and everyday citizens.

CASE STUDY 1: EGYPT

a. Digital Regulatory Environment

In 1999, the Ministry of Communications and Information Technology was established with the overall task of developing Egypt's ICT sector, encouraging the usage of digital technologies across the country by citizens and businesses alike, and overseeing ICT-related policies. In 2003, the Telecom Regulation Law no.10/2003 was passed which established the National Telecom Regulatory Authority (NTRA), the country's key regulator of the telecommunications sector which enjoys legal personality and financial independence. NTRA is mandated to 'ensure that the principles of transparency, competition and user rights are enshrined in the sector' (NTRA, n.d.), and that citizens and businesses have access to high-quality and efficient telecommunications technologies at affordable and competitive prices. In addition, NTRA is mandated with developing and promoting strategies and policies to support and increase the usage of ICTs in the country, and encourage investments in the ICT sector (NTRA, n.d.).

While Egypt does not have one specific law governing e-commerce, several laws exist which regulate the sector. In 2004, Law No.15/2004 on 'E-Signature and the Establishment of the Information Technology Industry Development Authority [ITIDA]' was passed, which is a key piece of legislation in Egypt's digital transformation (Law No.15/2004). The law established the ITIDA, which is one of the executive arms of the Ministry of Communications and Information Technology tasked with developing Egypt's ICT industry (ITIDA, n.d.). This broad mandate encapsulates encouraging and directing investments in the ICT industry, supporting and encouraging ICT-related research, supporting small and medium enterprises (SMEs) in their digital transformation, and regulating all e-transaction activities. Regarding the latter, ITIDA has the authority to issue and renew 'licenses required for operating e-signature services and other activities of e-transactions', as well as the authority to set out e-signature standards and technical specifications and receive and act on all e-transaction and e-signature-related complaints (Article 4). The law gives e-signatures 'the same legal force and admissibility as traditional signatures if they follow stringent technological requirements and are considered secure' (Blythe, 2011, p.199). As for consumers' protection, the new Consumer Protection Law ratified in 2018 and replacing the previous law from 2006 contains provisions to protect consumers who engage in e-commerce. Businesses selling services or products online must provide potential consumers with

information on the ‘business itself, the product, the warranty, the post-sale services, and the delivery date and location’ (Iskander, 2019). Consumers who make purchases online now have up to seven days to cancel their placement, as well as up to 14 days to request a refund starting from the day the purchased item is received (Riad & Riad, 2019).

Although the 2004 law was considered to be a commendable first step towards Egypt’s digital transformation, it was lacking in several aspects. For instance, the law ‘fails to include consumer protections for e-commerce buyers’, and the list of e-transactions crimes that the law identifies is far too narrow, as it fails to mention ‘unauthorized tampering with computer information’, ‘unauthorized use of a computer service’, ‘unauthorized interference in the operation of a computer’, ‘unauthorized dissemination of computer access codes or passwords’ and the ‘injection of a virus into a computer’ (Blythe, 2011, p.202). As the law was drafted in the early 2000s, it is outdated by today’s standards, and is deficient when it comes to the practical aspects of e-transactions, the concluding of such transactions, the liability of the parties engaging in e-transactions, data protection, and burden of proof (Ibrahim, 2019). In addition, several governmental entities in addition to the Ministry of Communications and Information Technology are responsible for regulating and monitoring e-commerce in the country, namely the Ministry of Industry and Trade, the Ministry of Finance and the General Authority for Investment and Free Zones (Riad and Riad, 2019).

Various laws facilitating e-commerce have been passed since the 2004 law was passed. For instance, in November 2016, the Central Bank of Egypt introduced regulations to facilitate mobile payments, encourage financial inclusion and strengthen trust among citizens in the country’s banking system (CBE, 2016). The regulations stipulate that businesses (regardless of their size), organizations and merchants can now make payments or collect funds through their mobile bank accounts (Enterprise, 2016). Since then, the number of commercial banks authorized to provide mobile payment services has been on the rise, and as of September 2019, the total value of transactions carried out through mobile payments amounted to around 20 billion Egyptian pounds (Mounir, 2019a). In 2019, ‘Meeza’ was launched, which is a national payment scheme developed under the supervision of the Central Bank that provides bank cards and mobile wallets for transactions carried out within Egypt. The goal of ‘Meeza’ is to enable financial institutions in the country ‘to meet the needs of consumers who expect to make payments and access funds wherever, whenever and however they choose’,

to promote financial inclusion and pave the way for an eventual cashless society (Meeza, n.d.).

In August 2018, the ‘Anti-Cyber and Information Technology Crimes’ law was ratified, which ostensibly ‘aims at fighting extremist and terrorist organizations that use the Internet to promote their ideas’, and which has made impersonating someone else or an organization illegal (Sadek, 2018). This law was followed by a Personal Data Protection Law, passed in July 2020, which came into force on 14 October 2020. Some have claimed that the law is inspired by the European Union’s (EU) General Data Protection Regulation (GDPR) and that it protects individuals’ personal data. For instance, individuals’ personal data (be it their physical and mental health conditions, financial situation, religious beliefs or political opinions etc.) are considered sensitive; businesses must appoint a data protection officer responsible for ensuring that the organization complies with the law; and any data breach must be immediately communicated to the individuals whose data was breached or to governmental authorities in case the information breached ‘relates to national security protection considerations’ (Diab, 2020). The law has several positive provisions: it provides several ‘legal safeguards to protect individuals’ personal data and information as they use the Internet’, such as users’ ability to ‘give and withdraw consent to the collection and processing of their personal data’ and grants them the ‘right to know what personal data is being collected, processed and accessed, and by whom’ (Fatafta, 2020).

Concerning big data mining, Artificial Intelligence and blockchain technologies, no specific laws or regulations exist yet. As for cloud computing, while Egypt does not have standalone laws to regulate the usage of cloud computing by cloud service providers or customers, the Anti-Cyber and Information Technology Crimes Law stipulates that cloud computing falls under its provisions (Hashish, 2020).

Egypt’s digital regulatory framework has several lacunae. No legislation exists to regulate and provide clear guidelines regarding the usage of the latest digital technologies, while e-commerce regulations are fragmented along several laws, some of which are outdated and fail to take into account the changes in the way the Internet is used and how data is generated.

b. Digital Government in Egypt

One of the objectives of Egypt’s Ministry of Communications and Information Technology is to ‘transform the government into a digitally connected government’ through digital linkages between all public bodies, and to ‘promote e-governance and foster the values of transparency, accountability and oversight’

(MCIT, n.d.). However, while significant progress in terms of e-government development has been achieved since then, this progress has been somewhat disorderly.

In 2000, the Ministry of State for Administrative Development (MASD) was formally tasked with developing Egypt's e-government. Four years later, the first Egyptian governmental online portal was launched, and it presently features several procedures and services that can be carried out online. However, Egypt remains far from achieving a highly developed e-government system.

In a study carried out in 2012, it was found that the trajectory of e-government development in Egypt did not start off on the right foot: rather than adopting a multi-stage whole-of-government approach to digitally transform the public sector with specific benchmarks to be achieved in each stage, the process was reportedly carried out in an uncoordinated manner with little cooperation between the different key stakeholders. The process was characterized by periods whereby e-government related initiatives would be undertaken, followed by periods in which the process would be neglected completely. In the study, governmental websites were described as having low security making them prone to being hacked; in addition, no unified systematically updated and accurate citizen database existed and each ministry or subagency relied on its own data, with little intra-governmental data sharing. The large size of the Egyptian public sector, coupled with stiff resistance to e-government initiatives within the public sector, rendered e-government initiatives very hard to implement. In addition to the bureaucratic obstacles, the digital transformation of the government has not been a priority for the highest authorities in Egypt (Dolan, 2014).

It appears that in the last decade, Egypt's e-government development has proceeded at a relatively slow and uneven pace. In 2010, Egypt's EGD I stood at 0.4518 and rose to 0.5129 in 2014, only to fall back down to 0.4594 in 2016. Despite the launching of the 'Egyptian Government Cloud Strategy' in 2014, a research paper from the Cairo-based Institute of National Planning from 2018 which surveyed different public bodies' perceptions towards and desire to adopt cloud computing provided unencouraging results. Public officials were reluctant to adopt cloud computing due to fears that their privacy and the confidentiality of their work would be compromised, as well as due to lack of trust in cloud service providers (El Haddad, 2018).

The year 2019 witnessed noteworthy developments in Egypt's path towards e-government. The Ministry of Communications and Information Technology launched 'Digital Egypt', a plan which seeks to digitally transform the Egyptian government and 'to provide public services in a faster and simpler way'. A pilot project was

implemented in Port Said City in mid-2019 whereby 155 governmental services were made available online via a 'Digital Egypt e-platform'. The next year, in August 2020, a trial version of 'Digital Egypt e-platform' was launched with several governmental services offered, such as requests to renew a car registration or to obtain new ration cards, which provide access to subsidized goods for low-income citizens (GIV, 2020).

However, despite the potential shown by the 'Digital Egypt e-platform', Egypt's EGD I in the latest UN E-Government Survey 2020, while climbing up to 0.5527, remains behind the world average of 0.6 (UN DESA, 2020). The MASD, which as a Ministry of State lacked executive powers and hence could not forcefully bring about e-government reforms and could only work with reform-minded ministers and bureaucrats, was eventually dissolved in 2014. Without a proper digital transformation of Egypt's public sector – no mean feat given its enormous size, its heavily centralized and bureaucratic character, and the many overlapping mandates between different public bodies – Egypt's digital transformation will remain hampered.

c. Going Digital Framework – the case of Egypt

Since the early advent of the Internet in Egypt, and having rapidly identified the economic benefits that could be reaped, the country's political authorities sought to promote its usage across the population. In 2000, the Ministry of Communications and Information Technology launched a 'National ICT Plan' which sought to increase the usage of ICTs across the country among citizens and businesses, and to develop legislative and regulatory frameworks to ensure a liberalized ICT sector. Subsequent years were characterized by expanding and modernizing the country's ICT infrastructure, boosting ICT usage among the population, and passing laws to regulate online transactions (MCIT, n.d.c, p.17-18).

A little over a decade after the first ICT plan was passed, the Egyptian government launched several strategies dealing with 'the information society' or the country's ICT sector (MCIT, n.d.c), one of which was the 'National ICT Strategy 2012-2017: Towards a Digital Society and Knowledge-based Economy', a multi-faceted strategy which sought to further develop Egypt's digital transformation and make the country a regional ICT hub. The strategy contained several quantitative benchmarks to be achieved, such as 'providing all schools and educational institutions with high-speed Internet access', 'increasing the proportion of e-banking customers using online or mobile banking to 30%', 'raising the volume of e-commerce by 20%' and having '4.5 million households, approximately 22% of Egyptian households, subscribing to high-speed Internet services

by 2015', to name a few. The strategy also deals with Egypt's digital regulatory framework, containing a whole section outlining which laws need to be amended and what new laws need to be passed, including a Freedom of Information Draft Law and an E-Commerce Draft Law (MCIT, n.d.c, p.33-35).

This strategy was followed by an ICT 2030 strategy, which is concomitant to Egypt's Vision 2030, an overarching framework launched in February 2016 that seeks to put Egypt on the pathway to meet the UN Sustainable Development Goals by the year 2030 (MPED, n.d.). The ICT 2030 strategy tasks the Egyptian government with undertaking a wide array of initiatives to speed up Egypt's digital transformation – from increasing the ICT sector's contribution to the economy and building the digital capacities of the Egyptian workforce and businesses, to digitally transforming the public sector and essential public services (ITA, 2020).

Since the 1990s, e-commerce in Egypt has been growing steadily, and the Egyptian government has sought to capitalize on this growing market and the potential that e-commerce holds to bring about sustainable economic growth and new job opportunities, particularly for the youth and citizens in marginalized rural areas (more on e-commerce in the section below).

Egypt's ICT sector is rapidly growing, and shows much promise and potential due to the country's large young and largely tech-savvy population. In 2018, the ICT sector's share to GDP stood at 3.5%, and increased to 4% of GDP the following year (ITA, 2020). In 2018, the sector comprised around 3.1% of Egypt's overall income, and around 3.2 billion USD worth of ICT goods and services were exported (Abdel Zaher, 2019).

i. Access

Several obstacles to Internet access exist in Egypt, including poor Internet quality and low speeds (Nile FM, 2020); prices are relatively affordable and among the lowest in the MENA region, although they remain prohibitive for a significant segment of the Egyptian population relative to the average income (Nile FM, 2020). Egypt ranked 63rd out of 100 countries in terms of affordability (which looks at both price and competitive environment) on the Inclusive Internet Index 2019, and 82nd on support for digital literacy – suggesting that digital illiteracy may play a role in the low levels of Internet penetration. In addition, geographical disparities to Internet access exist (Freedom House, 2019a). Over 57.2% of individuals in Egypt were using the Internet in 2019, an increase of over 10% from the previous year (46.9%); while 59.9% was the proportion of households with Internet access at home in 2019, also up significantly from the previous year (51%).

The number of fixed broadband subscriptions per 100 people in the country has increased steadily over the years, standing at 7.57 per 100 people in 2019 (WB database). Many more individuals are connected to the Internet via their mobiles – there were 54.81 mobile broadband connections per 100 people in Egypt in 2020 (Degenhard, 2020).

Despite significant investments by the Egyptian government (30 billion EGP) to increase Internet speed, Internet users in Egypt reported slower speeds in 2020, attributable to a significant increase in local Internet use as a result of home confinement due to the COVID-19 pandemic (Ahran Online, 2020). The Egyptian government has responded to the resulting increased demand for the Internet by providing flexibility of payment to prepaid users, covering the costs associated with upgrading monthly packages, securing free cloud applications for companies, providing free Internet services to university professors, and free SIM cards to students to facilitate online learning via their devices (Guermazi, 2020).

ii. Use

E-commerce began in Egypt in the late 1990s, at a time where a fraction of the population was connected to the Internet and before laws to regulate e-commerce were introduced. Some of the country's leading grocery chains had established websites allowing online purchases, while several tech-savvy entrepreneurs and businesses rapidly saw the Internet's potential and sought to market their enterprises, products and services online to reach a wider clientele both within Egypt and abroad (Kamel, 2000). Nevertheless, fully tapping into the potential that e-commerce holds for the country has yet to be realized.

According to the Ministry of Communications and Information Technology, in 2012, it was estimated that only 2% of Egyptian households with Internet access engaged in e-commerce. Over half of all online purchases (55% to be specific) were stocks, bonds or other financial investments, followed by audiovisual entertainment such as movies and music (29%), e-tickets and reservations (15%), clothing (8.5%), magazines, newspapers and books (5.2%) and electronic equipment such as computers or software (5%) (El Shennawy, 2013). The major challenges that households engaged in e-commerce encountered were the inability to return purchased products or obtain a refund, higher costs compared to non-online purchases, false advertising whereby the purchased product ended up looking different from the one advertised online, and delays in the delivery of the purchased item. As for the reasons stated for not engaging in e-commerce, the major reason was that households lacked the knowledge regarding how to engage in e-commerce, as well as the lack of

legal recognition of electronic contracts (despite the fact that e-signatures have been legally recognized since 2004). These findings are very indicative: when we examine the items purchased online, given that finance-related purchases (e.g., stocks, bonds etc.) comprise the majority of purchases, followed by means of entertainment, it appears that e-commerce is largely practiced by households that are relatively well-off (El Shennawy, 2013).

In 2017, a National E-commerce Strategy for Egypt was prepared by the United Nations Conference on Trade and Development (UNCTAD) and the Egyptian government which acknowledged Egypt's lag in terms of e-commerce, stating that the e-commerce market in Egypt was 'still in its infancy' (UNCTAD, 2017a, p.xiii), as well as highlighting the massive potential that e-commerce holds for Egypt's socioeconomic development. Despite the significant increase in Internet penetration rates and the number of businesses engaging in e-commerce and websites devoted to facilitating e-commerce since the 1990s, in 2015-2016, it was estimated that e-commerce business-to-consumer activities had reached only around 544 million USD, which comprised roughly 0.4% of the total retail sales in Egypt – a minuscule share (UNCTAD, 2017a). In 2018, it was estimated that only 5.3% of Internet users in the country made online purchases, while only 17% of large firms and 3% of small firms sold their products and services through the Internet (Sirimanne, 2018). Another hamper to e-commerce growth in Egypt is the fact that the number of citizens holding credit or debit cards is relatively low as compared to the total size of the population. According to the Central Bank, by the end of 2018, only 15.4 million debit cards and 3.975 million credit cards were in issuance (Mounir, 2019b), and it was estimated that around 80% of the e-commerce carried out in Egypt relied on cash paid upon delivery of the ordered product (Privacy Shield, n.d.).

Concerning the usage of cloud computing in Egypt's private sector, the potential remains largely untapped, which is a phenomenon that applies to most of the developing world. Several efforts have been carried out by both the public and private sectors in recent years to encourage cloud service adoption in Egypt. For instance, in 2014, IBM collaborated with ITIDA to provide training in cloud computing to one hundred Egyptian companies in the ICT sector. This is in line with ITIDA's objectives, which includes encouraging SMEs in the ICT sector to 'expand their offerings to new markets and help grow the Egyptian economy based on the proliferation of technology trends such as big data' (IBM, 2014).

A study from 2016 to understand how cloud computing services are perceived in Egypt and the factors that

encourage or deter their adoption provides useful insights. The study relied on over 100 focused semi-structured interviews conducted with stakeholders from academia, the government, civil society and the private sector (from business and industry leaders to entrepreneurs in ICT- and non-ICT-related fields). While all respondents acknowledged that cloud computing offers many benefits, ranging from improved efficiency and cost reduction to increased storage and flexibility, to name a few, several impediments which discourage usage were highlighted. It is indicative that 75% of the respondents stated that they were not very familiar with the concept of cloud computing or simply did not know how to access cloud computing services, while 70% of respondents stated that they had reticence due to security concerns or concerns dealing with the reliability of the technology. These figures indicate that, even though the number of cloud computing service providers is limited in Egypt, there is a need to increase awareness on cloud computing, particularly among SMEs, as they do not always have knowledge regarding the benefits that can be accrued from adopting the technology (Kamel & Abouseif, 2015). Nonetheless, the usage of cloud computing services in Egypt is steadily growing, and a study by the International Data Corporation from 2019 estimated that 'cloud services will create nearly 100,000 jobs in Egypt by the end of 2022' (Microsoft, 2019).

iii. Innovation

In 2019, the Ministry of Higher Education and Scientific Research released the 'National Strategy for Science, Technology and Innovation 2030' which seeks to create an environment whereby scientific and technological innovations are supported and contribute to economic growth and Egyptian society's overall wellbeing. When it comes to the weaknesses that Egypt struggles with in terms of support provided to research and development, many are highlighted in the strategy: Egypt lacks expertise in several rare specializations (such as nuclear physics); there is an insufficient number of technical staff in scientific institutes (such as laboratory assistants and technicians); the youth are not empowered to have a say in national science and technology policy, while the education they receive is built on memorization rather than critical thinking which is crucial for innovation; there is little cross-university and cross-departmental interdisciplinary research carried out; the quality of scientific publications is generally poor and they have little impact either within the Egyptian economy or globally; research coordination between universities and scientific institutes is minimal, leading to much duplication; the number of patents registered every year is low, while regulations governing Intellectual Property need to be revised (MHESR, 2019). These structural problems have led to a 'continuous drain of' Egypt's

distinguished scholars, experts and brightest youth who move to the Gulf or Western countries in search of better opportunities (MHESR, 2019, p.18). These impediments to scientific research and innovation in Egypt have existed for decades, and are not exclusive to Egypt, as most Arab countries suffer from similar structural deficiencies and inadequacies in the spheres of education, research and innovation.

However, this does not mean that innovative ideas have not been turned into profitable businesses that created decent jobs and positively impacted society. Venture capital and angel investment were once alien terms to the Egyptian economy, but over the past decade-and-a-half, Egypt's startup ecosystem has grown significantly and numerous private sector-led investment funds have been launched to support the country's budding startups, many of which are in the ICT sector. The startup ecosystem has been steadily growing in size, as well as gaining more societal acceptance and rhetorical and practical support from the government in recent years. In 2018, Egypt was described as the fastest growing country in the MENA region when it came to investor funding, with 81 deals as opposed to 54 in 2017. Several, tech startups – be it in health, ridesharing, online recruitment or online real estate, to name a few – attracted millions of USD in investor funding, as investors are fully cognizant of the fact that Internet usage and smartphone adoption is on the rise in Egypt, and see a promising future for the digital economy in the country (El Sawy, 2019) see Box 3. The number of accelerators and incubators, such as Flat6Labs or the American University of Cairo's Venture Lab, have significantly increased over the past decade, providing much needed mentorship, guidance, assistance and funding opportunities for budding entrepreneurs and startups, several of whom ended up founding leading tech startups (Sallam, 2019).

The Egyptian government has also stepped in to support the country's startups ecosystem, particularly given the fact that the government has sought to promote the digital economy and digital skills among the workforce and encourage the youth to engage in entrepreneurship. In 2017, the Ministry of Investment and International Cooperation (MIIC) launched the 'Fekretak Sherketak' ('Your Idea, Your Company') initiative, which 'offers a complete package of consulting services to support young entrepreneurs', 'a space [...] to set and develop their ideas, transfer knowledge, share experiences and skills as well as [receive] one-on-one mentorship and consulting sessions'. By the end of 2017, the initiative had led to the establishment of 42 startups, out of over 3,000 pitches, in 13 governorates (Egypt Today, 2017). The next year, MIIC established Falak Startups, an accelerator that supports tech entrepreneurs through

Box 3: Fawry trailblazing the Egyptian startup ecosystem

Founded in 2008, Fawry is an e-payment network which offers a convenient way through which payments can be made (online, via ATMs, mobile wallets, point-of-sale machines). It is considered among the quintessential high-growth startups in the Egyptian startup ecosystem, as within seven years of its establishment, its 'founders sold a majority stake' for 100 million USD, an exit that 'has opened the door for both technology startups and investors to become optimistic about the state of the ecosystem' in Egypt (Sallam, 2019). In August 2020, with COVID-19 creating a surge in demand for electronic payment services, Fawry's market cap surpassed the 1 billion USD mark (Paracha, 2020).

a 6-month program that equips them with all the skills and knowledge needed to succeed, as well as funding and assistance when it comes to attracting funding (Sallam, 2019).

However, given the enormous size of the Egyptian market and the country's large youth population, there is still tremendous potential left untapped (Kamel & Abouseif, 2015). Entrepreneurs face several challenges, 'ranging from regulatory bureaucracy to a lack of available funding especially following early-stage investments.' When it comes to the former, sometimes the simplest of governmental procedures require a lot of time and effort which discourage entrepreneurs and force them to seek legal assistance to properly register and maintain their business. Despite amendments in recent years to the Companies Law, and despite Egypt's ranking in the World Bank's Ease of Doing Business improving, the regulatory framework for investors is complex and they often find it difficult to understand what processes are required to keep the company they have invested in in good standing (Sallam, 2019). As for challenges when attempting to access funding, there are not enough channels through which entrepreneurs can meet potential domestic and foreign investors (Moneim, 2020).

When it comes to Intellectual Property (IP) in Egypt, the main legal instrument that governs the IP system is Law 82 of 2002 pertaining to the Protection of Intellectual Property Rights, which is a comprehensive law that has wide protections provided to IP holders and mandates full and thorough examinations of patents and industrial designs in-line with international standards, as Egypt is party to several international treaties administered by the World Intellectual Property Organization. The public body

mandated to examine, verify, register and issue patents is the Egyptian Patent Office (EGPO). For a long time, EGPO struggled with numerous obstacles that hindered its ability to properly carry out its mandate: it lacked the proper infrastructure, as well as qualified human resources to carry out the meticulous work of analyzing, registering and maintaining an IP database. In 2013, EGPO was upgraded, as over one hundred examiners from many different technological fields holding post-graduate degrees were hired and provided with capacity-building training programs. Despite this improvement, the quality of IPs registered in Egypt has been lackluster, as universities and scientific institutes in the country generally lack a strong culture of quality control and monitoring and evaluation in research. Similarly, as has been alluded to by the aforementioned National Strategy for Science, Technology and Innovation 2030, there is little collaboration between academic institutions and the private sector, with the former not engaging with the latter to see how their scientific research may have economic potential, and the latter unaware of the potential of scientific research being produced (ESCWA, 2019b).

iv. Jobs

As previously mentioned, the ICT sector in Egypt has grown tremendously since its inception in the 1990s, becoming a revenue-generating sector that provides job opportunities for all segments of society, but particularly for youth. For instance, in December 2008, there were an estimated 175,000 employees and less than 3,000 businesses in the ICT sector; two years later, the numbers rose to 212,260 and 4,250 respectively (MCIT, 2011). By 2017, the number of workers directly employed in the sector had risen to 500,000, and an expanding number of tech multinationals were setting up offices in Egypt as the country was seen as a strong ICT hub through which to expand to other Arab markets, and the country's 'large pool of skilled graduates coupled with low operating costs' enabled the sector's rapid growth (Oxford Business Group, 2017).

The Ministry of Communications and Information Technology has been 'investing heavily in building local talent and reinforcing Egypt's large' workforce with the latest digital skills needed to partake in the digital economy (Alaa El-Din, 2020). This has been done partly through collaborations with tech firms in the private sector in recent years to provide training to citizens and businesses on the latest digital technologies. The aforementioned collaboration with IBM on cloud computing training to Egyptian companies in the ICT sector is one example. In 2016, the Ministry of Youth and Sports partnered with Microsoft to launch the 'Tawar w 3'ayar' ('Develop and Change') initiative, a program which seeks to build the digital skills of the

population, and particularly the youth, so that the labor force is properly equipped with the knowledge and ability to use the latest digital skills and create new tech-related jobs. Since its launch, it is estimated that over 1.4 million youths in Egypt have benefited from the initiative (Microsoft, n.d.) and an accompanying online portal offering several free tech-related courses (ranging from basic introductory lessons on Microsoft's programs to more advanced courses on data science and coding). In early 2020, the Ministry launched the 'Our Opportunity... is Digital' initiative which seeks to further such government-private sector partnerships to support the digital transformation of the country's workforce and businesses (Egypt Innovate, 2020). Since then, several partnerships relevant to equipping the youth with the digital skills and knowledge necessary for a digital economy have been launched. For instance, in May 2020, ITIDA partnered with Udacity to launch the 'Future work is a digital initiative', an 18-month scholarship program with the objective to equip and train up to 100,000 Egyptian youths with the digital skills needed to partake in the digital economy (ITIDA, 2020). Participants are able to enroll in courses in 'web development, data analytics and digital marketing', each with different tracks depending on the participants' existing skills and knowledge (Alaa El-Din, 2020). Similarly, a partnership was established between the Ministry and Amazon Web Services, one of Amazon's subsidiaries, in mid-2020 to offer training to 500 Egyptian youths on 'artificial intelligence (AI), machine learning (ML) and data science technology' (Startup Scene, 2020a).

While these public-private partnerships to promote digital skills among the population, and particularly the youth, have much to be commended about, and while they do showcase the Egyptian government's intent on ensuring that Egypt's economy transitions into a digital economy, the partnerships appear to be uncoordinated and lacking an overarching framework with specific goals and objectives to be achieved. In addition, while the number of youths benefiting from these partnerships is increasing, and while many have used the skills gained to find jobs or bring additional value to their workplace, it is unclear whether these partnerships are sufficient to properly equip the country's young population with the digital skills needed for the digital economy in the absence of wide reforms in the education system and increased investments in public schools and universities. If the youth are not receiving high-quality education, and if teachers in schools and universities themselves are not properly equipped with the knowledge to inculcate their students with the skills for the digital economy, it is doubtful that these public-private partnerships will be enough for Egypt's

TABLE 1. EGYPTIAN WOMEN'S USAGE OF THE INTERNET (%)

Age	Uses computer at least once a week	Uses Internet at least once a week	Uses social media at least once a week	Uses all three digital media at least once a week	Uses none of the three digital media at least once a week
15-19	7.7	2.8	3.7	1.8	90.9
20-24	14.2	8.3	10.5	7.6	84.7
25-29	17.0	9.9	11.9	8.6	81.6
30-34	16.2	8.8	10.8	8.3	82.9
35-39	13.7	6.9	9.0	6.5	85.7
49-44	11.7	5.5	7.9	5.3	87.9
45-49	8.4	4.3	5.7	4.0	91.3

digital transformation in the absence of increased governmental investments in public education.

v. Social Prosperity

Momentum towards pushing for women to engage in coding and other fields that are integral to the digital economy has been building in recent years. Several private sector- and civil society-led initiatives have been launched to encourage and support young Egyptian women to study STEM fields at the higher education level, to engage in tech entrepreneurialism or to pursue programs to develop digital skills (Solayman, 2014).

However, Egypt remains very far from bridging the digital gender divide - as recently as in 2018, only 41.3% of females (as a % of the female population) were Internet users. Despite the paucity of gender-disaggregated data on Internet usage in Egypt, studies carried out over the past decade feature some stark figures. In 2012, a study based on a representative sample uncovered that one in five women believed that the Internet was not 'appropriate' for them, believing that not only was the Internet not beneficial or useful in their lives, but also that their families would not be approving of their using it. In the same year, it was estimated that only 32% of women had access to the Internet (Intel & Dalberg, 2012). The Demographic and Health Survey of 2014, which is a nationally representative survey carried out by the Ministry of Health and Population, features data regarding women's usage of the Internet which complement the 2012 study. Table 1 contains the percentage of ever-married women aged between 15 and 49 who use digital technologies on a weekly basis (MOHP, 2015).

These figures are very grim: in every age group (excluding those aged 50 and above, as the survey does not have data on their usage of the Internet), a vast majority of women rarely use a computer, the Internet or social media. In addition, the survey mentions that an urban-rural divide exists, as 23% of women living in urban areas compared to 9% of women living in rural areas use the computer at least once a week (MOHP, 2015, p.33). Similarly, a wealth gap exists when it comes to usage of computers and the Internet among women: 35.1% and 16.4% of women in the top two wealth quintiles are likely to use a computer at least once a week, compared to just 2.6% and 4.4% of women in the lowest two quintiles. As for using the Internet, 22.4% of women in the highest wealth quintile use it at least once a week, compared to 0.9% of women in the lowest wealth quintile (MOHP, 2015, p.33). When it comes to enrollment in college degrees in a digital related field, data from 2016 reveals that only 3% of women in Egypt were enrolled in such courses, in comparison to 13% of men (Assi & Marcati, 2020).

Among the dividends that accrue from a digital transformation are the potential for digital technologies to transform the workplace and allow for employees to work remotely. Flexible work arrangements have long been recognized in Egypt, and the country's labor law, enacted in 2003, does have provisions which allow for flexible forms of work and allows for 'diverse type[s] of customized contracts' that provide for flexible working hours and specific definitions of the workplace, which the employer decides upon with the employee (PWC, 2019). While remote work was slowly gaining traction in Egypt in the past few years (Eltigani, 2019), the

COVID-19 pandemic increased acceptance of remote work in the country. However, this has not been without challenges, with many businesses moving to remote work citing all sorts of problems that accompany such a rapid and drastic shift – from the inability of employees to properly communicate and set tasks, to the inability to ‘disconnect’ from work once working hours are over. Nonetheless, remote work has also brought positive new trends which many hope will be maintained once the pandemic subsides (Mada Masr, 2020).

vi. Trust

There is a dearth of data on the behavior of individuals engaging in e-commerce in Egypt or on exposure to privacy violations among Internet users. One study investigating e-commerce and online purchasing in Egypt identified level of trust and age as significant barriers to the diffusion of e-commerce in the country (Ramzy & Eldahan, 2016). Beyond this, issues of trust in Egypt can be directly related to loopholes in existing digital laws. As mentioned previously, Egypt’s Law No.15/2004 on ‘E-Signature and the Establishment of the Information Technology Industry Development Authority [ITIDA]’ is lacking in several aspects, including that it ‘fails to include consumer protections for e-commerce buyers’ (Blythe, 2011, p.2020).

vii. Market Openness

Since the liberalization of the Egyptian economy in the late 1970s, the country has increasingly relied on foreign direct investment (FDI) to stimulate economic growth and create job opportunities. The ICT sector is one particularly attractive sector due to the country’s large and increasingly online population. However, bureaucratic red tape has long been a hamper to investing in the country, despite official proclamations coming from the country’s highest authorities that ‘investors can expect reduced bureaucracy and red tape, a clear investment and easier access to investment opportunities’ (Saleh, 2017). Egypt made slight progress in the Doing Business Index in 2020 (jumping to the 114th spot out of a total of 190 countries), but still ranks low globally. Even Egyptian expatriates, whom the government has sought to entice to invest in their home country, have struggled, encountering a non-responsive bureaucracy, difficulties in obtaining official governmental documents and facing uncertainty regarding whether their rights as investors will be protected (Hammad, 2019).

Nonetheless, despite the obstacles that hamper investing in Egypt – be it in the ICT or other sectors – the country has witnessed positive trends regarding the export of digital services. In tandem with the growth of Egypt’s ICT sector and the increasing number of youths engaging in jobs that require proficiency in digital skills, the country has become an exporter of digital

services, recording around 3.67 billion USD’s worth of digital services’ exports in the 2018-2019 fiscal year (Kamel, 2020). The most exported digital services are software-related, technical support and mobile application development, followed by digital marketing (ITIDA, 2020b). The Egyptian government has supported the growth of such exports, with ITIDA organizing several rounds of the ‘Export IT’ program since 2010 which seeks to encourage and support Egyptian firms in the ICT sector to ‘develop resources, enhance competitiveness and reduce export overheads’. The program was instrumental in increasing Egypt’s digital services exports over the past decade (ITIDA, 2020b).

d. Recommendations

Over the past several decades, Egypt has made significant strides in bringing about a digital transformation. Early on, Egyptian authorities invested in telecommunications infrastructure and passed the necessary legislations related to e-commerce, and since then the country’s ICT sector has grown to become a promising component of the national economy generating many jobs for the country’s youth and increasing the number of digital services exports on an annual basis.

However, much more needs to be done for Egypt to properly undergo a digital transformation which ensures that the potential positive changes of digital technologies are fully felt at all socioeconomic levels:

- ▶ Firstly, while the percentage of the Egyptian population that uses the Internet is growing on an annual basis, Egypt only had 57.2% of its population connected in 2019. While reaching near 100% levels in a country such as Egypt is understandably difficult due to the large size of the population and the country’s size and difficult geography, the fact that over 40% of the population still has no access to the Internet brings forth many problems. Not only is this large segment of the population not benefiting from the tremendous potential that the Internet holds, but this segment will also miss out on potential employment opportunities in the digital economy and could very well be left behind during the digital transformation. Ensuring that unconnected Egyptians have Internet access is of the utmost importance. In this regard, specific efforts have to be made to ensure that Internet use improves across all socioeconomic levels, and also across genders.
- ▶ Increasing the number of Egyptian citizens who have access to the Internet cannot be done without significant administrative reforms in the country’s bloated and heavily bureaucratized public sector. Egypt’s e-government trajectory has not reached

its full potential, and much more needs to be done to digitally transform the public sector. A whole-of-government approach is needed for Egypt's public sector to transition into a digital government offering all kinds of services and procedures to citizens online. This can only be done if such a major reform effort enjoys the full political support from the country's highest authorities. This transformation needs to come in tandem with long-overdue structural administrative reforms in the Egyptian public sector which has grown uncontrollably in size over the past decades and which has become overly bureaucratic, posing all sorts of obstacles to potential investors or entrepreneurs seeking to launch a business. In addition, an open data portal that publishes all sorts of datasets that public bodies collect, particularly the data pertaining to digital transformation-related issues, should be launched, as this open access to data would not only allow policymakers to monitor the country's digital transformation, but also allow for usage of the data by the private sector.

- ▶ As for the population that is already connected to the Internet, although Egypt's ICT is witnessing promising growth and an increasing number of Egyptians are not only working in it but also providing digital services abroad on a freelance basis, more efforts must be made to ensure that the youth have the knowledge and digital skills necessary to partake in the digital economy. In order to do this, Egypt's public education must be drastically supported, and school and university curricula must provide digital skills to the youth in school. In addition to adding digital skills to educational curricula, the country's education system must be reformed in a manner whereby students are encouraged to engage in critical inquiry. Egypt's universities were once the prime target destination for Arab citizens seeking to obtain a world-class education. Egypt's education system could reclaim this position and could play a key role in providing knowledge on digital skills to the Arab region should the proper investments and the proper support provided by the government be made available.
- ▶ Concerning the programs to provide digital skills to the youth conducted in partnership with the private sector, they have increased significantly in recent years, and are indicative of the government's drive to undergo a digital transformation in the country. However, these programs remain fragmented across different ministries with seemingly little coordination among them. These programs, alongside future programs, must be placed within an overarching

long-term framework so as to be able to properly evaluate whether they are reaching the targets and are leading to the digital transformation of Egypt, and where improvements need to be made.

- ▶ The digital transformation of the Egyptian private sector is underway, but much needs to be done for it to bring about all of its potential dividends to society. E-commerce is on the rise, and Egyptian authorities have sought to increase financial inclusion and encourage citizens and businesses to partake in e-commerce, but the country's e-commerce still has much room to grow, and businesses adopting cloud computing services remain a minority. Despite the large number of universities and research institutes in Egypt, lack of proper channels for academia-industry collaboration is often cited as a reason why scientific research is slow to develop into innovative products and services in the country, which indirectly impacts the tech startup ecosystem. Although this ecosystem has grown in recent years, investors and entrepreneurs continue to face bureaucratic red tape which slows down or discourages their zeal – a red tape which could be solved through a proper digital transformation of the public sector, guided by a national strategy and implementing procedures, and protected by appropriate legislation.
- ▶ Egypt's digital transformation still has a long way to go, but the building blocks are there, and many promising developments are underway. Should Egypt undergo such a transformation, with a revamped education system offering knowledge in the latest digital technologies, and a dynamic economy in which a robust e-commerce system is in place, this will have positive reverberations across the Arab region.

CASE STUDY 2: KINGDOM OF SAUDI ARABIA

a. Digital Regulatory Environment

In 1997, a program to liberalize KSA's telecommunications sector was initiated, with the hopes that this would stimulate investments and promote efficiency in the sector (Saudi Telecom Co., 2002). In 2001, the Saudi Communications Commission was established and was tasked with regulating the kingdom's telecommunications sector and ensuring that 'a competitive environment based on equity and transparency' was in place whereby 'high quality universal telecommunications services' would be provided at affordable prices (CITC, n.d.). In 2003, the commission was renamed the Communications and Information Technology Commission (CITC) as it took up additional duties dealing with the kingdom's ICT sector, and since 2006, it has been responsible for regulating the Internet in the kingdom. The Ministry of Communications and Information Technology (MCIT), originally the Ministry of Post, Telegraph and Telephone and renamed MCIT in 2003, is tasked with setting 'general policies, plans and development programs for the telecommunications sector, and representing the KSA in domestic, regional and international bodies in the telecommunications sector' (DLA Piper, 2017, p.4-5).

The Anti-Cyber Crime Law, promulgated by Royal Decree No. M/17 in 2007, 'sets out all cyber-crimes and their associated penalties', and seeks to 'secure the safe exchange of data, protect the rights of users of the computers and the Internet, and to protect the public interest and morals as well as people's privacy' (Alqahtani, 2016). The types of cybercrimes that the law describes are numerous: they range from hacking and illegally accessing a website or someone's device (i.e., computer, tablet, smartphone etc.), stealing data or misusing cameras from said device, and threatening, blackmailing or defaming legal persons via the Internet (Royal Decree, 2007a).

In the same year that the Anti-Cyber Crime Law was promulgated, Royal Decree No. M/18, 'Electronic Transactions Law', was passed, which 'aims at controlling, regulating and providing a legal framework for electronic transactions and signatures' (Ministry of Communications and Information Technology, 2017). The law recognizes the legality and validity of electronic transactions, records and signatures as long as they comply with the law's provisions (Royal decree, 2007b).

In 2019, a new e-commerce law was promulgated which seeks 'to regulate the practice of e-commerce by increasing transparency, ensuring consumer protection and enhancing trust in online transactions' (DLA Piper, 2019). Prior to the passing of this law, KSA's e-commerce legislative framework was fragmented, with some components falling under the Electronic Transactions Law. The new law is the 'stand-alone law regulating e-commerce' which applies to 'consumers and e-commerce services providers, whether established in KSA or not provided they are selling to consumers in the Kingdom' (DLA Piper, 2019). Users and consumers of e-services have more protections: their data is more protected, as e-service providers 'are prohibited from using and or disclosing such data without having' the consent of users; if a purchase made online takes longer than 15 days to reach the consumer from the agreed-upon date of delivery, the consumer has the right to terminate the purchase or contract; in addition, misleading or false statements are now prohibited, with non-compliant advertisements subject to sanctions prescribed by the law (which range from warnings to fines and temporarily stopping or permanently shutting down the e-service providers' activities) (DLA piper, 2019).

When it comes to cloud computing, CITC issued a regulatory framework that came into effect in March 2018 which applies to 'any cloud service provided to cloud customers' residing in KSA and which seeks to increase 'regulatory clarity and encourage the adoption of cloud computing services' in KSA (O'Connell, 2018). Any legal person 'controlling data centers, or other critical cloud system infrastructure, hosted in Saudi Arabia and used for the provision of cloud services must register with the CITC and disclose the location and main features of the data centers located both in KSA and in other countries provided that they process data and content for Saudi-based cloud customers. Cloud service providers must also allow their customers to 'access, verify, correct or delete their customer data'. As for unlawful content stored on clouds, the framework specifically mentions that the cloud service provider is not to be held accountable or criminally liable, but is required to inform the CITC or other relevant authorities if a customer is using the cloud in ways that could violate the Anti-Cyber Crime Law (O'Connell, 2018). The regulatory framework was slightly modified in 2019, to limit its potentially broad application to only cloud service providers that conclude a contract with customers, whereas in the previous iteration it also applied to 'cloud service providers that owned the relevant infrastructure, or that sold cloud services through local partners, but had no direct relationship with cloud customers' (O'Connell, 2018).

In 2019, the CITC published an Internet of Things (IoT) Regulatory Framework to put KSA on a strong footing when it comes to adopting IoT across all sectors and fields and to encourage its use. In addition to general provisions, such as requiring IoT service providers to ensure that users are aware of how to use the services and adhere to existing CITC regulations, the framework stipulates that 'IoT services can be provided using wired and wireless networks', and classifies the major requirements that IoT service providers must abide by, as well as the kind of equipment that can be used and what specifications they must comply with (CITC, 2019, p.5). As for the management of data, although KSA does not have specific overarching data protection legislation, the framework stipulates that IoT service providers must store all data in the kingdom and must comply with existing data-related legislations issued either by CITC or other Saudi authorities (CITC, 2019).

KSA's digital regulatory framework is relatively advanced: not only is e-commerce regulated with a standalone law which replaced the previous fragmented system, but Internet users – be it citizens or businesses – are very well protected from all sorts of cybercrimes. In addition, KSA has in recent years adopted regulations to ensure that the kingdom is at the forefront when it comes to the adoption of the latest digital technologies – namely IoT and cloud computing – which highlight Saudi authorities' seriousness in pushing for the digital transformation of the country, at the economic, political and social levels. However, while provisions to protect Internet users' personal data are present in other laws, such as the 2018 regulatory framework dealing with cloud computing and the 2019 e-commerce law, there is no law dedicated to ensuring personal data protection in KSA akin to the EU's GDPR.

b. Digital Government in KSA

Since the early 2000s, Saudi authorities have focused significantly on transforming the public sector into an e-government as the economic benefits that are to be accrued from such a transition – namely facilitating and speeding up citizen-government and business-government transactions and interactions – were quickly acknowledged. In 2003, High Order No. 7/B/33181 entrusted MCIT with the formulation of a plan to transition into e-government and make governmental services and transactions electronic (GOV.SA Unified National Platform, 2020a). Two years later, 'Yesser', KSA's e-government program, was launched with the objectives of moving governmental transactions, services and procedures online. By 2016, over 2,500 governmental services, procedures and transactions for Saudi nationals, residents and businesses could be carried out online (Ministry of Communications and Information

Technology, 2020), and in that year's UN E-Government Survey, KSA obtained the respectable rank of 44th most developed country in terms of e-government, with an EGDI score of 0.6822 (United Nations, 2016).

As Vision 2030 places much emphasis on the digital transformation of both the public and private sectors in the KSA, several governmental bodies tasked with promoting such a transformation have been established. Crown Prince MBS, who has spearheaded Vision 2030, has often highlighted the importance of using the latest technologies. In 2017, an 11-member National Committee for Digital Transformation, comprising several ministers and senior public officials, was established and tasked with formulating policies, plans and digital transformation strategies in the public sector, as well as coordinating them (National Digital Transformation Unit, 2020). In the same year, a National Digital Transformation unit was established to act as the Committee's executive arm and lead the efforts towards KSA's digital transformation (National Digital Transformation Unit, 2020).

In August 2019, the Saudi Data and Artificial Intelligence Authority (SDAIA) was established with three sub-agencies: (1) the National Center for AI, (2) the National Data Management Office and (3) the National Information Center. The SDAIA and its sub-agencies have been active in preparing data- and AI-related policies, such as the Open Data Policy and the Data Sharing Policy, which will ostensibly 'pave the way for a robust, business-friendly regulatory environment'. SDAIA also launched a cloud for the Saudi government 'which provides various cloud services to public sector entities and aims to enhance government performance, boost e-service provision, reduce digital infrastructure costs, and ensure high information security standards' (Access Partnership, 2020). In October 2020, the SDAIA unveiled the National Strategy for Data and AI which seeks 'to put AI at the heart of the country's development and growth' and make KSA a 'global leader in Artificial Intelligence by 2030' (Business Wire, 2020). The strategy will be implemented under several phases which include developing AI-related skills and expertise, AI-related policies and regulations, and promoting investments in AI-related research and innovation (Business Wire, 2020). Specifically, by 2030, the strategy seeks to make KSA among the 'top 15 countries in the development and application of AI', 'train and host more than 20,000 data and AI specialists and experts', establish partnerships with leading AI stakeholders, invest over 20 billion USD in data and AI, establish a business-friendly regulatory environment, and ensure that an ecosystem comprising over 300 startups in the fields of data and AI is in place (Access Partnership, 2020).

Complementing efforts to digitally transform the public sector is 'Aadaa', the National Center for Performance Management, established in October 2015, and which seeks to develop public sector capacities and spread the culture of good governance and evidence-based performance (Aadaa - The National Center for Performance Measurement, 2020a). 'Aadaa' has 'developed a performance measurement framework based on best global practices' to measure the extent to which Saudi public bodies are operating well and the extent to which beneficiaries of governmental services are satisfied, as well as to 'identify and analyze risks and obstacles' and provide support and assistance to public bodies so that they can fulfill their objectives and provide the best possible services (Aadaa - The National Center for Performance Measurement, 2020b).

In May 2019, the Saudi government issued a resolution on the usage of ICTs in the public sector which replaced the Resolution No.81 of 2009 on the usage of 'computers and information networks in government agencies' (Library of Congress Law, 2019). The resolution is comprehensive in terms of how public bodies must use the Internet. For instance, Section 2 of the resolution specifically details how governmental websites are to be designed: in addition to prominently displaying the name and logo of the public body on the main interface, the website must also include links to the public body's social media pages, as well as contact information with at the minimum a general email address. Section 3 stipulates that all civil servants must use their government email for work-related matters only, while Section 4 calls on public bodies to 'include cloud computing and innovative emerging technologies as part of their strategic plans' (Library of Congress Law, 2019). Concerning official electronic documents, Section 5 stipulates that government agencies must 'comply with relevant regulations to protect' them, while Section 7 stipulates that civil servants must use their 'electronic signature and electronic certification features in all official correspondence'; as for ensuring that the personnel is adequately trained in using ICTs, Section 9 dictates that the 'government must train authorized personnel on the use of information technology resources' and urges 'government agencies to recruit qualified Saudi citizens in the field of information technology' (Library of Congress Law, 2019). This resolution, particularly Section 4, highlights the Saudi government's commitment to ensuring that the public sector is run in the most efficient manner with the latest digital technologies.

In June 2020, KSA's central bank, the Saudi Arabian Monetary Authority (SAMA), announced that it will deploy blockchain technology when depositing part of a liquidity package into the banking sector. SAMA is considered a

pioneer in the region when it comes to experimenting 'with blockchain technology for monetary transfers', and other public bodies, such as the Saudi Customs Authority, have already begun experimenting with this technology, spurred on by Vision 2030 (Department of Commerce, 2020).

The e-government developments that have taken place since King Salman's ascension to the throne in 2015 appear to have borne fruit: the latest findings from the UN E-Government Survey 2020 give KSA an EGD score of 0.7991, a significant increase over preceding surveys (UN DESA, 2020).

c. Going Digital Framework – the case of KSA

Grand changes in KSA, be it at the political, economic or societal level, have always proceeded slowly. The country's consensual system of governance, whereby the monarch, senior princes and the religious establishment – all of whom may have very different viewpoints and ideas regarding the future directions that KSA should take – consult with one another and attempt to reach consensual decisions, makes change very slow. Even though multiple five-year socioeconomic developmental plans were passed since the days of King Faysal, and despite the significant socioeconomic development achieved in KSA since the kingdom was established in the early 1930s, these plans did not significantly affect the socioeconomic status quo. In addition, such plans often had lackluster track records (Thompson, 2017).

This all changed starting in 2015 when King Salman ascended to the throne. At its core, the main objective of the aforementioned Vision 2030 document is to transform KSA's economy and move it away from its reliance on hydrocarbon resources. This entails developing 'a sophisticated digital infrastructure' that 'is integral to today's advanced industrial activities', and partnering up 'with the private sector to develop the telecommunications and information technology infrastructure, especially high-speed broadband' (Saudi Government, 2016, p.57). The Vision also entails the establishment of a national council to oversee the country's digital transformation, and seeks to 'increase [the Saudi government's] investments in [...] the digital economy' (Saudi Government, 2016, p.44). The passing of the new e-commerce law and the IoT regulatory framework are but two examples of such changes taking place.

With this being said, the sub-sections below will seek to apply the OECD framework to highlight how KSA's digital transformation is proceeding, and in which areas progress still needs to be made.

i. Access

Although the government has implemented several projects to expand connectivity to underserved areas, Internet access remains poorer in some of KSA's rural villages and provinces than in urban areas. The average consumer monthly cost of broadband in the country is relatively high when compared to the region (96 USD per month in 2018), but is not prohibitive locally, as the price is considered low when compared to the monthly gross national income per capita (Freedom House, 2019b). In fact, 96% of individuals in KSA were using the Internet in 2019 (World Bank, 2020), and an equally high proportion of households had Internet access at home (99.2%) that year (Knoema, 2020). The number of fixed broadband subscriptions per 100 people has been steady at around 20 subscriptions per 100 people since 2015, and was equal to 19.849 in 2019 (WB database). The number of mobile broadband connections per 100 inhabitants in KSA was equal to 84.94 in 2020.

The COVID-19 pandemic and ensuing lockdown and safety measures translated into a surge in the use of both mobile and fixed Internet services in the kingdom, with the CITC reporting that average daily consumption of data was up 33% for the month of February 2020, as compared to the same month in 2019 (Arab News, 2020a). The government took several actions to improve broadband network and services in response to the pandemic, including securing continued access to various e-government services, developing their e-learning platform, providing more spectrum to telecom companies, as well as providing free Internet services to university professors and free SIM cards to students to facilitate online learning via their devices (Guermaz, 2020).

ii. Use

A year after Vision 2030 was released, CITC launched a report detailing how e-commerce was on the rise in the kingdom: the amount spent in business-to-consumer (B2C) e-commerce in 2016 exceeded 29.7 billion Saudi riyals (i.e., over 7.9 billion USD), and the number of Saudi businesses offering their products and services online was on the rise (from commercial banks to companies selling general consumer goods, to name a few). The number of electronics, cultural and media entertainment under digital formats, clothing and everyday goods purchased online, including via smartphones, was also on the rise. Nonetheless, the report also highlighted several challenges inhibiting the expansion of e-commerce in KSA, namely a lack of trust in the way websites handle customers' personal information, as well as low awareness regarding protections offered to consumers making online purchases (Communications and Information Technology Commission, 2017).

KSA's UNCTAD B2C E-Commerce Index score in recent years has been commendable. The index measures countries' e-commerce landscapes and the role that the ICT sector plays in their economies, and in 2015 and 2016, KSA obtained the respectable scores of 67 and 69 respectively (UNCTAD, 2017b). These scores put KSA in the 'high readiness' category when it comes to e-commerce development, and put the country above the average for Western Asia, which stood at 58 in 2017 (UNCTAD, 2017b). In 2019, the year in which the new e-commerce law was promulgated, KSA's score jumped to 73.3, significantly higher than the regional average for Western Asia, standing at 59 (UNCTAD, 2017b). Today, several companies devoted to e-commerce are operating in KSA, such as Amazon (which purchased the Dubai-based Souq.com in 2017) and Namshi (owned by the Dubai-based Emaar Group), which is focused on clothes (Garrós, 2019).

However, despite the promising growth of e-commerce in KSA, the enabling regulations and the tremendous potential that exists due to the country's large, tech-savvy and increasingly connected youth population, obstacles continue to hinder e-commerce growth in the kingdom. A study from early 2019 highlights how KSA has not been able to materialize its high readiness into e-commerce growth on par with the country's high potential, describing e-commerce in KSA as being 'still embryonic' (Garrós, 2019). Saudi nationals have been described as 'conservative, risk-averse online shopper[s] who only buy predefined items online', while cash-on-delivery continues to be the most widely used payment method for consumers who engage in e-commerce due to the low credit and debit card penetration rates, as well as to the reluctance by many to input their card details online (Garrós, 2019). As for Saudi SMEs wishing to engage in e-commerce, a study from 2018 uncovered several obstacles barring them, namely the high costs associated with launching an e-commerce venture, the lack of skilled personnel who can manage the company's e-commerce operations, inadequate access to ICTs and fear of taking risks (Aljarboa, 2016).

Concerning cloud computing services, they have been on the rise in KSA – both in the private sector as well as in the public sector. Businesses in finance, media, entertainment, hospitality, and retail have increasingly been adopting cloud computing services. In 2018, the year in which regulations pertaining to cloud computing were promulgated, the first public cloud data center was launched by SAP as part of the Saudi government's Vision 2030, which is expected to boost cloud adoption among both the public and private sectors (GMI Research, 2020). Furthermore, several reports forecast that cloud computing adoption is set to grow in KSA, particularly as the COVID-19 pandemic altered the way many

businesses operate (International Data Corporation, 2020; GMI Research, 2020).

Nonetheless, despite the promising outlook, challenges persist which, if not dealt with properly, are likely to hamper the growth of cloud computing and e-commerce in KSA, and hence slow down the country's digital transformation. A study from 2015 found that businesses in KSA were reluctant to engage with cloud computing due to perceived fears that their security would be jeopardized (Alhammedi, Stanier, & Eardley, 2015). In another study conducted five years later and focusing on SMEs in the country's biggest cities (Riyadh, Mecca, Jeddah, Medina and Dammam), several barriers to cloud adoption were highlighted: many of the SMEs had privacy concerns or worried that their data stored on the cloud would not be secure, while some stated that high costs barred their adoption of cloud computing services. Interestingly, the study also showed that lack of governmental support and lack of knowledge about cloud computing were among the most common barriers to cloud adoption among Saudi SMEs (Alsafi & Fan, 2020).

iii. Innovation

As the population of KSA has rapidly gone online in the last decade-and-a-half, and as the Saudi government passed legislations and policies to facilitate access to the Internet and encourage e-commerce, it is expected that the country's ICT sector will grow significantly and the number of investments made by the private sector in ICTs will increase in tandem. It is expected that ICT spending will increase to over 46 billion USD by 2023, as Saudi businesses are likely to adopt cloud computing and data analytics services, as well as artificial intelligence and IoT technologies, in the upcoming years (Global Data, 2020).

Vision 2030 identifies research and development as 'a fundamental enabler of economic diversification', as research and knowledge production lead to innovations that can add value to existing products and services or which in turn lead to the emergence of new businesses (Ministry of Education, n.d.). Since the establishment of the first university in the kingdom, KSA has developed a robust research environment with numerous universities and scientific institutes conducting research in a wide array of fields, with the Riyadh-based King Abdulaziz City for Science and Technology, a public body founded in 1977 grouping several research centers and institutes under its umbrella, and the Thuwal-based King Abdullah University of Science and Technology, a private university founded in 2009, being only two prominent examples. However, cooperation and collaboration within the country's research environment was lacking. In 2017, a Research and Development Office was established within the Ministry of Education, tasked with transforming KSA's research and development ecosystem and enhancing

the capacities of universities and research institutes in the country, with the hopes that this would lead to more synergy within the country's research environment as well as more academia-industry linkages that would positively contribute to KSA's economic diversification and digital transformation (Al-Ghalayini, 2019). In addition to the low levels of academia-industry linkages and intra-academia collaboration, the Saudi educational system as a whole is in need of reform. CICT 'has noted a decrease in the quality of education in [KSA's] less prestigious universities', alongside 'a general scarcity of qualifications in emerging technologies', 'a low level of English language capability among ICT graduates' and 'a shortage of teachers with sufficient expertise'. All of the latter can lead to inadequate academic curricula at the school- and university-levels which do not properly equip Saudi youths with the knowledge and skills, both technical and non-technical, needed to partake in the digital economy and usher in KSA's digital transformation (Bohsali, Papazian, Rizk, & Matar, 2017, p. 14). Similarly, KSA's technical and vocational education sector has long been neglected, while Saudi nationals have been generally averse to enrolling in this sector due to the unjustified, unfavorable social attitudes towards this type of education, as it is seen as equivocal to low socioeconomic status (Bohsali, Papazian, Rizk, & Matar, 2017).

While the Saudi government had encouraged entrepreneurship, particularly innovation-based and in the ICT sector, several years prior to the launch of Vision 2030, the strategy formally recognized the need to support the growth of SMEs and entrepreneurship in the kingdom and provide a business environment that facilitates this growth. In 2016, the Saudi government established 'Monshaat', the General Authority for Small and Medium Enterprises, tasked with developing the country's SMEs and providing them with technical support to improve 'their administrative, technical, financial, marketing, human resources and other capabilities' (Monshaat, 2020). 'Monshaat' is also mandated with encouraging entrepreneurship and innovation via specialized programs and projects, as well as collaborating with the kingdom's financial institutions to increase financing opportunities for aspiring entrepreneurs and startups (Monshaat, 2020). The following year, KSA's sovereign wealth fund, the Public Investment Fund, launched 'Jada', a fund dedicated to investing in venture capital and private equity funds in order to encourage SMEs (Al Arabiya, 2019).

A study by Arabnet (2017) identified several impediments that startups in KSA's ICT sector face, the most salient of which are difficulties in securing funding, finding qualified local talent (many of whom prefer stable jobs in large corporations rather than in potentially risky

startups) and the lack of technical assistance available. More than half of the tech startups surveyed (56%) stated that they launched their startups with their personal savings, while 29% stated that they needed technical support. Entrepreneurs surveyed in the study mentioned that they faced difficulties finding talent with the ability to code and other tech-related skills (Arabnet, 2017). Since the Arabnet study, investments in Saudi startups have been on the rise, as Saudi authorities have sought to make the kingdom more attractive for investors and have launched several initiatives to facilitate startups' access to funding, such as the aforementioned 'Jada'. In 2019, Saudi-based startups recorded 'the highest-ever number of funding deals' with 71 investments, which was a 92% increase from 2018 (Nabil, 2020). In the first half of 2020, the total funding Saudi startups raised surpassed the total raised during the whole preceding year. Many of the startups securing funding are in tech-related sectors, such as fintech, e-commerce, edtech and tech-enabled services (Startup Scene, 2020b). Now that funding is far more easily available for aspiring entrepreneurs and startups in the Saudi ICT sector, it appears that one of the major hurdles has been removed thanks to governmental support. However, investors and entrepreneurs continue to struggle to find talented workers willing to embark on a startup (Hamid, 2019).

iv. Jobs

The growth of KSA's ICT sector is a key component of Vision 2030, considering that the sector is a key ingredient in all strategies to diversify the country's oil-reliant economy. As the Saudi population has become increasingly connected to the Internet, businesses have embraced social media platforms to advertise their products and services, and are increasingly engaging in e-commerce. Thus, the ICT sector has grown significantly in recent years (Oxford Business Group, 2020b). However, the kingdom has had a chronic problem of shortage of Saudi nationals with the necessary ICT skills to engage in the digital economy, which has created a decades-long dependence on expatriate workers.

In a report published by CITC in 2015, it was estimated that KSA's ICT workforce would reach around 230,000 professionals, but the market would still face a shortage, highlighting the need to develop the skills of the existing Saudi ICT talent pool, encourage youth to study ICT-related fields to partake in the sector, as well as increase opportunities available for them to obtain training on digital skills via public-private sector collaboration (Communication and Information Technology Commission, 2015a). In 2019, the Ministry of Communications and Information Technology released the 'ICT Strategy 2019-2023', aligned with Vision 2030, which seeks to attract leading multinational tech firms to KSA, upskill the Saudi workforce with the digital skills

and technical knowledge to partake in the ICT sector and the digital economy more broadly, as well as to promote research and development in KSA's growing startup ecosystem (Ministry of Communications and Information Technology, 2019a). Concretely, the strategy sets the goal of 50% growth of the ICT sector as well as raising the Saudi ICT workforce to 50% by the year 2023, alongside attracting foreign investments in KSA's ICT sector and increasing women's participation in the sector (International Trade Administration, 2019). Such goals are made all-the-more important when bearing in mind that, according to the World Economic Forum's 2016 'The Future of Jobs' report, a very high number of Saudi nationals are employed in sectors of the economy that could be negatively disrupted by digital technologies (World Economic Forum, 2016). The 2020 strategy features more insights on the needs of the Saudi labor market. The six most important skills identified as being in high-demand were 'complex problem-solving', 'leadership and social influence', analytical thinking and innovation', 'active and learning strategies', alongside 'resilience, stress tolerance and flexibility' and 'critical thinking and analysis'. 'Technology use, monitoring and control' came in the seventh place (World Economic Forum, 2016, p. 101). This highlights that the Saudi workforce needs more than just digital skills to be equipped for such a transition. As mentioned in the previous section, the kingdom's education system must be reformed so that Saudi youths are equally equipped with the non-technical skills needed for an increasingly digital labor market.

The Saudi government has, in recent years, launched several initiatives and programs to provide training to Saudi nationals to equip them for the digital economy, ranging from basic digital literacy programs to programs providing training on the skills needed to operate the latest digital technologies.

Close collaboration between the public and the private sector is necessary in order to develop the skills and talents of the Saudi national workforce and ensure that it is capable of leading a digital transformation. For instance, in May 2019, the Ministry of Communications and Information Technology established the Saudi Digital Academy which is 'aimed at developing the digital capabilities of the Saudi youth in the field of modern and advanced technologies in partnership with the private sector', offering programs in web design, data science, cloud computing and even video game development (Ministry of Communications and Information Technology, 2019b; Saudi Digital Academy, 2019). Similarly, the Misk Academy, an initiative led by the Mohammed bin Salman Foundation and launched in 2019, provides training to Saudi youths on leadership and the cutting-edge technical and digital skills needed

for partaking in the digital economy (such as coding, blockchain, cybersecurity etc.) and has trained over 9,000 students to date (Misk Academy, 2020). In September 2020, the Ministry launched the 'Future Skills' program 'which aims to provide intensive training in digital domains, including data science, information security, communications and technology projects management, web development, artificial intelligence, information technology engineering and blockchain' to over 5,000 nationals in the public, private and nonprofit sectors (Arab News, 2020b). These are only some examples of the recently-launched government-led efforts and public-private collaborations to spread digital skills among the Saudi workforce, and given the high priority such programs have in KSA's Vision 2030, there is no doubt that they will continue.

v. Social Prosperity

At first glance, the digital gender divide for the KSA does not appear to be very deep. The percentage of female Internet users (as a percentage of the female populations) in KSA was 91.4% in 2018 (United Nations Development Program, 2020). Furthermore, according to a 2015 report by the CITC based on a nationally representative survey, Internet usage was higher among women than men (96% against 88%), with the former spending more time on average online than their male counterparts. However, around 37% of the survey's respondents were expatriates, which means that these results are not fully representative of Saudi women's access to and usage of the Internet (Communication and Information Technology Commission, 2015b). Women in KSA heavily engage with the Internet and technology in general, as the two are seen as potential ways through which they can find remote work opportunities. With this being said, the number of female Saudi students pursuing university degrees in computer science is higher than their male counterparts. In 2014, out of all students pursuing such a degree in Saudi public universities, 59% were women (Alghamdi, 2016). In the past few years, the number of Saudi women pursuing online classes on digital skills has also been on the rise, as these skills allow them to engage in freelance remote work (Hamid, 2018). Nevertheless, data from 2016 revealed that the percentage of women graduating from digital related fields in KSA is lower than that of their male counterparts (6% versus 24%); furthermore, the percentage of graduates with degrees specifically in ICTs in KSA remains low for both males (6%) and females (7%) (Assi & Marcati, 2020).

Although KSA has very impressive Internet penetration rates and a very large proportion of the population is connected, gaps exist regarding access. Rural and remote areas have historically been seen as financially unattractive areas with small populations, making large-

scale telecommunications infrastructure investments seem unworthwhile and forcing residents of these areas to rely on mobile broadband services. This problem was identified early on, and the Ministry of Communications and Information Technology launched in early 2012 the 'E-training caravan Learning' initiative which consisted of large buses travelling to remote areas to 'provide much-needed computer literacy and Internet courses for both young and old' (GOV.SA Unified National Platform, 2020b). In recent years, the Saudi government has further made it clear that the urban-rural digital divide will be reduced and that all areas of the kingdom will enjoy fixed broadband coverage, particularly given the fact that Vision 2030 seeks to diversify the economy and that rural areas play a role in this regard, such as through the development of a Saudi tourism industry (Oxford Business Group, 2020d). In 2019, the Minister of Communications and Information Technology stated that the ministry 'is looking to expand high-speed Internet coverage of higher than 10 megabytes per second (Mbps) across all rural areas by 2022' (Argaam, 2019), and in the preceding years, the ministry had already begun signing memorandums of understanding with private sector firms in the telecommunications sector to bring affordable high-speed Internet access to citizens living in rural and remote areas (Russell, 2017).

Concerning working remotely, its potential benefits were recognized even prior to the COVID-19 pandemic. In January 2020, right before the advent of the pandemic in the MENA region, the Ministry of Labor and Social Development launched a 'remote-work' program, which included a job-matching electronic portal bringing together employers offering suitable jobs that can be done remotely and jobseekers (such as freelancers) who can work from a distance (Alshathri, 2020). Nevertheless, the pandemic 'forced public and private sector organizations to adopt remote, flexible working with unprecedented speed', and remote work became the order of the day for many businesses throughout the kingdom (PWC, 2020).

vi. Trust

Few studies from the KSA look at issues of privacy violation and cybersecurity in the country. A study looking at privacy concerns in relation to online social media platforms found that although individuals reported being concerned about their privacy and the protection of their personal information, fearing that their personal information would be misused and abused, this was not reflected by their online behavior (AlSagri & AlAboodi, 2015). Another study which examined concerns about Internet surveillance in a number of Arab countries, including the KSA, found that 52.6% of Saudi nationals reported concerns about companies checking what they do online, while 41.4% of non-nationals in

KSA reported being worried about companies checking what they do online (Martin, Naqvi, & Schoenbach, 2019). Furthermore, there is no law dedicated to ensuring protection of Internet users' personal data in the KSA. At the level of organizations, an assessment of organizational digital transformation in the KSA identified cyber insecurity as a major challenge faced by organizations. Despite the significant strides made towards managing and identifying cybersecurity threats and the passing of the Anti-Cyber Crime Law, participants shared that technical ability and appropriate laws were still missing (Alharbi, 2019), possibly due to lack of awareness about the laws' provisions. Participants also mentioned that users feared sharing their personal information online, due to a lack of awareness about cybersecurity measures (Alharbi, 2019).

vii. Market Openness

Since Vision 2030 was announced, Saudi authorities have sought to make the country 'open for business' by creating a Ministry of Investment mandated to improve KSA's business environment, facilitate investors' journeys in the country and 'promote Saudi Arabia as a world-class investment destination' (MISA, n.d.). With the onset of the COVID-19 pandemic, the Ministry has become 'a central hub for information on the business effects of the crisis', providing investors with all sorts of information regarding what opportunities exist despite the pandemic, while organizing several webinars 'for current and potential investors in order to keep the FDI momentum going' (Kane, 2020). According to UNCTAD's World Investment Report 2020, FDI flows to KSA have increased to 4.6 billion USD, an increase of 7% from the preceding year, many of which went to non-oil sectors, which indicates that the Vision 2030-affiliated policies to improve the country's investment climate and diversify the economy is bearing some fruit (UNCTAD, 2020).

KSA's ICT sector has attracted significant investments over the past decade. In 2010, excluding telecommunications service providers, the ICT sector was the recipient of 21.08 billion Saudi riyals (roughly 5.6 billion USD) which gave a boost to the country's digital infrastructure and tech companies (Communication and Information Technology Commission, 2015c). According to Invest Saudi, which is overseen by the Ministry of Investment, FDIs in the kingdom were on the rise in 2019. In 2018, 97 foreign investor licenses were provided for investors in the professional, scientific and technical sector, only to increase to 125 licenses in the next year (Invest Saudi, 2020).

However, it is unclear to what extent these FDIs are having an impact on the kingdom's ICT sector. Previous sections mentioned how tech startups in KSA are not only increasing in number but are also managing to attract

more funding thanks to governmental actions, although not all of such funding came from abroad. It is perhaps still early to determine the impact of FDIs on KSA's ICT sector, but what is increasingly clear is that since Vision 2030, the number of FDIs in the kingdom have increased, and the country's tech sector will not be left out of these investment flows.

d. Recommendations

As the aforementioned sections make clear, KSA's digital transformation is well underway. The Saudi population is among the most connected populations in the world, and this is reflected in the increasing size of e-commerce in the kingdom. The country's ICT sector is growing in size, while tech startups are managing to find new sources of funding and investors are increasingly seeing KSA as a hub for tech-related investments. Saudi authorities have passed laws and regulations to facilitate the digital transformation, be it through providing protections to consumers and businesses engaging in e-commerce, or through regulating the usage of the latest digital technologies, just to name a few. Nonetheless, the road towards a full digital transformation reaping in all the potential dividends that can be accrued remains somewhat distant, as much needs to be done in several fields:

- ▶ Firstly, despite the efforts exerted by the Saudi government in recent years to promote digital skills across the population and particularly among the youth, there is a clear skills gap in the country's ICT sector. Many firms continue to hire and rely on skilled expatriate workers for their technology-related operations, despite efforts by the Saudi government in recent years to promote a 'Saudization' of the workforce and reduce businesses' reliance on foreign workers. This difficulty in finding Saudi nationals equipped with the skills to partake in the digital economy is challenging not just for existing companies, but also for budding tech startups. This gap in digital skills in the workforce hampers businesses seeking to undertake digital transformations. Studies have shown that even businesses that are aware of the potential benefits of e-commerce and cloud computing services often struggle to engage with both due to a lack of available talents who can handle these operations. However, the lack of technical skills among the workforce is not the only struggle that Saudi businesses and startups face, as there is also a general lack of non-technical skills, such as leadership, critical thinking and problem-solving skills. The common thread linking these challenges to one another is the fact that the kingdom's public education system needs to be

revamped and must include components related to digital skills (such as coding and web design) as well as non-technical skills, such as the ones.

- ▶ The Saudi government has developed an impressive open data portal which provides access to many different kinds of datasets that are of use for businesses, researchers, policymakers and everyday citizens. However, data collection on digital transformation-related indicators should be improved, as this would allow for better monitoring of the kingdom's digital transformation, as well as better identification of the gaps and challenges that hamper the kingdom's digital transformation.
- ▶ KSA's impressive scientific research and development ecosystem has much to be commended for, but in its current state, it operates as isolated islands with little cooperation and collaboration within academia and between academia and industry. In order to reap the most dividends out of the digital transformation, scientific collaboration across research institutes and universities must be strengthened, while academic innovative discoveries and ideas coming out of academia must find a welcoming home in the private sector. In other words, both intra-academia and academia-industry linkages must be strengthened and supported.
- ▶ In addition to revamp KSA's public education system and scientific research ecosystem, the existing public-private partnerships to develop youths' digital skills and encourage them to partake in the digital economy must not only be increased, but must also be put within a broad overarching framework with clear goals and targets so as to better be able to monitor progress made in KSA's digital transformation.
- ▶ Lastly, despite the existing regulations providing much digital-related protections and security, many businesses are reluctant to either engage in e-commerce or adopt cloud computing services. Efforts must be put in to encourage the private sector to transition online and engage in cloud computing services.
- ▶ KSA's digital transformation has been well underway for several decades now, and it got a significant jolt with the announcement of Vision 2030. The COVID-19 pandemic has wrought on the country significant challenges, key of which is the dramatic decrease in oil prices that has severely affected the Saudi government's revenues. Such exogenous shocks should serve to further drive the digital transformation, which could eventually wean off KSA from its chronic reliance on the oil sector.

CASE STUDY 3: THE UNITED ARAB EMIRATES

a. Digital Regulatory Environment

The UAE's laws and regulations dealing with all things digital are advanced compared to other countries in the region, as the UAE's leadership has always sought to ensure that the country's economy is attractive to foreign capital and investments. The Telecommunications Regulatory Authority (TRA) is a key actor in promoting the UAE's digital transformation. Established in 2003 through Federal Law by Decree No.3 Regarding the Organization of Telecommunications Sector (Telecommunications Regulatory Authority, 2003), the TRA is more than simply a regulatory authority tasked with ensuring that the country's telecommunications sector is properly run and regulated. As an authority, it is also 'responsible for the overall digital infrastructure in the country' – from promoting the digital transformation of the public sector (from e-government to digital government) and supporting the ICT industry in the country, to developing, modernizing and enhancing the UAE's telecommunications infrastructure (Telecommunications Regulatory Authority, 2020a).

When it comes to e-commerce, the TRA has an e-commerce section which is tasked with implementing Federal Law No.1 of 2006 on Electronic Commerce and Transactions, and ensuring that the law is properly applied. The law provides for the TRA to 'support the ICT sector', 'safeguard competition', as well as to raise the public's awareness on e-commerce, encourage e-commerce-related investments, and protect the rights of all those who engage in e-commerce. The law gives legal recognition to electronic signatures, electronic documents and records, and seeks to promote 'public confidence in the validity, integrity and reliability' of transactions carried out through the Internet (Telecommunications Regulatory Authority, 2020b).

Regarding cybersecurity, Federal Decree-Law no. 5 of 2012 on Combating Cybercrimes is the general legislative framework that highlights what cybercrimes are and what kind of punishments are to be meted out to those who commit them. For instance, hacking into someone's computer or website is punished by a fine and/or imprisonment, as is deleting or copying any of the data or information present on them (Telecommunications Regulatory Authority, 2012). In 2019, the TRA launched a National Cybersecurity strategy which seeks to enhance the UAE's cyber

infrastructure and ensure that citizens and businesses are well-protected online. The strategy highlights the large economic and non-economic costs (such as loss of trust or reputational damage) that cybercrimes have on economies worldwide, and seeks to not only make citizens and businesses secure online, but also to create cybersecurity-level entrepreneurship and make the UAE a world-class destination for cybersecurity professionals (Telecommunications Regulatory Authority, 2019). The government of Dubai launched a Dubai-specific cybersecurity strategy which, taking into account that Dubai has long been a 'major target for malicious actors using cyberspace for their attacks' (Dubai Electronic Security Center, 2017, p. 9), seeks to ensure that cybersecurity is taken very seriously in the emirate and that citizens and businesses alike are well protected from all sorts of online threats.

In March 2018, the UAE government issued the Internet-of-Things (IoT) Policy 'with the intention of making the UAE a leading country in developing IoT services.' The broad objectives of the policy are to encourage the usage of IoT to 'support ongoing innovation' in the country', 'manage scarce resources efficiently' and 'provide clarity for IoT market development' (Jhala, 2019). The regulatory framework for IoT stipulates that IoT service providers must register with the TRA, and contains several provisions to protect users' personal data. These provisions have been viewed as a potentially positive step towards bringing about advanced data protection legislation akin to the European Union's General Data Protection Regulation (GDPR), as the UAE currently does not have 'legislation that regulates the protection of personal data' (Al Jisr, n.d.). The IoT regulatory framework can be seen as a step towards 'achieving the TRA's goal in making [the] UAE a leading country in the development of IoT services' (Fielding, 2019).

All in all, the UAE's digital regulatory framework has much to be commended about. The general e-commerce legislative framework is comprehensive regarding how online transactions are to be carried out, while the cybercrimes legislative framework offers many protections to Internet users – be it citizens or businesses. However, lags persist. While a regulatory framework for IoT has been passed, the UAE still does not have laws to regulate cloud computing nor laws on personal data protection.

b. Digital Government in the UAE

Over the past decade-and-a-half, the UAE's public administration has undergone significant developments, with some scholars arguing that it is becoming a legal-rational bureaucracy in the

Weberian sense, largely due to significant investments in public sector development and the introduction of modern methods of public sector management (Sarker & Al Athmay, 2018). In 2003, major reforms seeking to modernize the UAE's civil service and adopt managerialist principles of New Public Management doctrines were enacted. These doctrines adopt private sector-level approaches to managing public bodies and view citizens as customers who should ideally be happy with government-provided services. In 2004, the UAE's public finances were upgraded through the implementation of a performance-based budgeting system which is in line with the proscriptions of the International Public Sector Accounting Standards. The ascension of Dubai's energetic ruler Sheikh Mohammed bin Rashid Al Maktoum to senior positions of the federal state (since 2006, he has been Prime Minister and Vice-President in addition to Ruler of Dubai) served as a boost to the country's public sector development, as Sheikh Mohammad has long pursued long-term socioeconomic development through the latest and most advanced tools and methods. In 2008, a new law was passed which streamlined the UAE's civil service, and in 2010, a federal-level ministerial resolution was passed to ensure ethics in the public sector (Sarker & Al Athmay, 2018).

In tandem with these managerial and administrative reforms in the public sector was the development of the UAE's e-government apparatus. The TRA plays a key role in promoting e-government, as its Information and eGovernment Sector 'is responsible for supporting infrastructure and strategies that drive the e-transformation process of UAE government entities', with the ultimate objective of making the UAE the world leader in terms of online governmental services and citizen satisfaction. The sector is itself divided into three departments, one focused on 'infrastructure management, cloud service and application management', one focused on managing government portals and e-commerce, and one tasked with planning for future policies and managing the UAE's national domains (TRA, n.d.).

In 2010, around a decade-and-a-half since the term e-government came into being and when governments across the world began using the Internet to improve the public sector's performance, the UAE was considered one of the leading Arab countries when it came to e-government development. By then, the country had a robust telecommunications infrastructure and had invested significantly to improve the public sector's online presence (Westland & Al-Khoury, 2010). However, much needed to be done to increase citizens' and businesses' engagement with the UAE's e-government platforms, and experts

called on the country's authorities to prioritize this aspect of e-government (Westland & Al-Khour, 2010). Today, it appears that those calls have been heeded, as the UAE's governmental websites are constantly up-to-date and contain interactive features to facilitate citizen-government interactions. Most public bodies have a presence on social media platforms, and most governmental services and procedures can be carried out online. Furthermore, throughout the Emirati public sector, there is a wide acceptance of the important role that e-government plays in contributing to citizen and business satisfaction, and to promoting economic growth and investments (Al Jenaibi, 2019). In the latest UN E-Government Survey, the UAE is ranked in the 'Very High E-government Development Index [EGDI]' tier, with a score of 0.8555, and is ranked as the 21st most advanced country in terms of e-government development, surpassing all other Arab states (UN DESA, 2020). Today, when compared with other countries in the region, the UAE's public sector is considered to be one of the most efficient, streamlined and digitally-enabled public sectors, widely admired by fellow Arabs and investors seeking to engage in business in the country (Sarker & Al Athmay, 2019).

c. Going Digital Framework – the case of the UAE

As previously mentioned, the UAE's highest political authorities have often made it clear, both in rhetoric and in policy action, that undergoing a digital transformation is a priority. The country's rulers have sought to ensure that the UAE is not only learning how to use and adopt the latest digital technologies, but that the country is also home to innovative startups in the technology sector and that citizens and businesses alike can adopt such technologies. The federal government recently developed several strategies that seek to further ensure that the country is at the forefront of technological developments. The UAE Strategy for Artificial Intelligence, launched in October 2017 seeks to promote the usage and adoption of AI in the public sector and across all sectors of the economy (from transportation and health to renewable energy and education, to name a few) in order to cut operational costs, improve efficiency and productivity (UAE Government, n.d.a). This strategy is backed by a Council for AI headed by a Minister of State for AI and 'tasked with proposing policies to create an AI-friendly ecosystem' and push for research in the field and promote public-private collaboration in AI (NPAI, n.d.). Similarly, an Emirates Blockchain Strategy 2021 was launched in April 2018 which seeks to use blockchain technology in the public sector to make governmental transactions faster and to simplify citizen-government

and business-government transactions and interactions (UAE Government, n.d.b.).

This enthusiasm has not subsided during the COVID-19 pandemic. As a matter of fact, the drive towards digital transformation only intensified during this time, as the country's authorities identified and tried to harness the digital-laden opportunities that the pandemic brought. Sheikh Mohammad bin Rashid Al Maktoum even stated in August 2020 that the 'digital economy is a key catalyst for the growth and development of new economic sectors' and that the UAE's next priority will be to promote the digital economy (Khaleej Times, 2020). It is worth noting that in late 2018, the UAE launched a governmental open data platform, bayanat.ae, with the hopes that the easy access to massive amounts of data will serve as a boost to the transition to a knowledge economy (UAE Government, 2018). As of the time of writing, bayanat.ae contains over 2,600 datasets in a wide range of fields and sectors - from education and the environment, to the economy, agriculture and food security, to name a few - obtained from several public bodies in the UAE. This federal open data portal is complemented by emirate-level open data portals, such as the Abu Dhabi Open Data platform with over 2,000 datasets, Dubai Pulse which contains over 600 datasets, and Ajman Data page which contains over 500 datasets.

With this being said, the sub-sections below will seek to adopt the OECD framework to highlight the progress of the UAE's digital transformation, as well as the areas where more work needs to be done.

i. Access

Although the UAE offers the fastest home Internet speeds in the region (download speed of 9.62Mbps), it also has the highest average broadband package costs (Dh577) in the world (Ryan, 2019). Nevertheless, these high costs are not prohibitively expensive for a large portion of the population due to the country's high income per capita (Freedom House, 2020). The proportion of households with Internet access at home in the UAE was 99.2 % in 2019, and 99% of individuals in the UAE were using the Internet in 2019. In addition, the number of fixed broadband subscriptions (per 100 people) has been around 31 since 2018, over 3 times the MENA average of 9.76 that year. In 2015, PayPal revealed that the UAE was 'the country with the world's second largest smartphone market' (Entrepreneur, 2015). More recent data reveals that the number of mobile broadband connections per 100 inhabitants in UAE was equal to 393.05 in 2020 (Degenhard, 2020).

TABLE 2. VOLUME AND GROWTH OF E-COMMERCE IN THE UAE

Year	E-commerce volume (billions of USD)	Annual Growth Rate
2015	5.1	-
2016	7.5	0.47
2017	9.7	0.293
2018	12.3	0.268
2019	16	0.301
2020 (until September)	19.8	0.238

Demand for data traffic increased significantly in the UAE as a result of COVID-19, and both Internet service providers and the government responded to this surge. Internet service providers responded by increasing local network capacity and international data capacity as well as by providing free mobile Internet to families without a home Internet connection (Oxford Business Group, 2020c).

ii. Use

As the UAE has ‘some of the highest levels of Internet, smartphone and social media penetrations globally’ as well as among ‘the most connected and digital savvy’ consumers (Google and Bain and Company, 2019), it is unsurprising to see that e-commerce in the country has been on the rise over the past few years. The UAE has obtained high scores in the UNCTAD’s Business-to-Customer (B2C) e-commerce index. In 2015 and 2016, the UAE’s score stood at 85 and 87 respectively (UNCTAD, 2017b), but dipped slightly to 83.8 in 2019 (UNCTAD, 2019). Table 2 contains figures retrieved from a study conducted by the Dubai Department of Economic Development whose findings are made available on the UAE’s bayanat.ae.

The figures above highlight the clear trend in e-commerce growth that the UAE has been witnessing in recent years. Dubai in particular has heavily promoted the digital transformation of the private sector. To illustrate, the Dubai Chamber of Commerce and Industry partnered with Google in 2017 to support the Chamber’s members to ‘go online’ by providing them with the relevant training on the necessary digital skills (Entrepreneur, 2018). Within three years, the partnership has resulted in over 100,000 Dubai-based businesses undertaking a digital transformation (John, 2020). Given such a strong push from both the public and the private sectors towards promoting

e-commerce, it is unsurprising to see that since 2015, the volume of e-commerce transactions has almost quadrupled, and given how the COVID-19 pandemic has led to a significant increase in e-commerce across the world, it is likely that the trend will speed up in the upcoming years.

Despite this significant progress, it seems challenges remain regarding citizen and businesses’ engagement with the latest digital tools. In a study from 2014 targeting 225 tertiary educated Internet users in the UAE from a wide array of professional backgrounds, it was found that 80% did ‘not trust cloud service providers to maintain the privacy of the information that they disclose to them or store in their system’, 85% believed that ‘data placed on the cloud cannot be kept secure’ and that the personal data stored on the cloud will ‘be permanently deleted after they deregistered from a service’ (Danaher & Chong, 2014, p.1266). Half of the respondents stated that they did not know whether the UAE had any laws dealing with the privacy or security of data stored on clouds, while 70% felt that privacy notices that cloud service providers present to customers are too difficult to understand (Danaher & Chong, 2014). While the sample of the study is far too small to be representative of the country’s private sector, it does nonetheless bring forth several questions regarding the extent to which businesses are reluctant to engage in cloud computing due to a lack of trust regarding whether their data and sensitive information could get compromised. Despite this reluctance, the number of data centers in the country has been on the rise, and a growing number of businesses have been engaging in cloud computing (Buller, 2019). Dubai is emerging as a regional hub for the adoption of cloud services, while ‘the UAE is the region’s most active adopter of cloud computing’ (Sharma, 2019).

iii. Innovation

Many public sector- and private sector-led initiatives to support entrepreneurship and tech startups in the UAE have been carried out over the past several decades, as the UAE's authorities have long recognized the need to diversify the once-oil based economy and have acted rapidly to ensure that the country is a hotspot for all sorts of entrepreneurialism and tech companies. Dubai Internet City (DIC), founded in 1999, is often heralded as a brilliant innovation that has brought about many benefits to Dubai and the UAE as a whole. As a free zone, DIC has become a strategic base for countless ICT companies seeking to expand in the region (DIC, n.d.). Similarly, the Dubai Silicon Oasis Authority, founded in 2005, is a government-owned free zone that acts as a hub for tech companies who not only enjoy state-of-the-art IT infrastructure and specialized business services, but also enjoy benefits such as complete ownership for non-Emiratis and no taxes (DSOA, n.d.). Free zones such as the latter two (to name but a few) have been instrumental in promoting the UAE's ICT sector and encouraging tech-based entrepreneurialism. The UAE is today considered one of the most dynamic hubs for entrepreneurialism in the Arab region, and countless investors and budding entrepreneurs from the region and globally have made a home for themselves in the country thanks to the facilitations and services offered.

UAE authorities have also sought to make the country a hub for scientific research, as they are cognizant of the important role that scientific and technological innovations play in boosting economic growth and creating employment opportunities. The Ministry of Education and Scientific Research is responsible for coordinating with research institutions and providing licenses for their operations, and federal authorities have prioritized several areas of research that are of strategic importance for the UAE's future, one of which is the ICT sector. Emirati universities, all founded after the country gained independence in 1971, are recognized as dynamic centers for scientific innovation, and have increasingly gained global prominence, particularly due to the high-level support provided by federal authorities to the education sector. Several Emirati universities are engaging in research on the latest digital technologies such as artificial intelligence and blockchain, while Emirati students, who traditionally tended to prefer pursuing their higher education abroad, are increasingly preferring to study in their country (Rizvi, 2019).

The UAE's remarkable economic growth over the past few decades has firmly established the country as a safe space for investors, businesses and entrepreneurs, but this would not have happened

without a strong patent protection system for scientific innovations. Such protections are of the utmost necessity for economies to undergo a digital transformation, as entrepreneurs and businesses need to be sure that their innovative products and services cannot be copied. The UAE's patent protection system is regulated by Federal Law No.17 of 2002, which was later amended in 2006, and the country has seen a growing number of patents, 'mostly concentrated in the sectors of information technology, petrochemicals [...] and pharmaceuticals' (Saleh, 2014).

Despite the promising research and innovation landscape, there is still room for improvement. For instance, there appears to be a significant difference between public universities and foreign universities' branches in the UAE when it comes to conducting research. Conducting research is generally not very emphasized in the former, as lecturers are expected to engage more in teaching than in producing research generally – a hamper that affects higher education throughout the Arab region generally and limits the quantity and impact of Arab knowledge production. Nonetheless, Emirati authorities have recognized this problem, consequently investing in state-of-the-art infrastructure for scientific research in order to boost Emirati universities' global rankings (Amer, 2019). As a matter of fact, a 'reverse brain drain' appears to be manifesting itself in the UAE, with Emirati and Arab expatriates moving to the UAE to conduct their research, although the extent of this phenomenon is still unclear (Amer, 2019).

iv. Jobs

Since the 1990s, UAE authorities have pushed for 'Emiratization' policies in the labor market in order to reduce the country's dependence on expatriate workers and reduce unemployment among Emirati citizens. However, by the early 2010s, these policies focused more on administrative jobs in the finance and oil sectors, rather than in the country's promising ICT sector. This led to a mismatch between the supply and demand sides of the ICT sector whereby businesses struggled to employ Emiratis with the technical and non-technical skills needed, and reported that Emiratis expected much higher salaries and benefits than expatriates. On the other hand, Emirati citizens generally preferred working in the public sector due to the higher salaries and better working conditions, and the country's education system was better preparing them for civil servant jobs rather than private sector jobs – be it in the ICT or non-ICT sector (Al Qubaisi, 2012). In addition, the lack of proper training in English in public schools discouraged students from pursuing STEM disciplines in higher education (The National, 2014).

Since then, the landscape has evolved greatly. An increasing number of Emirati students, and particularly Emirati women, have been pursuing their higher education in STEM disciplines. A comprehensive review from 2019 of the literature on the UAE's STEM education provides hopeful findings albeit with a few caveats: in the last decade, since the UAE Vision 2021 was announced which puts a prime focus on improving education and particularly education in scientific disciplines, the UAE has made significant progress towards promoting STEM disciplines across universities. Emirati authorities have prioritized the education sector by devoting substantial parts of governmental budgets for it. However, many challenges persist. For instance, Emirati students tend to lack interest in STEM fields due to the perceived difficulties and complexities of these disciplines. Given that there is a dearth of STEM-related resources in the Arabic language and that not all Emirati students are proficient in English, this further poses a barrier, while the high tuition costs of studying STEM disciplines makes pursuing such education out of the question for many who lack the means to do so. In addition, many teachers in public schools lack the abilities and training to inculcate their students with the passion and desire for pursuing higher education in STEM disciplines (Al Murshidi, 2019).

The UAE's private sector continues to be dominated by expatriates, and this includes the ICT sector. According to the Federal Competitiveness and Statistics Authority, in 2017, only 48% of Emiratis were participants in the labor market, and among them, 84% worked in the public sector (divided between 32% in the federal government and 52% in local governments). Furthermore, only 8% of Emiratis participating in the labor market were working in the private sector (Sanderson, 2019). Encouraging more Emiratis to partake in the ICT sector and ensuring that they have the skills needed for that is of the utmost importance if the UAE is to have a proper digital transformation and reap its dividends.

Federal authorities have already begun taking the steps necessary to ensure that Emiratis are well equipped with the skills needed for the jobs of the future, or the 'Fourth Industrial Revolution', as the eponymous strategy sets it out. In September 2017, the federal government launched the UAE Strategy for this so-called revolution which 'aims to strengthen the UAE's position as a global hub for the Fourth Industrial Revolution and to increase its contribution to the national economy by means of advancing innovation and future technologies' (Moran, 2017). Complementing this strategy are several other strategies focused on promoting specific skills

needed for the Fourth Industrial Revolution among the population, and particularly the youth, such as the UAE National Innovation Strategy, while governmental authorities have already launched several programs to promote digital skills among the youth and the workforce (such as, for example, the UAE AI Camp which seeks to empower students in high school and university, as well as government officials to know how to use AI to boost the UAE's economy) (UAE Government, 2020).

v. Social Prosperity

The UAE has very impressive Internet penetration rates, with a very large proportion of the population connected. In 2018, 98.8% of females (as a percentage of the female population) were Internet users. Nevertheless, the female to-male ratio in professional and technical jobs was equal to 0.22 in 2020, a relatively low ratio when compared to other countries in the region (Egypt: 0.62, Lebanon: 0.8, and Kuwait: 0.93 (Assi & Marcati, 2020)). Although female university graduates outnumber male graduates, in 2016, much fewer women (16%) than men (27%) were taking college courses in digital-related fields (Assi & Marcati, 2020). Still, the percentage of graduates with degrees from ICT programs in the UAE is low for both males (6%) and females (7%) (Assi & Marcati, 2020). In addition, a study assessing higher education students' perceptions and expectations regarding the use of technology by their instructors found that digital tools and technology-enabled learning promoted passive use by students (such as to retrieve course materials or grades, for setting class schedules or for researching on the Internet for assignments) rather than use for the production of information or in an innovative manner (Ashour, 2019).

Internet penetration is also high in schools, with the percentage of primary schools in the UAE with access to the Internet standing at 100% in 2017, and similarly standing at 100% for secondary schools, although data on the integration of science and technology in schools is scarce. A review of the state of educational technology integration in schools (including higher education institutions) in the UAE showed that the attitudes, perceptions, overall awareness, or acceptance of educators, parents, and sometimes even institutional leadership impacted this integration (Dickson, Fidalgo, & Cairns, 2019). In addition, barriers in the classroom, already mentioned previously, are a major hindrance. Almekhlafi and Almeqdadi (2010) found that teachers who were trying to integrate technology in their classroom activities faced a number of challenges, including technical problems and lack of financial support.

In 2017, the Ministry of Human Resources and Emiratisation issued the Ministerial Resolution No. 787 on Teleworking, aiming at creating job opportunities for individuals living in remote areas – the law requires employers to provide the necessary tools and systems for remote-working, and is only applicable for UAE nationals (MOHRE, n.d.). Yet, only 10% of workers in the UAE reported working from home one to two days per week prior to the COVID-19 pandemic. This number increased significantly since the country implemented strict guidelines in response to the pandemic, which included requesting that almost all workers in the public and private sector work from home (Warner, 2020). This shift was made possible by significant changes implemented by the TRA (some of which were already covered previously), towards what may be a permanent shift in the way people work in the UAE. Changes implemented by the TRA included providing collaboration tools and cloud services to enable government employees to work from home, increasing infrastructure capacity, and developing and sharing relevant guidelines and policies, such as the “Guide of Remote Working in the Federal Government and the Procedural Guidelines in the Critical and Emergency Circumstances”, the “Business Continuity Readiness Guidelines for UAE Organizations in the event of the Novel Coronavirus (COVID-19)” and the “Collaboration and work from home guidelines for IT Administrators” (Al Mansoori, 2020).

vi. Trust

According to a representative YouGov poll conducted in April 2019, 49% of the UAE’s adult population were very concerned by the fact that ‘their personal documents or images’ are automatically uploaded to the cloud, while 48% ‘consider their personal details getting auto filled during a transaction quite troubling’. As for the biggest tech-related issue that worries the people of the UAE, 54% stated that losing their private data – ‘such as photos, emails, financial information’ – was their biggest fear (Comfort, 2019). In addition, the UAE does not currently have ‘legislation that regulates the protection of personal data’ (Al Jisr, n.d.).

Nonetheless, trust in e-commerce in the UAE tends to be relatively high. A study conducted in 2019 by Dubai’s Department of Economic Development and Visa with a representative sample revealed that 66% of respondents trusted online shopping and 70% trusted online payments, with payments made by debit or credit cards being the predominant mode of payment (Dubai Economy, 2019, p.26). As for citizen-government interactions via the Internet, the UAE’s highly developed e-government already

outlined previously was designed keeping in mind that government agencies need to interact with their users, be it through governmental websites or through governmental social media accounts. One of the scores that the UN EGD looks at is the e-participation index which consists of analyzing the extent through which ICTs are ‘fostering civic engagement and open, participatory governance’ as well as ‘collaboration between governments and citizens’. In the latest UN E-Government Survey 2020, the UAE reached the impressive 16th position worldwide, demonstrating that citizen-government and business-government dialogue and interactions carried out through digital tools is very much alive and extensive (Telecommunications Regulatory Authority, 2020c), with the ‘Sharik.ae’ platform being a prime example of one such facilitated and lively channel of open citizen-government communication.

vii. Market Openness

The UAE’s economy has, at least since the country joined the World Trade Organization in 1996, been characterized by its open character and free trade policies. Federal authorities leveraged the country’s strategic geographic position and turned it into a key regional and international hub for a wide array of economic sectors. As previously mentioned, several policy initiatives (such as the establishment of free trade zones catering to ICT companies) have been passed in the past several decades to boost the UAE’s economic diversification, and foreign investments in the country’s ICT sector have increased significantly over the past few years. Tables 3 and 4 contain figures on the sum of foreign investments in ‘professional, scientific and technical activities’ and ‘information and communication’ respectively in Abu Dhabi and Dubai from 2007 to 2015 (data for the remaining five northern emirates was unavailable).

These figures indicate that foreign investments in the UAE’s ICT sector have grown significantly since 2007. Investments in ‘information and communication’ in Dubai grew from 0.694 billion USD in 2007 to 2.268 billion USD in 2015. While figures from pre-2011 are unavailable for Abu Dhabi, the existing data points to an equally impressive growth: from less than 1 billion USD in investments in ‘information and communication’ in 2011 to over 8.517 billion USD in 2015.

The UAE’s open economy has been a boon to the country’s digital transformation, as the number of investments in the ICT sector and in tech startups, as well as in sectors that require technological prowess and digital skills, has been on the rise. However, as the preceding section highlighted, it is unclear to what

TABLE 3. FOREIGN INVESTMENTS IN ‘PROFESSIONAL SCIENTIFIC AND TECHNICAL ACTIVITIES’ IN ABU DHABI AND DUBAI (IN BILLIONS OF USD)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Abu Dhabi	N/A	N/A	N/A	N/A	0.964	0.376	0.527	0.864	0.927
Dubai	1.436	1.527	1.611	1.614	1.909	2.284	2.739	2.828	2.961

TABLE 4. FOREIGN INVESTMENTS IN ‘INFORMATION AND COMMUNICATION’ IN ABU DHABI AND DUBAI (IN BILLIONS OF USD)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Abu Dhabi	N/A	N/A	N/A	N/A	0.004	1.622	1.943	8.523	8.517
Dubai	0.694	0.720	0.843	1.177	1.547	1.634	1.726	2.218	2.268

Source: The UAE government’s open data portal; N/A: Not available

extent these investments are creating employment opportunities for Emirati nationals. Ensuring that Emiratis benefit directly from these investments and that they are partaking in tech-related sectors in which investments are flowing is crucial for the country’s digital transformation to succeed.

d. Recommendations

The UAE’s digital transformation is proceeding at an impressive pace. Since the early days of the Internet, the country’s ruling authorities invested heavily in developing a strong ICT infrastructure to promote access to the Internet whereby today the UAE has one of the highest Internet penetration rates and fastest Internet speeds in the world. The UAE is leading the way regionally (and perhaps soon on globally) in the adoption and proliferation of the latest digital technologies, such as artificial intelligence and cloud computing, in both the private and public sectors. In addition, the UAE’s e-government is globally recognized as among the most developed, providing citizens, residents and businesses numerous facilitations and the opportunity to interact easily and directly with the public sector through digital means. Administrative reforms to the Emirati public sector over the past two decades, and particularly since Sheikh Mohammed bin Rashid became Vice-President, Prime Minister and Ruler of Dubai in 2006, have been carried out in tandem with the transition to e-government, and have ensured that the country’s digital transformation is on a solid footing. These reforms have introduced modern management methods and clear indicators to be met within the public sector, a first in the Arab

region, which is generally characterized by inefficient and heavily bureaucratic public sectors that slow rather than enable economic growth and digital transformations:

- ▶ Despite the promising landscape, the composition of the UAE labor market – whereby expatriate workers hold the vast majority of jobs in the private sector while Emirati nationals are overwhelmingly employed in the public sector – poses a hamper to the country’s digital transformation. The UAE’s ICT sector is a fast-growing sector whereby foreign and domestic investments are flowing, in part thanks to the policies passed in previous decades to encourage such investments, such as the development of devoted free zones. The sector could very well absorb Emirati nationals, particularly the youth, who struggle to find employment in the public sector and who may not be enticed by working in certain sectors of the private sector. For this to happen, the country’s public education system needs to be revamped and Emirati students must not only be properly equipped with the digital skills needed for the ‘Fourth Industrial Revolution’ – to borrow the term used by Emirati authorities – but they must also be encouraged to pursue STEM disciplines. Many obstacles have been highlighted barring them from doing so, from lack of skilled teachers, to high costs of university tuitions, to inadequate preparation in the English language which makes studying STEM disciplines unreachable to many.

- ▶ Promoting scientific research is one way through which the composition of the labor market could be gradually changed and hence encourage more Emirati nationals to partake in it. The UAE has built an impressive scientific research ecosystem, and in recent years, efforts have been exerted to make Emirati universities more research-oriented. This is a positive development and should be pursued – the more scientific institutes produce research and establish proper linkages with industry and business, the better the labor market evolves and the more employment opportunities for Emirati nationals open up. However, ensuring that Emiratis benefit from these opportunities brings us back to the point regarding revamping the public education system.
- ▶ Several public-private partnerships have been carried out throughout the years to boost digital skills among the population and the youth in particular, and to assist Emirati businesses to undertake digital transformations and engage in e-commerce. These initiatives must be expanded and include more digital skills training provided to the youth.
- ▶ Although an impressive federal-level open data portal exists as do several emirate-level open data portals, data on digital transformation-related indicators, particularly up-to-date data, is not always easily accessible. The UAE’s agencies devoted to conducting statistical research and gathering data should focus on gathering such data as this would allow policymakers and the private sector to better measure the country’s digital transformation, identify existing gaps and act on them.
- ▶ The UAE has made significant strides in its digital transformation over the past several decades. The country’s ruling authorities are not only fully onboard with the transformation and aware of the need to undertake it, but are also actively promoting it so as to make the UAE a leading country regionally and globally regarding the usage and knowledge of the latest digital technologies. Ensuring that all Emirati nationals have access to high-quality public education that provides them with the knowledge and skills to partake in the ‘Fourth Industrial Revolution’ is the key challenge barring the country’s digital transformation.

CONCLUSION AND RECOMMENDATIONS

This review has sought to highlight how the digital transformations of three key countries in the MENA region – Egypt, KSA and the UAE – is faring. While these three countries are considered to be economic and geopolitical heavyweights in the region, they are facing challenges, both exogenous (such as terminally declining oil prices) and internal (such as high unemployment rates and undiversified economies), that do not bode well for the future if not adequately tackled. Yet, all three countries have an opportunity to develop their economies and improve living standards by prioritizing their digital transformations – both at the levels of the public sector and the private sector. This review has sought to provide a general overview of each country’s digital transformation by highlighting the digital regulations passed and the state of e-government in each country and also to loosely adopt the OECD Going Digital Framework, a comprehensive paradigm that examines all policy dimensions of a digital transformation, in each case. The framework itself is based on very specific quantitative indicators which, for the most part, were difficult to obtain or did not exist for the three case studies.

The lack of easily accessible digital transformation-related data points to the first general recommendation to be considered when thinking about the digital transformations of these three countries. Such data, in the three case studies, tends to be disparate and coming from many different sources – be it reports commissioned by private sector firms, countrywide surveys carried out by the public sector in partnership with international organizations, or studies conducted by governmental authorities, to name a few. The disparate nature of the data, coupled with the fact that up-to-date and reliable data is not always readily available, poses a challenge to evaluate the digital transformation of the three case studies, and makes it difficult to assess the progress achieved in this regard. The three countries have remarkable data collecting agencies, and KSA and the UAE have even established open data portals that contain many datasets on a wide array of issues – be it digital or non-digital related data. Efforts should be made to not only improve the capacities of these data collecting public agencies, but also to collect data on digital transformation-related indicators, akin to the ones that the OECD Going Digital Framework highlights. Egypt is lacking such a portal altogether, and efforts should

be made to create one. For instance, the indicator ‘Share of small businesses making e-commerce sales in the last 12 months’ (in the ‘Use’ policy dimension) is particularly important given that SMEs are generally the majority of all businesses in the three countries, and it could give a clear view regarding the extent to which e-commerce is developed as well as the obstacles barring SMEs’ ability to engage in e-commerce. Similarly, the ‘Share of businesses purchasing cloud services’ (also in the ‘Use’ policy dimension) is also crucial to understanding adoption of cloud computing, noting that cloud computing brings tremendous potential for businesses’ development and growth, but remains poorly adopted in the three countries. Having access to this data also facilitates cloud-related policy initiatives. Collected data should be as disaggregated as much as possible (age groups; gender; region/governorate; wealth status; size of business engaging in e-commerce; etc.) as this would allow to better recognize where digital divides exist – be it divides on the geographic, age, gender or class levels. In addition, the data should be made available on a periodic basis to allow assessment of digital transformation-related policies and the overall digital transformation of each country over time.

Apart from the dearth of digital transformation-related data, the three countries exhibited similarities regarding the untapped potential of their youth to be engaged in the digital economy generally, and in the ICT sector in particular. Public-private partnerships to teach, improve and boost digital skills among the workforce and the youth are abundant, but, as is the case throughout most of the MENA region, they tend to ‘operate as boutique interventions rather than national-level programs’ (Blom et. al., 2020). Such initiatives, no matter how commendable and well-implemented, cannot ultimately lead to a proper digital transformation if they are not implemented within an overarching framework or strategy with clear goals, objectives and targets to be met. These initiatives, when placed within such a framework, must be constantly evaluated throughout their implementation and after their conclusion so as to identify what progress was made, as well as what challenges and obstacles hampered the efforts. Concomitant with these public-private partnerships are the government-led efforts to bring about the digital transformation of the private sector, be it through encouraging the youth to partake in digital skills training and tech entrepreneurship, or by supporting existing businesses to undertake digital transformations and partake in e-commerce. These efforts should be equally put within an overarching framework and ideally should not be carried out in a

piecemeal effort whereby each ministry or public agency pursues its own initiative or program with little-to-no coordination with other public bodies. In this instance, coordination between the ministries implementing the project and the ministry of education is of the utmost importance, particularly to ensure that students have the right skills to join an economy that is progressively becoming more digital.

Another obstacle hampering the digital transformation that was common in all three countries was the state of the education system. The public education systems in all three countries generally do not adequately prepare the youth with the digital skills and knowledge nor the non-technical skills necessary to partake in the digital economy. While private schools and universities may, in general, be providing such digital literacy training throughout students’ educational pathways, if this is not the case in public schools and universities, then digital transformations are severely hampered and the full dividends and benefits of such transformations risk being missed. Not only should public schools be equipped with the latest digital tools to facilitate students’ ability to gain digital skills, but teachers must be provided with the necessary training and tools to be able to properly provide these skills to their students. This is made all the more pressing given the COVID-19 pandemic which has forced distance learning upon schools and universities, many of which were poorly prepared to embark on this challenging transition.

Scientific research and technological innovations play a key role in digital transformations. These discoveries, when properly protected, can lead to the establishment of new businesses and the emergence of new job opportunities. In all three cases, academia-industry linkages are generally weak and have much more room to grow. In addition, the quality of scientific research leaves room for improvement. While this is not a recent discovery and the inadequate state of Arab scientific research was highlighted as early as the 1980s, this inadequacy takes on an urgent character at a time when digital transformations are not only impacting every facet of our lives and the economy but are also proceeding at breakneck speed. Fostering scientific research should be made a priority and encouraging cross-academia and academia-industry linkages as well as cross-border Arab research is essential to give a much-needed boost to each country’s digital transformation, and can also boost the state of the digital economy in the region as a whole.

Lastly, digital divides persist in all three countries. In some instances, significant portions of the population do not have access to the Internet;

in other cases, while Internet penetration rates may be high, geographic disparities exist whereby rural areas have poor access to the Internet. Often, there are gender-based digital divides, be it when it comes to accessing the Internet, pursuing an education in digital related fields or finding employment in the ICT sector. Addressing all of these digital divides and ensuring that all citizens have equal access to not only the Internet but basic digital skills training is paramount, as a digital transformation that leaves out segments of the population risks increasing injustices by causing societal harm and could result in additional or unforeseen socioeconomic problems.

Nevertheless, the digital transformations of the three countries reviewed hold tremendous promise and potential, and both governmental authorities and the private sector in general are aware of the need to undertake such a multi-faceted and multi-dimensional transformation in order to be ready for a 'Fourth Industrial Revolution'. However, many societal, economic and political obstacles and challenges stand in the way of such a transformation. Nonetheless, with the ball already rolling, any inaction and complacency will bring significant social and economic risks. It remains to be seen whether these countries will succeed or not in fulfilling their digital transformation.

The general recommendations covered in this conclusion and that should be developed further in order for each country to better undertake a digital transformation can be summed up as follows:

- ▶ The lack of easily accessible digital transformation-related data is a hindrance when it comes to measuring and evaluating the three countries' digital transformations. Efforts should be made to not only improve the capacities of their data collecting public agencies, but also to periodically collect data on digital transformation-related indicators that should be made easily accessible to the public via open data platforms.
- ▶ Initiatives to provide digital skills among the workforce and the youth resulting from public-private partnerships are key to supporting a digital transformation, and should be placed within an overarching framework or strategy with clear goals, objectives and targets to be met. This will not only ensure that the youth and workforce are well-equipped to partake in the digital economy, but also that the private sector increasingly partakes in e-commerce.

- ▶ The public education systems must be revamped and should adequately prepare students with the digital skills and the non-technical skills, such as critical inquiry and leadership skills, to partake in the digital economy.
- ▶ Encouraging and supporting scientific research, as well as intra-academia and academia-industry linkages should be a priority.
- ▶ Digital divides – be it geographic or socioeconomic – should be addressed in order to ensure that all citizens have equal access to the Internet and to basic digital skills training.

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APPENDIX. OECD GOING DIGITAL FRAMEWORK

Policy Dimensions	Brief Description	Specific indicators
Enhancing Access	This policy dimension looks at the extent to which the population of the country has access to telecommunications networks. Having access to high-quality telecommunication networks and services and competitive prices, as well as having access to data, is fundamental to a proper digital transformation.	<ul style="list-style-type: none"> ▶ Fixed broadband subscriptions per 100 inhabitants ▶ Machine-to-Machine SIM cards per 100 inhabitants ▶ Mobile broadband subscriptions per 100 inhabitants ▶ Average monthly mobile data usage per mobile broadband subscription (in Gigabytes) ▶ Share of households with broadband connections ▶ Share of businesses with broadband contracted speed of 30 Mbps or more
Increasing Effective Use	This policy dimension looks at the extent to which citizens and businesses are using basic and advanced digital tools, and how much awareness there is regarding the existence of such tools and their potential to drive innovation and productivity.	<ul style="list-style-type: none"> ▶ Internet users as a share of individuals ▶ Share of individuals using the Internet to interact with public authorities ▶ Share of Internet users who have purchased online in the last 12 months ▶ Share of small businesses making e-commerce sales in the last 12 months ▶ Share of businesses purchasing cloud services ▶ Share of adults proficient at problem-solving in technology-rich environments
Unleashing Innovation	This policy dimension looks at the extent to which innovation drives economic growth, as innovative services, goods and business models lead to increased efficiency and job creation.	<ul style="list-style-type: none"> ▶ ICT investment as a percentage of GDP ▶ Business R&D expenditure in Information Industries as a percentage of GDP ▶ Venture capital investment in the ICT sector as a percentage of GDP ▶ Share of start-up firms (up to 2 years old) in the business population ▶ Top 10% most-cited documents in computer science, as a percentage of the top 10% ranked documents ▶ Patents in ICT-related technologies, as a percentage of total IP5 patent families
Ensuring Good Jobs for All	This policy dimension looks at the extent to which workers are properly equipped with the skills to engage in the digital economy so that no one is left behind. Given that digital transformations create new jobs while eliminating others due to the advent of new technologies, it is essential that digital transformations do not lead to higher unemployment.	<ul style="list-style-type: none"> ▶ ICT task-intensive jobs as a percentage of total employment ▶ Digital-intensive sectors share in total employment ▶ Workers receiving employment-based training, as a percentage of total employment ▶ New tertiary graduates in STEM, as a percentage of new graduates ▶ Public spending on active labor market policies, as a percentage of GDP

Policy Dimensions	Brief Description	Specific indicators
Society (Promoting Social Prosperity)	This policy dimension looks at the extent to which society as a whole is benefitting from digital technologies.	<ul style="list-style-type: none"> ▶ Percentage of individuals aged 55-74 using the Internet ▶ Percentage of individuals who live in households with income in lowest quartile using the Internet ▶ Women as a share of all 16-24-year-olds who can program ▶ Percentage of individuals who use digital equipment at work that telework from home once a week or more ▶ Top-performing 15-16-year-old students in science, mathematics and reading ▶ E-waste generated, kilograms per inhabitant
Strengthening Trust	This policy dimension looks at the extent to which citizens have trust in digital technologies and believe that their privacy and personal data won't be violated or stolen. This dimension is particularly crucial, as without trust in digital technologies, the positive socioeconomic developments that accrue will be squandered.	<ul style="list-style-type: none"> ▶ Percentage of Internet users experiencing abuse of personal information or privacy violations ▶ Percentage of individuals not buying online due to payment security concerns ▶ Percentage of individuals not buying online due to concerns about returning products ▶ Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees
Fostering Market Openness	This policy dimension looks at the extent to which businesses are engaging in cross-border e-commerce, as digital technologies not only allow for ideas and information to be easily diffused, but also facilitate global trade.	<ul style="list-style-type: none"> ▶ Share of businesses making e-commerce sales that sell across borders ▶ Share of predominantly digitally-delivered services in commercial services trade ▶ Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value ▶ Digital Services Trade Restrictiveness Index ▶ Foreign Direct Investment Regulatory Restrictiveness Index

ABOUT THE PROGRAM

THE GOVERNANCE AND POLICY LAB

The Governance and Policy Lab (IFI GovLab) aims to undertake innovative policy research and activities that address some of the most pressing policy issues and public sector challenges faced in Lebanon and the region. Further to this, the IFI GovLab's goal is to strengthen the ability of local and regional actors to enhance governance mechanisms and the uptake of innovation within organizations, particularly those in the public sector, by providing them with the right tools and evidence to address national priorities, to the ultimate benefit of the greater public. The IFI GovLab also aims to conduct policy research affecting digital policies and Internet governance in the middle East and North Africa (MENA) region with the aim to advance knowledge creation and existing evidence on inclusive institutions and good governance in the region.

ABOUT THE ISSAM FARES INSTITUTE

Inaugurated in 2006, the Issam Fares Institute for Public Policy and International Affairs (IFI) at the American University of Beirut (AUB) is an independent, research-based, policy-oriented institute. It aims to initiate and develop policy-relevant research in and about the Arab world.

The Institute aims at bridging the gap between academia and policymaking by conducting high quality research on the complex issues and challenges faced by Lebanese and Arab societies within shifting international and global contexts, by generating evidence-based policy recommendations and solutions for Lebanon and the Arab world, and by creating an intellectual space for an interdisciplinary exchange of ideas among researchers, scholars, civil society actors, media and policymakers.

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