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**National Transformation
in the Middle East**
A Digital Journey

In the Middle East
since 1926

Abstract

Digital Transformation is playing a fundamental role in shaping the way governments across the world are adapting to new opportunities and challenges. Competition, cost and budget pressures, shifting citizen demands, among other changes are sparking governments all around the world to implement innovative ICT capabilities to drive their transformation to digital. Digitally mature countries like Estonia, South Korea and Singapore have realized the value of Digital Transformation and have successfully progressed to deliver delightful customer outcomes.

GCC countries are making the move to build on international best practice and leverage opportunities to transform into Digital Government models. The National Transformation in the Middle East: A Digital Journey, identifies six high impact themes relevant to the Public Sector in the UAE, KSA, Qatar and Kuwait: Smart Cities, Smart Tourism, Next Generation Care, Classroom of the Future, Smart Government and Future of Mobility. Across these themes, government strategies are emphasizing the role of digital in order to accelerate economic diversification, promote sustainability and enhance citizen satisfaction levels by implementing exponential technologies.

Smart solutions have emerged as a result of these efforts to incorporate digital into initiatives across each key digital theme. For example, national platforms have been successfully developed as a means of sharing information and enhancing

accessibility of resources for citizens, such as e-learning content, event information, open government data and more. Governments are integrating services in the form of mobile apps and one-stop-shop e-service centers to create seamless customer journeys that encourage paperless transactions and e-payment options for services. The digitalization of content such as medical records, education curriculums and more is allowing for better operational efficiencies across organizations. Finally, the rise of autonomous cars is expected to ensure the connectivity of people and networks across cities.

The successful outcomes of these programs will be driven by the rapid adoption and well-planned execution of digital programs. They will be supported by technologies like artificial intelligence, robotics, cloud, Internet of Things, and virtual reality, and governed by digital program offices encompassing the cross functional impacts. These transformations are long-term and each stage of maturity is driven by specific steps to be undertaken across the digital business, digital operations and digital customer horizons. Building maturity across these domains is the way forward for the Public Sector to deliver sustainable public service growth aligned to the 4th industrial revolution.



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Foreword: Deloitte



Emmanuel Durou
Partner, Head of Middle East
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Over the past decade, countries across the world and in the Middle East have witnessed some of the most seismic shifts in their economies, societies and environment. The financial crises restricted access to capital for billions, rapid population and urbanization growth has led to the birth of mega-cities and more extreme weather conditions have scarced essential power and water more than ever before.

At the same time, we have also seen some of the greatest technological breakthroughs and advances ever made. Artificial intelligence, flying taxis and the Internet of Things, once figments of our imagination, have now become a practical reality, unlocking new answers to key challenges, and new possibilities. Such advanced technologies have completely transformed the way we as citizens interact, learn, move, live, work and earn. Entire industries from media, retail, and tourism to finance have become disrupted, and the Public Sector now is also at the helm of a major Digital Transformation.

Countries need to be at the forefront of these changes to address the global and national challenges they face. Recognizing this, governments the world-over are now harnessing new exponential technologies and embarking on their own Digital Transformation journeys, some more advanced than others.

To this end, governments across the Middle East have launched ambitious national transformation plans with a major focus on enabling ICT and Digital Transformation technologies, to address their own economic, social and environmental challenges. As such, the new era of national transformation, is a journey that we believe is truly digital. From this perspective, we welcome you to “National Transformation in the Middle East – A Digital Journey”, a whitepaper

Deloitte has developed in collaboration with Huawei to examine the role of Digital Transformation and Digital Government in the Middle East.

The paper analyses global and regional Digital Transformation trends in the Public Sector, and based on this, identifies six key high impact themes that are at the top of policymaker agendas. Across these themes, the study explores how governments in the Middle East are applying Digital Transformation today, where they are on their Digital Transformation journey in relation to international best practices, uncovers key challenges they need to overcome as well as the opportunities they need to capitalize on going forward. To support this journey, the paper recommends a Digital Transformation pathway regional governments can take to help them succeed towards achieving their national transformation goals.

We are pleased and honoured to have worked alongside Huawei on this new study, a leading ICT player in the region and we thank them for their vision, expertise and support. We also express our gratitude to the government entities across the region that provided their invaluable insights in support of this paper.

While the study is based on Deloitte and Huawei research, international Digital Government surveys, interviews with regional governments and subject matter experts, we do not however presume ours is the last word on any given topic: our intent is to catalyze discussions and positive developments in the area in the best interest of regional governments, businesses and civil society alike.

A handwritten signature in black ink, appearing to read 'Emmanuel Durou', written in a cursive style.

Emmanuel Durou

Foreword: Huawei



Safder Nazir
Vice President, Digital Industries,
Strategy & Marketing
Huawei Technologies - Middle East

Digital is having a profound impact across the world's economies, societies and future sustainability. The rapid proliferation and adoption across the world of the internet, including broadband, mobile and digital technologies such as social media, smartphone devices, big data, cloud and the Internet of Things has given rise to a new era of hyper connectivity: the growing interconnectedness of people, organizations, and machines.

This increasing digitalization is enabling the growth of a new Digital Economy, the economic activity that results from billions of everyday online connections among people, businesses, devices, data and processes. It has completely transformed our urban transportation, social and government interactions, our learning and health experiences, the work we do and the way we live. Mobile is now our first screen, digital is now the primary channel, data is the new currency and automation is our key to unlocking new efficiencies and productivity.

With the disruption of every major economic sector ranging from e-commerce in retail, on-demand entertainment, travel and hospitality to the advent of FinTech in banking and insurance, digital technologies also represent an unprecedented opportunity for the Public Sector to reinvent itself. As such, governments are now digitally transforming the way they interact with citizens, deliver public services and tackle their greatest national challenges.

Middle East governments, in response to oil price pressures, rapid population growth, urbanization and rising citizen demands have also embarked on massive national transformation plans of their own. All of these plans are explicit about

Digital Transformation, harnessing and integrating digital technologies to develop smarter cities and become smarter nations, a key outcome of their national visions.

Huawei is focusing on helping the Middle East region accelerate its National ICT transformation plans from vision to reality through our broad ICT platform capabilities of Cloud, Pipe and Device plus a rich ecosystem of global and regional solution partners.

To help key stakeholders understand how Digital Transformation can enable success in achieving national goals and the potential impact it can have, we partnered with Deloitte in the development of this whitepaper, leveraging on their expertise in Digital Transformation, Digital Government and experience working with Middle East governments on their national transformation journeys. We thank Deloitte for their invaluable thought leadership and the regional government entities that have provided their key insights in support of this paper.

We invite you to explore with us the "National Transformation in the Middle East: A Digital Journey", a paper which assesses the trends and benefits of Digital Transformation for the Public Sector and the role of New ICT as a key enabler for Digital Transformation. Middle Eastern governments are on their Digital Transformation journeys, learning from successful digital use cases can help them to accelerate the realization of their national goals to become more competitive, world leading smart nations.

Safder Nazir

1. Digital Transformation in the Public Sector

1. Digital Transformation in the Public Sector

The future of governments – “Gov2020”

Demographic changes, new societal behaviors and technological breakthroughs are amongst the key drivers transforming the Public Sector. By 2020, 60 percent of the global population will be living in an urban area. New innovative transport modes will be deployed, such as autonomous vehicles and drones flying over cities¹. Governments will transform from a state of reactivity to proactivity in a variety of aspects ranging from policy decisions to emergency responses. Two billion people without financial services will gradually enter the banking system, and education will become more inclusive pushing for no child to be left behind in a world where illiteracy costs the global economy US\$1.2 trillion per year².

Governments will need to be at the forefront of these changes. As part of a recent global report, “Gov2020: A Journey into the Future of Government”³, Deloitte identified 204 Public Sector trends including 37 cross-sector and 167 specific sectorial trends which will shape the future of the Public Sector in the coming years. Each of these trends will have the potential to reshape Public Sector operating models with the aim to improve service delivery experience, foster the economy, enhance citizen well-being and become more cost effective. Many of the analyses and outcomes contained within the report have been used as a stepping stone for this paper where future government shifts will be analyzed through the lens of Digital Transformation.

Demographic changes, new societal behaviours and technological breakthroughs are amongst the key drivers transforming the Public Sector. Governments will need to be at the forefront of these changes.

The role of digital and ICT in Public Sector transformation

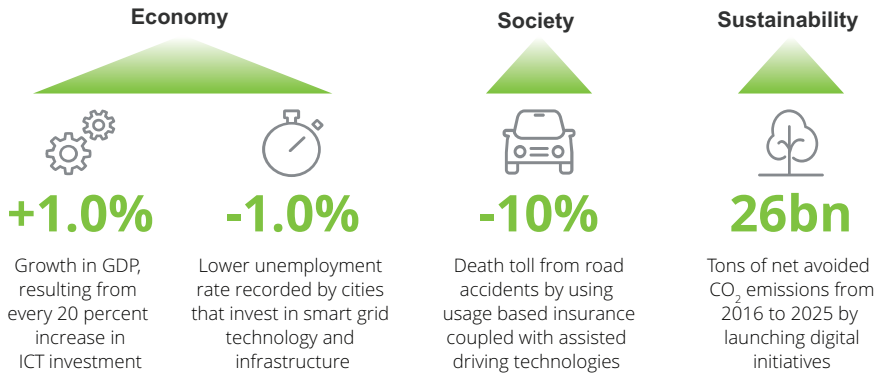
Whilst the drivers of Public Sector disruption are manifold, for the purpose of this paper, it was chosen to place a particular emphasis on digital technologies and their role in government transformation. Digital technologies represent an unprecedented opportunity for the Public Sector to reinvent itself, especially considering the convergence of four prominent technologies: social applications, mobile technologies, big data analytics and cloud infrastructure. These technologies represent a combined global market of approximately US\$1.2 trillion in 2017⁴. Furthermore, this market will witness a double digit compound annual growth rate (CAGR) over the next few years.

Governments can now use cloud based environments to enable new public-private partnerships for the provision of public services. Already, many government services are being made available through mobile, enhancing service delivery

experience. For example, by using mobile applications, individuals can create “service orders” to repair public infrastructure.

In the future, these trends will increase exponentially as governments will be able to allocate funds in more efficient ways. Using Internet of Things (IoT) to collect and aggregate data through connected devices with sensors can collate mass amounts of information and predict the occurrence of events. Predictive modeling will become more prevalent and data will be processed into valuable information to increase the accuracy of Public Sector decisions. Smart services based on remote devices connected to a mobile network will enable governments to enhance personal safety, sustainability, health, wellness and sanitation. Finally, with regard to Smart Cities, the world is on the brink of a new wave of disruption considering that opportunities in this domain are still largely unexplored and have the potential to transform the way cities operate.

Figure 1: Selected impact on ICT economies



Source: World Economic Forum⁵

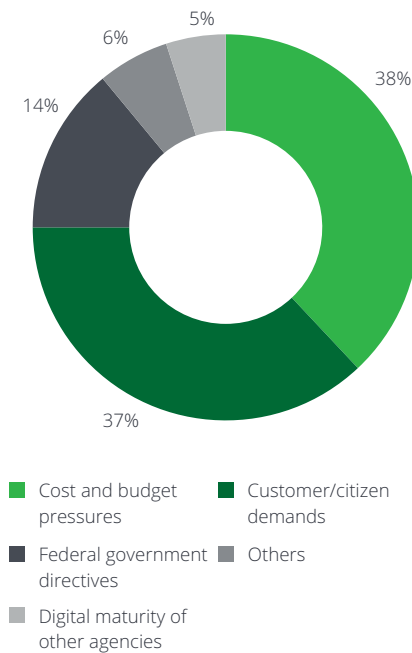
Digital maturity in the Public Sector

As pointed out earlier, Public Sector entities across the world are embarking on a Digital Transformation journey to help overcome the many critical challenges they face. According to interviews conducted with over 1,200 government entities worldwide, Deloitte identified the main drivers of Digital Transformation in the Public Sector shown in the figure on the right⁶.

According to interviews conducted with over 1,200 government entities worldwide, Deloitte identified 3 main drivers of Digital Transformation in the Public Sector: cost and budget pressures, customer/citizen demands and federal government directives.

Figure 2: Biggest drivers of Digital Transformation

Question: What is the biggest driver of Digital Transformation?



Source: Deloitte Global Digital Government Transformation Survey, "The Journey to Government's Digital Transformation 2015", Deloitte University Press (DUP)

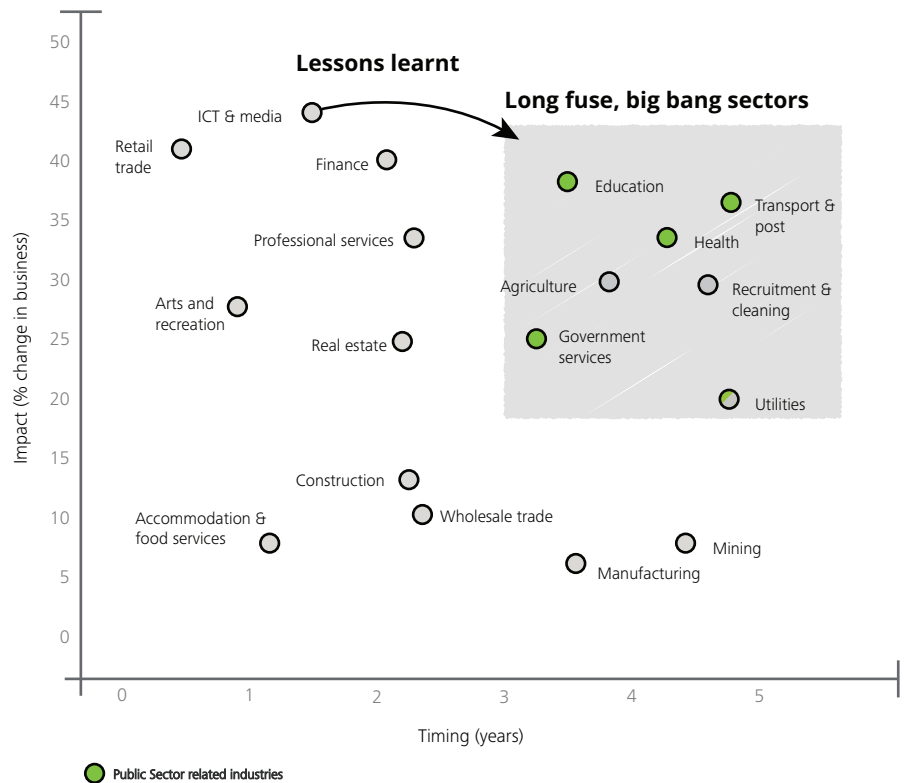
Digital technologies represent an unprecedented opportunity for the Public Sector to reinvent itself. The convergence of four prominent technologies: social applications, mobile technologies, big data analytics and cloud infrastructure represent a combined global market of approximately US\$1.2 trillion in 2017.

Many industries have experienced the impact of digital disruption before the Public Sector. This advent of digital technology is revamping the way of doing business across industries, at different paces and impacts. A comparison across industries based on digital impact and timing is presented in figure 3⁷.

Figure 3 outlines the main industry groups that have been impacted at different times and different levels of disruption by digital. Interestingly, Public Sector related entities (grouped with “long fuse, big bang industries”) are being severely disrupted now by digital, but this impact has been felt years after other sectors have, such as ICT and media for instance. The opportunity for the Public Sector is to learn from the experiences of the “short fuse, big bang industries” to best adapt to digital.

From a Public Sector perspective, the relative absence of competition has delayed the decision to undergo comprehensive transformation exercises up until the “status-quo” became unsustainable. However, in this day and age, transitioning to digital is no longer optional.

Figure 3: Public Sector benefits from the lessons learnt in “Industry 4.0”



With globalization, countries are increasingly competing against each other for talent, foreign investment and development. Ensuring that their digital infrastructure is in place has become a major competitiveness differentiator as reflected in a number of international competitiveness indices. This, in turn, has pushed countries both regionally and internationally to put in place national strategies to enhance smart government performance.

In developed countries, Digital Transformation serves primarily as a way to reduce budget pressure while enhancing customer experience. Certain emerging markets (i.e. South Korea, UAE, Singapore, Estonia) have successfully been able to achieve great progress in their digital initiatives. One of the factors that has helped these emerging countries to move quickly in their transformation is the absence of legacy technological infrastructure as compared to more developed countries.

How to assess the digital maturity of a sector

As indicated above, while technology is an integral part of a Digital Transformation, it requires a 360 degree operating model change. Digital Transformation is primarily about strategy supported by technology. It requires a focus on developing needed capabilities such as skills, culture and leadership.

As shown in the model on the right, digital maturity should be viewed through the lens of five key pillars which form the core components of Deloitte's Digital Maturity Assessment Framework.

These five pillars can support Public Sector entities in order to answer the following questions and assess their digital maturity:

- Do you have the right vision and strategy for digital, and the leadership, communications and focus required to support this vision?
- Do you have the right people, talent, skills and knowledge to support your vision, products, and services?
- Do you have the right processes, controls and digital technologies to support the operations of the organization?
- Do you have the right technologies and infrastructure as well as the ability to develop, manage and deliver?
- Do you have the right approach to understanding and communicating with your customers to succeed in a digital environment?

Figure 4: Deloitte's Digital Maturity Assessment Framework



Digital Transformation is primarily about strategy supported by technology. It requires a focus on developing needed capabilities such as skills, culture and leadership.

Global challenges in the digitalization of the Public Sector

Despite the pressure to change, Public Sector organizations are facing challenges in embarking on this journey. As per Deloitte's Global Digital Government Transformation Survey⁸, many organizations recognize that they are neither ready to respond to digital trends nor satisfied with the progress on the initiatives they are undertaking. According to government entities, the main challenges and barriers that are impeding the implementation of these solutions and programs can be categorized into the following:



Policy bottlenecks and bureaucratic inertia



Budget and capability constraints



Digital exclusion and divide



Privacy and security



Transitioning government staff to new roles

Policy bottlenecks and bureaucratic inertia

Public Sector entities need to keep up to date with the rapidly evolving digital technologies and innovations, yet these developments often involve drastic changes to their operating models. Given the complexity of such changes, some entities prefer to adopt a "status quo" approach and delay the decision making process.

Additionally, legislative and regulatory bottlenecks generate longer periods of time and resources required before organizations can start implementing any initiatives.

Budget and capability constraints

Budget constraints restrict organizations from investing in the right resources to transform their operating models (i.e. investing in new technology systems, hiring new talent etc). In this context, many Public Sector entities struggle to find the necessary budget to fund Digital Transformation initiatives, even though it can lead to substantial cost savings.

As per Deloitte's Global Digital Government Survey, culture, workforce skills and leadership are areas that remain a challenge for Public Sector organizations. As such, internal capabilities are a constraint that hinders the journey in transitioning to full digital maturity. Embarking on this journey requires hiring new talent and skills that were previously not available in-house and that are not always readily accessible in the market. Moreover, instilling a culture that is more innovation driven as opposed to operational is a challenge that many Public Sector organizations have not yet resolved.

Finally, the digital understanding and commitment of leadership are key in developing a foundation that will drive strategy and its implementation. Despite this fact, too often, entities face situations where leadership is not strong enough to drive these changes.

Digital exclusion and divide

Digital literacy is the awareness and ability of people to use digital tools in their daily lives. Overall, digital accessibility has improved dramatically over recent years thanks to new, more tech-savvy generations and enhanced ICT content in school and university curriculums. Nevertheless, digital exclusion remains an issue with a persistent lack of adoption of these technologies by certain population categories. Individuals residing in rural areas remain secluded from basic technologies such as high speed internet. Moreover, older generations at times

remain unwilling to transition to newer digital channels.

Privacy and security

Governments regularly deal with sensitive data related to personal information such as passport numbers, driver licenses and other classified information.

New avenues that are offered by technologies such as cloud computing, analytics (i.e. big data and open data) in terms of improvements are counterbalanced by greater risks regarding data protection and confidentiality. This can be seen by the number of security breach cases that have made the news in the last few years. Notwithstanding, with considerable improvements in terms of security and privacy protection, many governments remain reluctant to further open up their data.

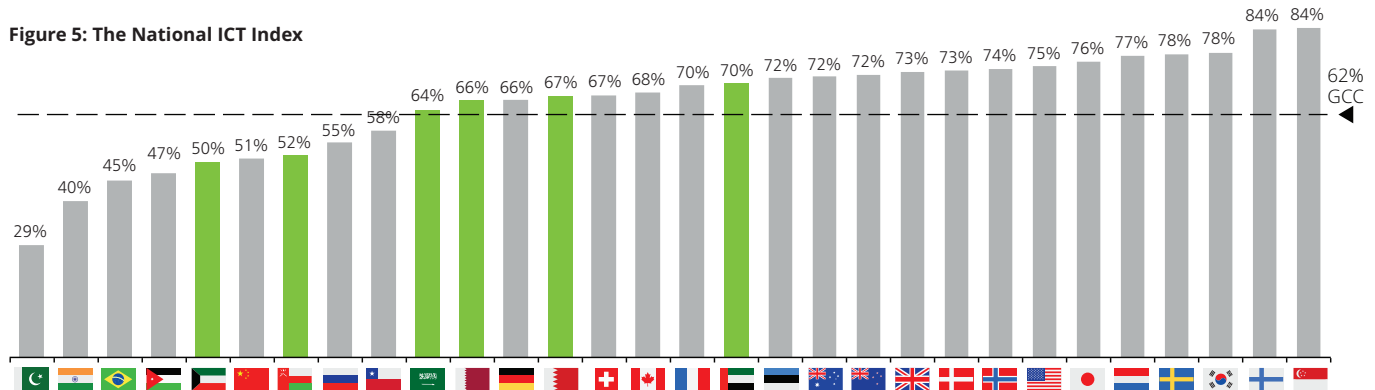
Transitioning government staff to new roles

With regards to government service digitization, the primary stakeholders affected are employees used to delivering manual tasks, but later require new types of skills. Too often, governments neglect to offer bespoke trainings to employees who have transitioned to new roles and are left without the required capabilities to properly manage the new position.

Value at stake

Digitizing government entities and their services can bring about major improvements for governments, citizens and businesses alike, and in turn, contribute to the competitiveness of a nation. According to Deloitte's National ICT Index which measures a variety of ICT readiness factors (i.e. telecommunications infrastructure, ICT regulation, government ICT adoption and social ICT impact), the GCC has made significant progress in recent years, but on average, lags behind other developed economies in terms of Digital Government capabilities.

Figure 5: The National ICT Index



Note: see Appendix for methodology and for calculation of National ICT Index for Canada
 Source: Deloitte research and analysis, based on various published national indices and indicators from World Economic Forum

The value at stake for governments can be measured in a number of ways that range from a cost saving perspective to the lens of creating value for citizens and businesses with better service delivery. Such improvements include citizen wellbeing (e.g. satisfaction with government services), or ease of doing business (e.g. time to open a company). There are three main areas (economy, society and sustainability) where Digital Transformation of the Public Sector can lead into tangible and quantifiable benefits that are illustrated based on case studies below:

According to the National ICT Index, the GCC has made significant progress in recent years, but on average, lags behind other developed economies in terms of Digital Government capabilities.



Impact on the Economy
Case study: business cost reduction in New Zealand

The New Zealand Ministry of Business, Innovation and Employment has launched a new initiative to improve Public Sector service delivery to business customers with the ultimate goal of decreasing costs to businesses (business cost to be reduced by 25 percent) when dealing with the government and enhancing the overall competitiveness of New Zealand's businesses. To achieve these goals, the ministry launched several initiatives:

- **Making tax simpler:** Businesses will be able to process their tax through improved online services
- **Accelerator:** An accelerator has been launched where Public Sector staff collaborate with the private sector entrepreneurs, developers and mentors to develop services with the goal of solving major pain points for local businesses¹¹.



Impact on Society
Case study: combating foodborne illnesses in the USA

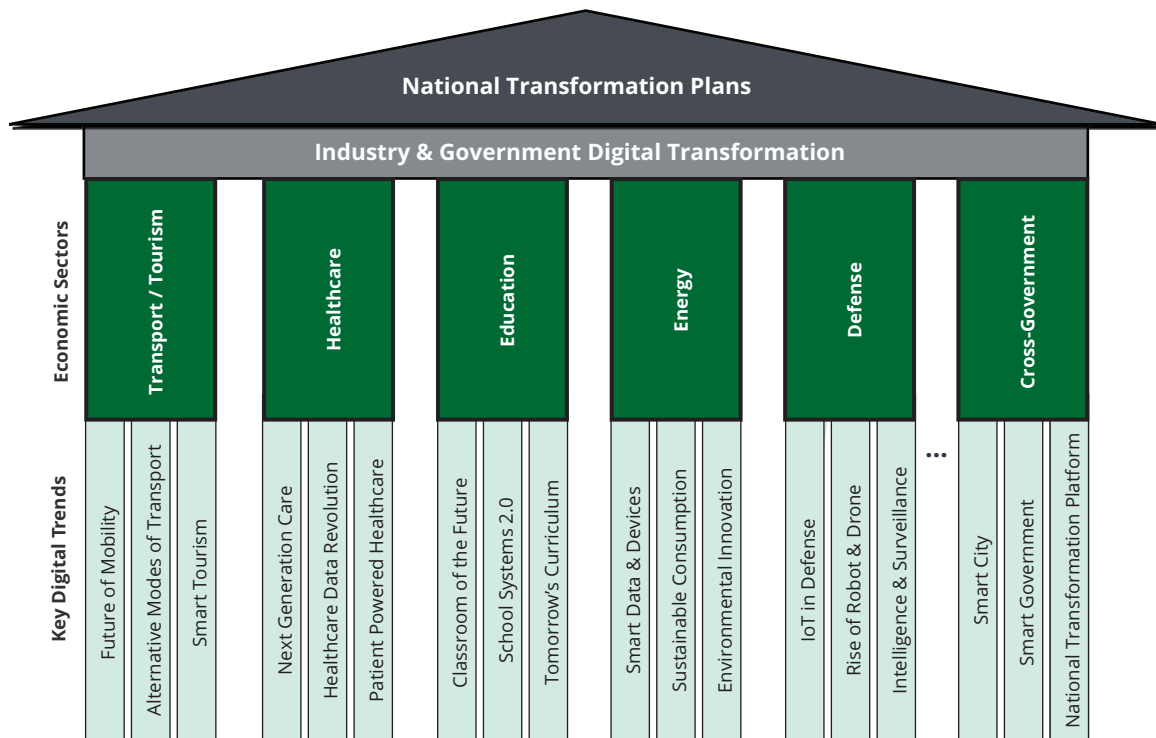
Chicago is using advanced analytics combined with big and open data to combat foodborne illnesses. Using unstructured datasets including 311 complaint calls, sanitation inspections, and even weather help, health inspectors have been able to forecast violations and focus on food establishments most likely requiring attention. With this new approach driven by prevention and anticipation, violations are now being discovered on an average of seven days earlier⁹.



Impact on Sustainability
Case study: safety for emergency services in the USA

In the wake of the 2014 Washington State Oso mudslide, the public, private and philanthropic sectors collaborated to fly drones with advanced sensors using reality computing. It then developed and printed a 3D surface model over the disaster zone. Consequently, drones were able to map the entire area in seven hours, an activity that would have normally taken two to three days, and it kept responders safe in the process¹⁰.

Figure 6: Multi-layered architecture to address Digital Transformation for Public Sector



Note: trends are not exhaustive

The Public Sector's key themes for Digital Transformation

Digital has an impact across multiple layers and levels of any organization. Identifying all the services that can be digitized is an exercise that goes beyond the scope of this document. For the sake of this paper, the large universe of trends that are shaping the Public Sector was analyzed in order to screen key themes to be assessed that are relevant for the GCC market. This paper leveraged the 204

trends identified in the "Gov2020: A Journey into the Future of Government"¹² report. Each trend was then derived by looking at a broad range of sectors (i.e. education, defense, transportation, energy and environment, healthcare, law and justice) and was supported by the following intrinsic drivers that affect the Public Sector: digital and exponential technologies, economy, demography and society.

For the purpose of this paper, these trends were grouped into key themes which were then filtered in two phases to ultimately arrive at six of the most relevant themes (as described in the figure on the right).

The first filter reflects the theme's relevance to digital and exponential technologies. This dimension underpins the importance of digital as an enabler for governments and Public Sector entities in order to take on such opportunities. Twenty one digital-driven trends were identified which range from IoT in defense to smart cities, to the rise of robotics.

Figure 7: Methodology to screen the key digital themes

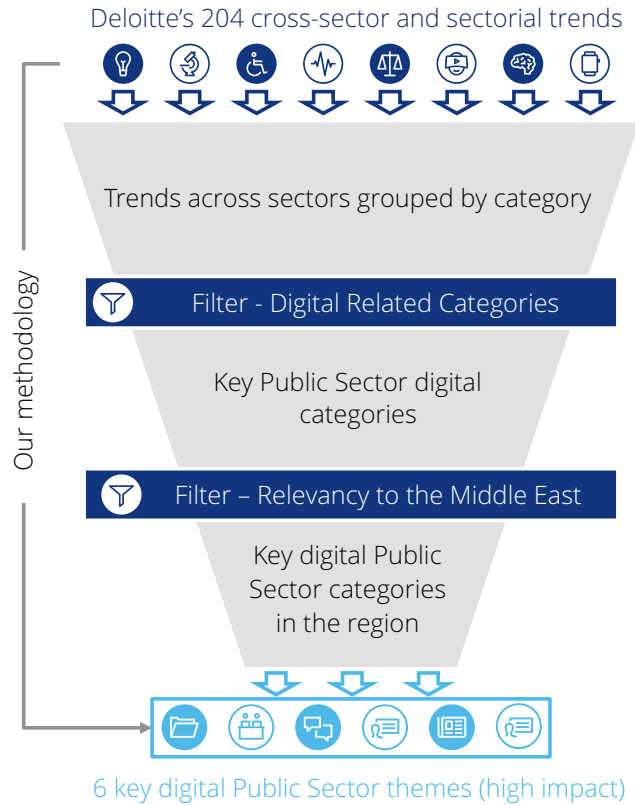
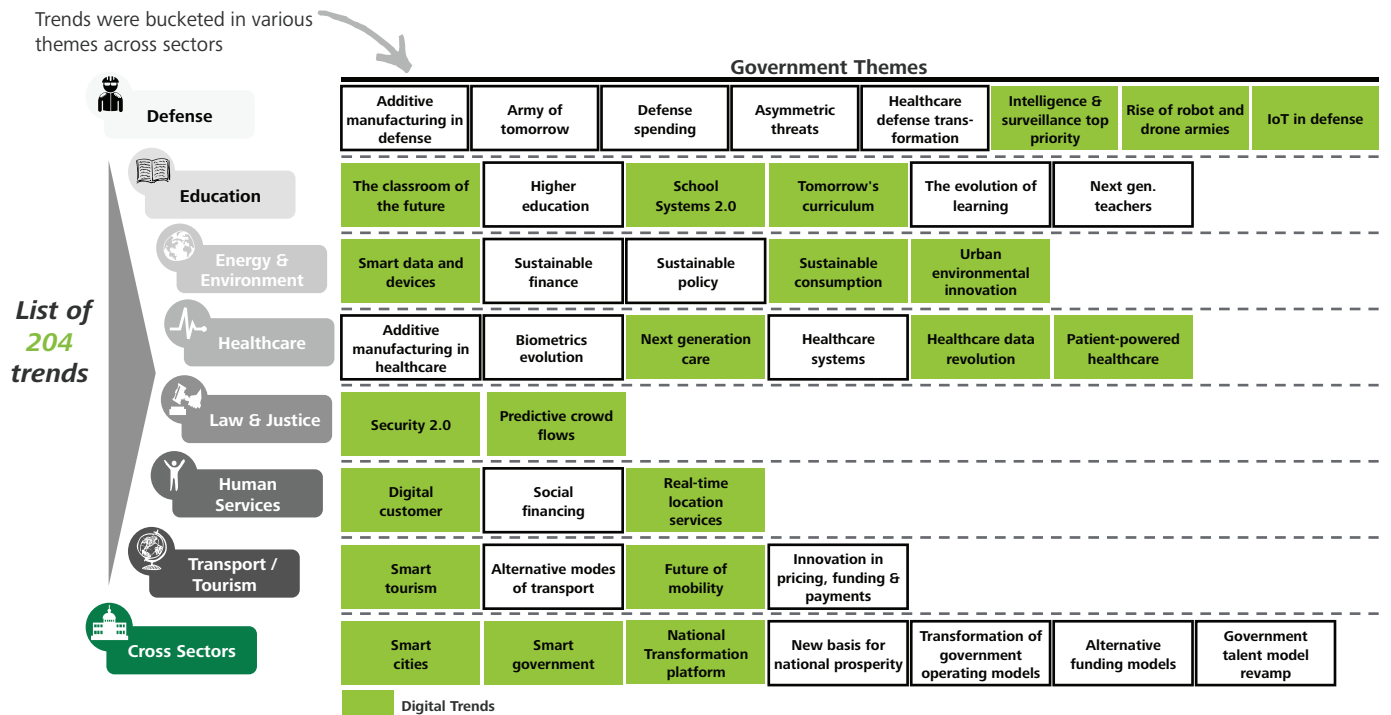


Figure 8: Mapping of digitally-relevant themes



The second filter is an assessment of the relevance of these themes to the Middle East and their impact on economy, society and sustainability. The final outcome reflects the most relevant digital themes related to Public Sector transformation in the region. Ultimately, the following key themes were selected to be explored in detail throughout this paper:

- **Smart Cities:** Cities that use smart technologies, data analysis and innovation to improve quality of life, efficiency of urban operations, services and competitiveness

- **Smart Tourism:** Smart Tourism is the use of ICT to promote travel and tourism by enhancing visitor experience

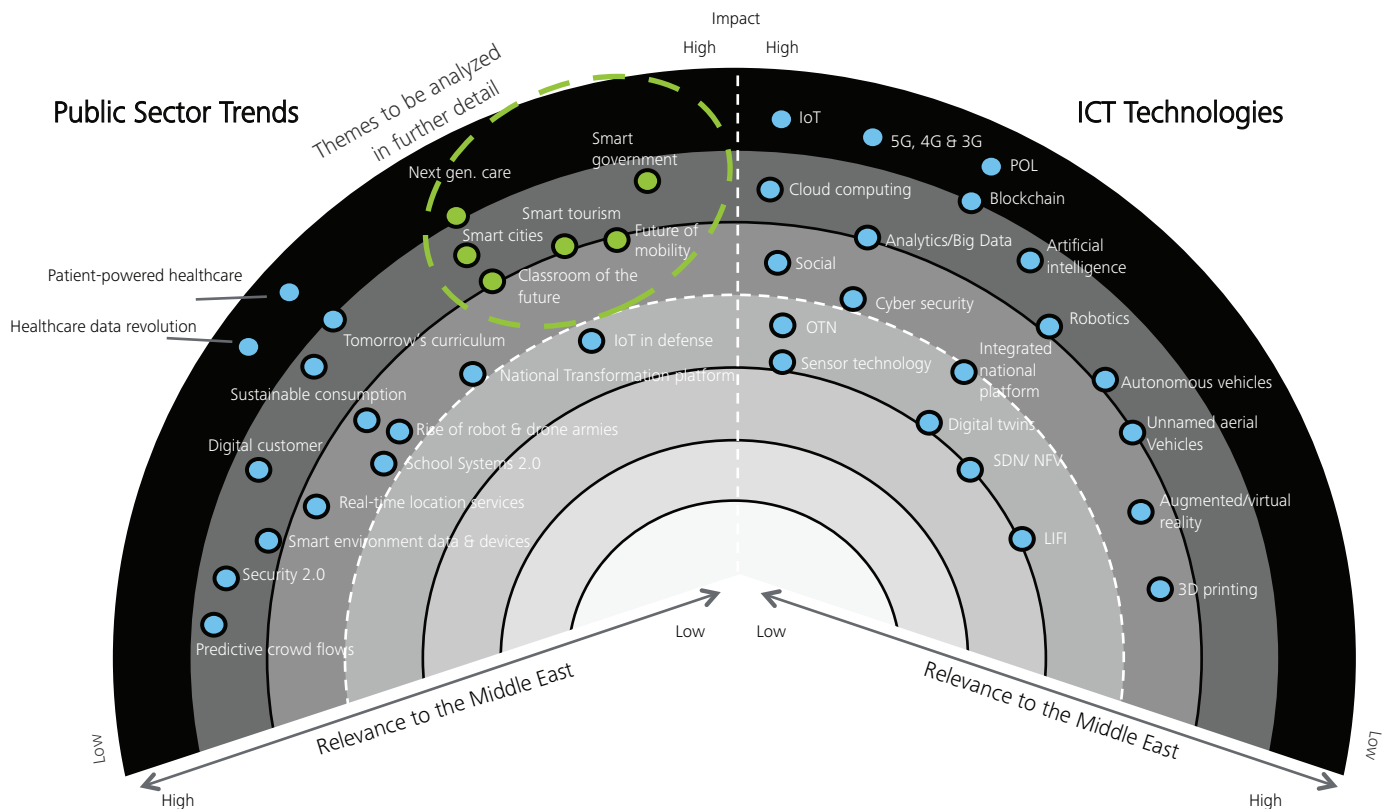
- **Next Generation Care:** Next Generation Care is characterized as pervasive, preventative, efficient and personalized care through ICT usage leading to higher quality and improved patient experience

- **Classroom of the Future:** Classroom of the Future represents the transformation of traditional education systems to digitally-enabled learning and curricula that enhances the learning experience

- **Smart Government:** Smart Government refers to the use of integrated information and communication technology in government policies, services and processes

- **Future of Mobility:** Future of mobility represents both the physical and digital infrastructure and services that enable people and goods to move more safely, cheaply, quickly, cleanly and happily. Existing and new advanced technologies are applied to improve mobility and resolve age-old transportation issues such as congestion, capacity and sustainability.

Figure 9: Selection of key digital Public Sector themes for the GCC



Note: trends and technologies are not exhaustive

2. Digital at the heart of GCC transformation

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Digital Transformation: no longer optional

GCC countries have been, at various levels and points in time, confronted with a sense of urgency to diversify their still largely hydrocarbon-dependent economies.

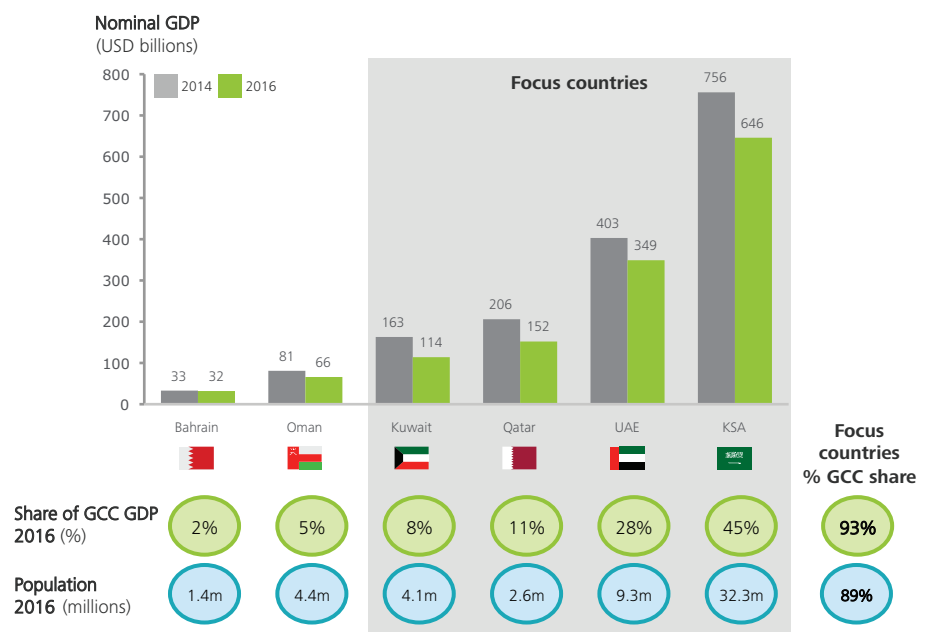
The imperative for change and new ambitions

The range and pace of social and economic challenges necessitating change in the Middle East are unique. In the aftermath of the Arab Spring, which precipitated significant shifts in the socio-political landscape of many Arab nations, as well as in the new light of more recent economic oil price shocks to national accounts, governments across the GCC

have recognized and reignited their efforts to respond, improve and evolve.

GCC countries have been, at various levels and points in time, confronted with a sense of urgency to diversify their still largely hydrocarbon-dependent economies. For the purpose of this paper we have focused our analysis on the four largest economies (GDP-wise) in the GCC as outlined in the figure below:

Figure 10: GDP and population analysis of the GCC



Source: World Bank, Deloitte analysis

The imperative to change has prompted a wave of national vision upgrades, the most recent being the Saudi Vision 2030 unveiled in 2016, the New Kuwait 2035 vision launched earlier this year, as well as the Qatar National Vision 2030 and UAE Vision 2021 visions established earlier^{13A}.

While endeavours towards national visions tend to follow a steady and incremental path over the long-term in other countries and regions, the plans adopted by this group of hydrocarbon-rich nations in the GCC are far bolder and more ambitious, seeking to make substantive impact in a five-year time horizon. Saudi Arabia's National Transformation Plan 2020, UAE's National Agenda 2021, Qatar's anticipated National Development Strategy 2017-2022, and Kuwait's Kuwait Development Plan (KDP) 2015-20 each represent massive modernization plans, which seek to accelerate economic diversification, stimulate growth, foster sustainability and unlock citizen happiness.

In doing so, these countries not only aim to secure a viable long-term future for their citizens, but also build on their national competitiveness and credibility on the global stage. They seek to encourage foreign investment while continuing their ascent towards becoming leading centers of knowledge, innovation and happiness.

Digital Transformation: the critical success factor

The most critical success factor in realizing such ambitious visions is Digital Transformation. As device penetration, connectivity and new technologies continue to proliferate, the rate of disruption in traditional business and operating models intensifies.

The region will see the emergence of “Government 4.0”, harnessing and applying the latest technologies and solutions to modernize, centralize and streamline government service delivery.

Governments, like businesses, will have to disrupt or be disrupted.

This is most acute in the Middle East where the population base, especially in GCC countries, rapidly adopted smartphone devices, posting world leading penetration rates and exhibiting some of the fastest digital media adoption rates in the world in just a few years. This consumer-led Digital Transformation ultimately disrupted and completely changed the way citizens communicate, consume media and information, and interact with governments across the region.

Governments, including in the GCC, have since learned from this and are now embracing Industry 4.0 – the next industrial revolution based on Digital Transformation. By placing new digital and ICT transformation programs at the heart of their national plans, GCC governments aim to reinvent themselves to better meet the ever-changing needs not only of better connected, informed citizens and residents (G2C: Government-to-Citizen), but also of businesses (G2B: Government-to-Business), employees and other government entities (G2G: Government-to-Government).

To this end, a number of 'digital-ICT-first' sub-strategies and programs have already been formulated. Notably, the UAE ICT 2021 Strategy and UAE National Innovation Strategy prioritize digital technology as one of the top seven national sectors, including the application and rapid adoption of new disruptive technologies across sectors. Digital Transformation is also a top four priority in Saudi Arabia's National Transformation

Plan 2020 (NTP), which highlights 29 essential digital initiatives for key sectors as well as funding for national digital assets. The Qatar Digital Government 2020 Strategy targets the efficient and transparent delivery of government services, supported by a world-class ICT infrastructure. Furthermore, Kuwait has also revealed an updated e-government program.

As such, the region will see the emergence of Government 4.0, harnessing and applying the latest technologies and solutions such as big data and analytics, IoT, blockchain, augmented reality (AR) and virtual reality (VR), artificial intelligence (AI), drones, robotics and 3D printing, to modernize, centralize and streamline government service delivery, positioning them as both innovators and disruptors, as opposed to disruptees.

Broadly in the Middle East, reports suggest that only 6 percent of the population lives under smart governance. Governments including those of the GCC have plenty of work to do.

However, as highlighted in the previous section, on average, the GCC Digital Government maturity level still lags behind a number of other developed economies. More broadly in the Middle East, reports suggest that only 6 percent of the population lives under smart governance^{13B}. Overall, governments including those of the GCC have plenty of work to do.

Figure 11: Cascade of national visions, plans and digital programs



Source: Official government websites and press releases, Monitor Deloitte research and analysis¹⁴

Regional Digital Transformation agenda

Drivers behind Digital Transformation plans

Similar to other countries across the world, Digital Transformation in the GCC's Public Sector is also driven by the same factors as alluded to in the previous section:

- **Cost and budget pressures:** since the drop in oil prices in late 2014 that has now curbed the revenues of oil-rich GCC countries, there is an increased emphasis on curbing expenditures on government assets and operations. Cost-savings from more efficient government processes are therefore a key driver behind new Digital Transformation programs. Not only do such benefits improve governments' ability to improve their budget balance, such cost-benefits also get passed onto customers and businesses.
- **Customer and citizen demand:** the emergence and popularity of social media among Arabs has opened up a new channel, enabling governments and citizens to work together. Governments have actively exploited this as a key channel to obtain citizen feedback, as citizens have also exploited this to demand greater and higher quality government services (e.g. simplified online payments solutions for utilities, car parking, fines and toll gate credits).
- **"Federal" government directives:** a top-down approach to decision making in GCC governments helps accelerate the pace of Digital Transformation programs, compared to more consultative processes in other nations. For Digital Transformation programs in the Middle East to get budget approval,

two important elements are required:

- **Inclusion in plans:** Digital Transformation programs must be recognized and prioritized as such within national visions and plans
- **Swift decisions:** quick decisions from the top will push government entities to enact Digital Transformation plans quickly and effectively

A good example of this is the H.H. Sheikh Mohammed Bin Rashid Al Maktoum UAE m-government directive in 2013 requiring government services to be available and offered via mobile within two years. This promptly led to an explosion of over 300 UAE mobile government services developed and launched by various UAE government entities across the country within just 730 days¹⁵.

In addition, the following region-specific dynamics are also compounding the need and urgency behind Digital Transformation, especially in the GCC:

- **Economic diversification:** as mentioned earlier, the GCC economies remain largely reliant on oil. Building a viable future will require them to expand their focus on other sectors and develop new industries:
- **Strategic focus on ICT sector:** GCC countries are already the largest spenders in the region on the ICT sector, which globally is also enabling the birth of new technologies and solutions behind Industry 4.0 advancements. Focus and importance on this industry is therefore a key enabler and driver behind national Digital Transformation efforts

- Modernization of other industries:

sectors such as education, healthcare and tourism are also key to economic diversification. These governments are already making significant investments in Digital Transformation efforts to modernize these sectors and unlock growth

- **Security:** over the years, the region's governments have also been experiencing and combatting increasing levels of security threats:

- **National Security:** GCC governments have seen an upsurge in conflict zones surrounding their territories. National security and citizen safety remain a priority, driving investment in state of the art digital security systems and solutions

- **Cyber security:** These governments have also become increasingly afflicted by cyber-attacks. As national data, assets and operations become increasingly digitalized in the region, cyber security becomes ever-more paramount. Recognizing this, governments are investing in strengthening their cyber security capabilities. In turn, improved cyber security, not just in terms of improved online defense systems but also in terms of laws and regulations (e.g. minimum security measures, data protection), will reinforce government and stakeholder confidence in the continued digital advancement towards Government 4.0.

- **Mega events:** although many programs have arisen out of a need to address new challenges, significant investments in Digital Transformation programs are also needed to enable as well as support the successful delivery and management of positive mega-events in the region taking place over the next five years. Namely the Dubai Expo 2020 and Qatar 2022 FIFA World Cup.

Key Digital Transformation initiatives

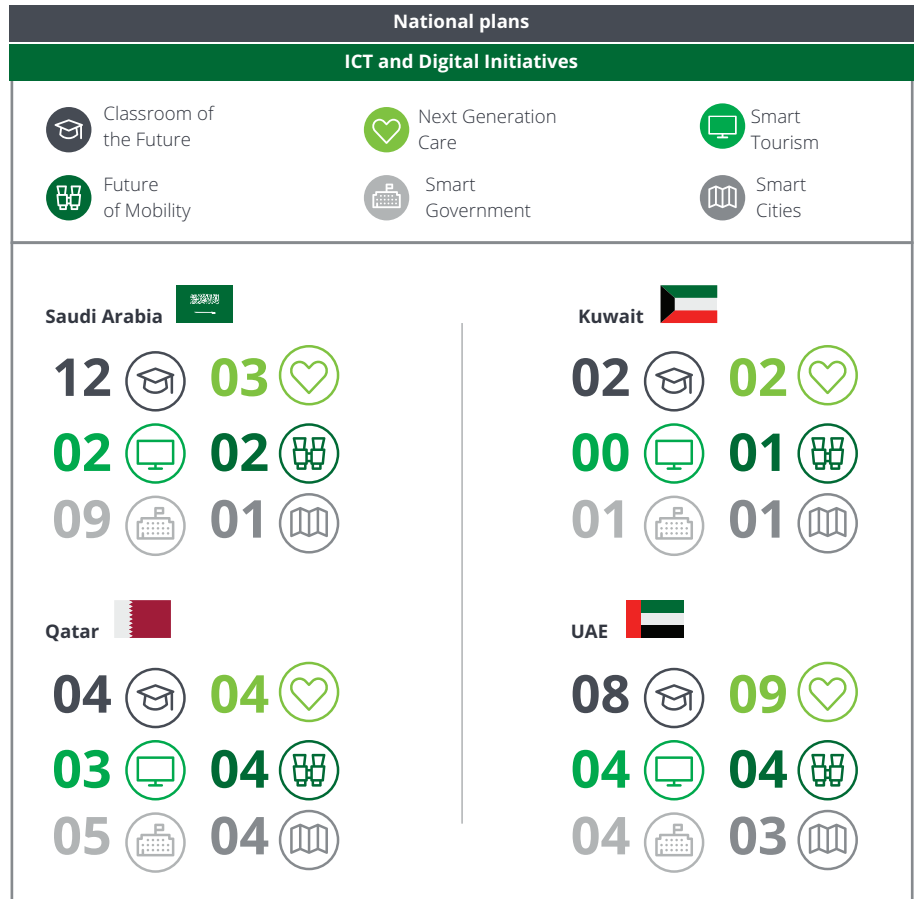
Transformation initiatives do not only aim to modernize governments, their reach extends to entire industries, economies and the way society functions at large within these countries.

The first section looked at key future of government trends (Gov2020) that were most prevalent in the Middle East, and clustered them as key regional themes: Classroom of the Future, Next Generation Care, Smart Tourism, Future of Mobility, Smart Government and Smart Cities. These were based on expert views, market research and interviews with key government entities in the GCC.

These themes are at the core of the GCC Digital Transformation agenda and are explored in more depth in this section.

Figure 12 gives an overview of key Digital Transformation initiatives across each theme that have arisen out of new GCC country visions, modernization plans and 'digital-first' programs.

Figure 12: Key digital initiatives under national visions and plans

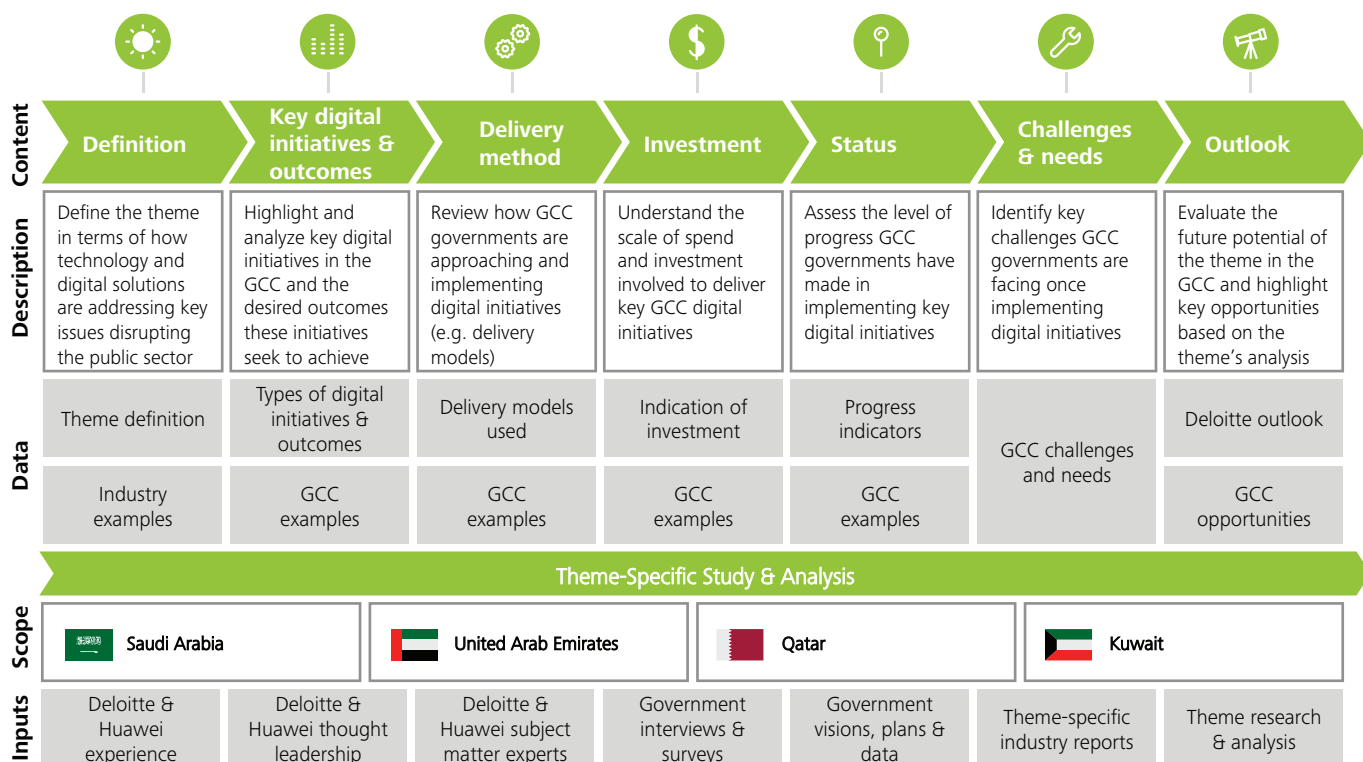


Note: The above represents a sample of key digital initiatives, which is not exhaustive
 Source: Official government websites and press releases, Monitor Deloitte research and analysis¹⁶

In the discussion that follows, this section examines more closely the Digital Transformation journey of these governments while exploring the role, progress and impact of some of these initiatives. As such, each theme is explored in depth based on a seven step methodology:

1. Definition
2. Key digital initiatives & outcomes
3. Delivery method
4. Investment
5. Status
6. Challenges & needs
7. Outlook

Figure 13: Theme deep-dive content and study methodology



Next Generation Care

Definition

At its simplest, Next Generation Care is characterized as:

- **Pervasive:** accessible everywhere, low-cost
- **Preventative:** information and awareness on vaccinations, pregnancies and healthier lifestyles
- **Efficient:** real-time health checks, diagnoses, health insurance claims processing and emergency services
- **Personalized:** tailored to individuals' genetics or DNA, body-types, preferential or other needs
- **Higher quality:** less invasive and less painful for improved patient experience.

Existing and new technologies are fundamental towards achieving Next Generation Care (next-gen care), with numerous examples of use cases that include m-health apps, remote monitoring, ingestible data-generating IoT sensors, holographic and robotic assisted surgery, to name a few.

Key initiatives and expected outcomes

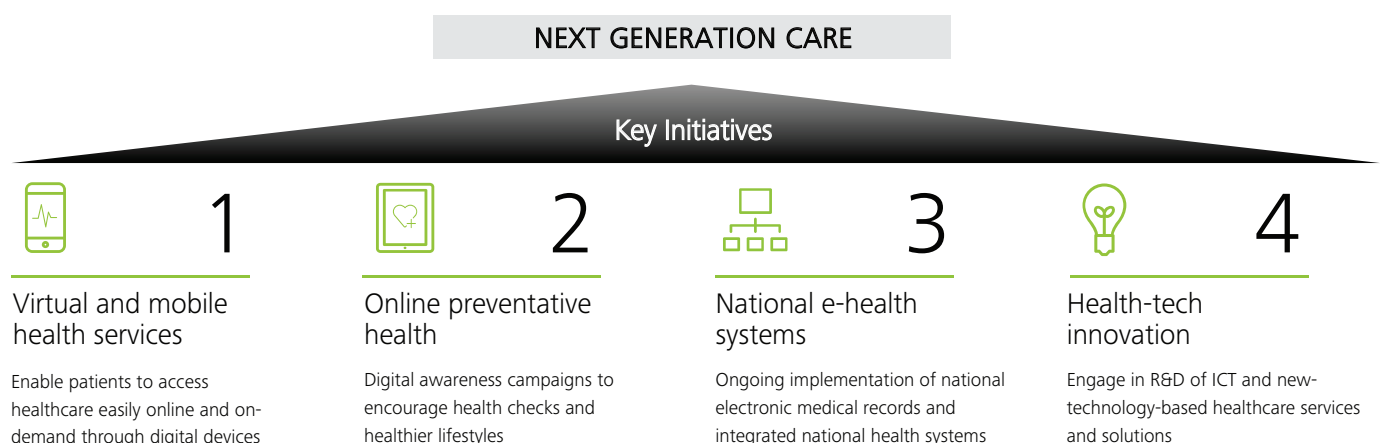
Healthcare remains a top concern for GCC governments, as citizens have been increasingly suffering from major public health illnesses such as obesity, diabetes and heart-disease. Providing care is also very costly as these governments offer national health services as a state benefit to citizens, employ a sizeable public health workforce (doctors, nurses), own and operate many assets (hospitals and clinics) and have to effectively manage service

delivery, requiring large budgets to sustain operations.

This, coupled with new economic restrictions and other aforementioned Digital Transformation drivers, has led to a range of digital initiatives which not only aim to resolve public health issues as noted above, but also develop a world-class next generation public health service. This, in turn, stimulates innovation and economic growth in the sector as a whole to support diversification. Through such next-gen care initiatives, GCC countries are also seeking to attract top medical talent and tourists from abroad to develop their med-tourist markets.

To this end, new digital initiatives of these governments broadly cover four main categories outlined in the figure below.

Figure 14: Key types of Next Generation Care digital initiatives



Virtual and mobile health services:

These services enable patients to access healthcare easily online and on-demand through their mobile devices, without having to visit hospital facilities only to wait in long queues to be served. Such services also reduce the burden and costs on state healthcare facilities by eliminating unnecessary hospital visits by patients. Similarly, telemedicine is another service enabling access to wider pools of practitioners via consultations from remote locations over digital media.

For example, Qatar's Smart Healthcare On-Demand initiative aims to offer new services which include a digital self-diagnosis platform (based on algorithms to process step-by-step digital checklists to process step-by-step digital checklists pin-pointing various symptoms for patients), Doctor Finder, an appointment service, and virtual doctor consultations through telemedicine (enabling patients to connect to doctors via online video chat with digital transmission of medical imaging and health informatics)¹⁷. UAE's Abu Dhabi Telemedicine Centre also provides a similar service with a free mobile application allowing patients to remotely share photos assisting their diagnosis (e.g. photos of an affected area of the body, medication labels)¹⁸.

National e-health systems

Key initiatives include the ongoing implementation of national electronic medical records and integrated national health systems:

Saudi Arabia's NTP plan is targeting 70% of all Saudi citizens to have a unified digital medical record by 2020.

- **Electronic medical records:** The process of centralizing patient data across the health system. For example, UAE's Ministry of Health and Prevention's National Unified Medical Record (NUMR) project (which started in 2016) aims to centralize patient data and analytics for common use by all providers nationally streamlining diagnoses and treatments¹⁹. Qatar's Single Patient Record project (a unique national patient record system) seeks the same²⁰. Saudi Arabia's NTP aims to expand its efforts to digitize patient data, targeting 70 percent of all Saudi citizens to have a unified digital medical record by 2020²¹.

- **E-integrated national health systems:** connecting different healthcare ecosystem players (e.g. patients, practitioners, hospitals, clinics, pharmacies, test labs, investors, regulators) to provide a seamlessly connected experience for all, representing a key step in digitally transforming GCC countries' health systems.

Qatar's updated National E-Health and Data Program (QNeDP), formulated in 2015, outlines a blueprint and set of phased implementation plans behind the integration of various national health management systems (e.g. e-referral, pharmacy, virtual medicine), health data systems, clinical repositories (e.g. clinical data, medication inventory) and external consumer systems (e.g. patient medical records and accounts, population health systems)²².

In the UAE, the Emirates ID and health insurance services are also integrating, enabling residents to use their Emirates ID as a national health insurance card across the country, whilst also expanding data on the national citizen database²³. The Mabrouk Mayak service by the UAE Ministry of Health and Prevention (MOHAP) is another good example. It enables rapid completion of all certifications for new-born Emiratis (e.g. birth certificate, ID card, passport) by reducing required interactions and visits from seven different government entities to just one²⁴.

Online preventative health

Initiatives include digital awareness campaigns to encourage health checks and healthier lifestyles.

For example Saudi Arabia's newly launched Rashaka program, a major health awareness campaign which aims to help reduce obesity rates in the Kingdom by 5 percent by 2020, is employing the use of digital social media channels and includes organizing competitions in Saudi schools to develop mobile health awareness applications²⁵.

The Health Authority of Abu Dhabi's (HAAD) Weqaya program for instance is a health screening program for Emiratis which allows them to check their health status and obtain follow up consultations if at risk of any diseases. At the same time, it also enables HAAD to rapidly extract data from screening results for various public health studies²⁶.

Qatar's Connected Wellness initiative also includes a Digital Health Coach Service, which uses smartphones and wearables, monitoring food consumption and activity levels to provide real-time user specific health advice. Data collected from the service is even integrated with patient records and monitored by health professionals to provide continuous guidance²⁷. Further, Qatar's Active Nation sports initiative also contains several services encouraging residents to participate in more sporting activities²⁸.

Health-tech innovation

GCC governments are also actively engaging in and encouraging more R&D in ICT, as well as newer technology-based healthcare services and solutions.

UAE's Innovation Strategy for instance cites health as a priority sector of focus. As such, Dubai's Dubai Biotechnology and

Research Park, DuBiotech, is a new free zone for life sciences and health tech companies²⁹. Government-backed Falcon and Associates has also launched the Dubai 100 accelerator program, an intensive 100-day program to support and accelerate digital health start-ups and encourage the growth of young talent in the digital health sector³⁰. Health-tech start-ups supported by this program include Singapore's AEvic health, working to develop a wearable device to diagnose asthma earlier, as well as Argentinian OTTAA, which is using predictive algorithms to help speech-impaired people communicate through images³¹.

The "Dubai 100" accelerator programme is an intensive 100-day programme to support and accelerate digital health startups.

Similarly, Saudi Arabia's MiSK foundation hosted the first ever UK-KSA dual-nation Medical Internet of Things hackathon last year to develop technology solutions to the world's most challenging health and medical problems³².

Delivery method

Healthcare is a specialized field and the scale and complexity behind the range of next gen care initiatives are significant. As such, GCC nations are driving the development and implementation of Next Generation Care initiatives through various public-private partnerships (PPP) with a wide range of private sector companies. In Saudi Arabia, the NTP actually targets a significant increase in the participation of the private sector, with the goal to increase the private sector's share

of the Kingdom's total healthcare spend by more than 10 percent by 2020³³. The NTP also advocates shared public-private business models³⁴.

To this end, Saudi Arabia's Ministry of Health signed a Memorandum of Understanding (MoU) last year with General Electric (GE). The partnership focuses on enabling and accelerating Digital Transformation of KSA's health sector, in which GE would provide advanced technical solutions such as health system control centers, simulation centers, virtual hospitals, improved patient experience in health facilities and extraction of cost-efficiencies³⁵. Similarly UAE's MOHAP partnered with digital health company Purehealth to implement the NUMR system³⁶. Qatar is also in the tendering process for the implementation of the Smart Healthcare initiatives of its TASMU program³⁷.

Investment

Investments required to deliver such large scale and complex transformation initiatives are also significant. Analysts report that MENA's medical ICT spending has reached a record high of US\$3 billion, largely attributed to GCC countries³⁸. Saudi Arabia's NTP for example has reportedly earmarked almost US\$1.6 billion in investment in Next Generation Care (electronic health) initiatives for the next five years (i.e. US\$320 million per year)³⁹. UAE's Innovation Strategy also requires government entities to set aside at least 1 percent of their budgets for innovation. With healthcare representing 8.6 percent of the UAE's US\$67.5 billion 2017-2021 national budget, this represents a minimum potential US\$58 million in R&D investment⁴⁰. Similarly, Qatar's drive for investment in health system modernization has led to large scale health system contracts. An example of this is the US\$28 million contract signed

between TTP Middle East and Qatar's Integrated Intelligence Services (IIS) to implement a nation-wide electronic health record (EHR) system⁴¹.

Status

As a result of the plans and investments, GCC governments are progressing towards Next Generation Care and their strategic goals at their own pace.

The UAE, as part of its more developed smart government program, has had the most time to develop its next generation initiatives, which are now largely in the implementation stage, if not live already. For example, Abu Dhabi's Telemedicine Centre is now a reality as it has, according to reports, successfully engaged with and screened most adult UAE nationals based in Abu Dhabi. Other aforementioned services such as the integration of the Emirates ID with the health insurance systems have also taken off, but need some time to be fully adopted and accepted by all of UAE's health insurance providers. Mabrouk Mayak has also just completed pilot testing and is poised to roll out across the country.

Saudi Arabia, dealing with a much larger population and scale of healthcare system has progressed in its own way as well. For example the KSA's Ministry of Health has already launched systems of e-health records, picture archiving, communications, cloud computing, and telemedicine as well as an electronic system to register and follow up on critical medical errors. Supporting this, it has also adopted data and interoperability standards, implemented digital health friendly regulations (around health IT, medical devices, data privacy, security and telecommunications) and has established a dedicated department for overseeing and implementing e-health projects.

Saudi Arabia's NTP for example has reportedly estimated almost US\$1.6 billion in investment in Next Generation Care (electronic health) initiatives for the next five years.

However, unifying thousands of healthcare hospitals and facilities is no small feat, and as such will still require some time before it is complete. Although Saudi Arabia laid most of the groundwork required to implement its initiatives and has connected most public health facilities, it still reportedly has to also reflect improvements on areas such as patient experience.

Qatar, as reported in industry interviews, is following its own journey. The country has upgraded its plans as part of its new TASMU smart government framework, and is now entering a pilot stage to test proof of concepts behind Next Generation Care initiatives.

Kuwait at the moment is focused on developing its traditional physical infrastructure (i.e. building more hospitals, clinics, medical facilities) and is yet to release further plans on digital health and Next Generation Care. However, digital health initiatives are inevitably expected to be announced in the near future as part of health sector transformation drivers.

Current challenges and needs

In developing and implementing Next Generation Care initiatives, regional governments face a number of challenges and needs:

- **Rising patient expectations:** for better access to higher quality of health care services that meet all patient demands. New and improved services emanating from Next Generation Care initiatives need to ensure they consider patient feedback, placing them at the center of solution and service design.
- **Data integrity, privacy and security:** patients still have several health records, holding at least one per provider, contributing to data fragmentation and the duplication of services. Sensitive patient data also needs to be protected and secured. Governments will need to adopt clearer data and security standards in their health systems, not just to maintain the data, but also to enable interoperability of data. Blockchain is being explored and applied as one solution.
- **Rural connectivity:** despite operators having expanded broadband networks considerably, many rural areas are still difficult to reach, as residents may not pay high rates for such services. Cheaper and more practical wireless solutions will need to be employed to ensure that affordable infrastructure is there for those that may need Next Generation Care the most.

- Implementation rates vs. disease trends:** Next Generation Care initiatives will have to be implemented faster than the rise in diseases (e.g. obesity, diabetes, heart diseases) afflicting patients, if they are to meet outcomes and KPIs directed at reducing disease rates.
- Health and ICT expertise:** there is still a heavy reliance on expatriate health professionals and health technology specialists leading to a huge variation in healthcare quality. Governments recognize this as a key issue and have set targets for locally trained and developed professionals. However, this is a process that may take time, and governments will have to work closely with more experienced private sector providers to enable adequate e-health progress and knowledge transfer.

Outlook

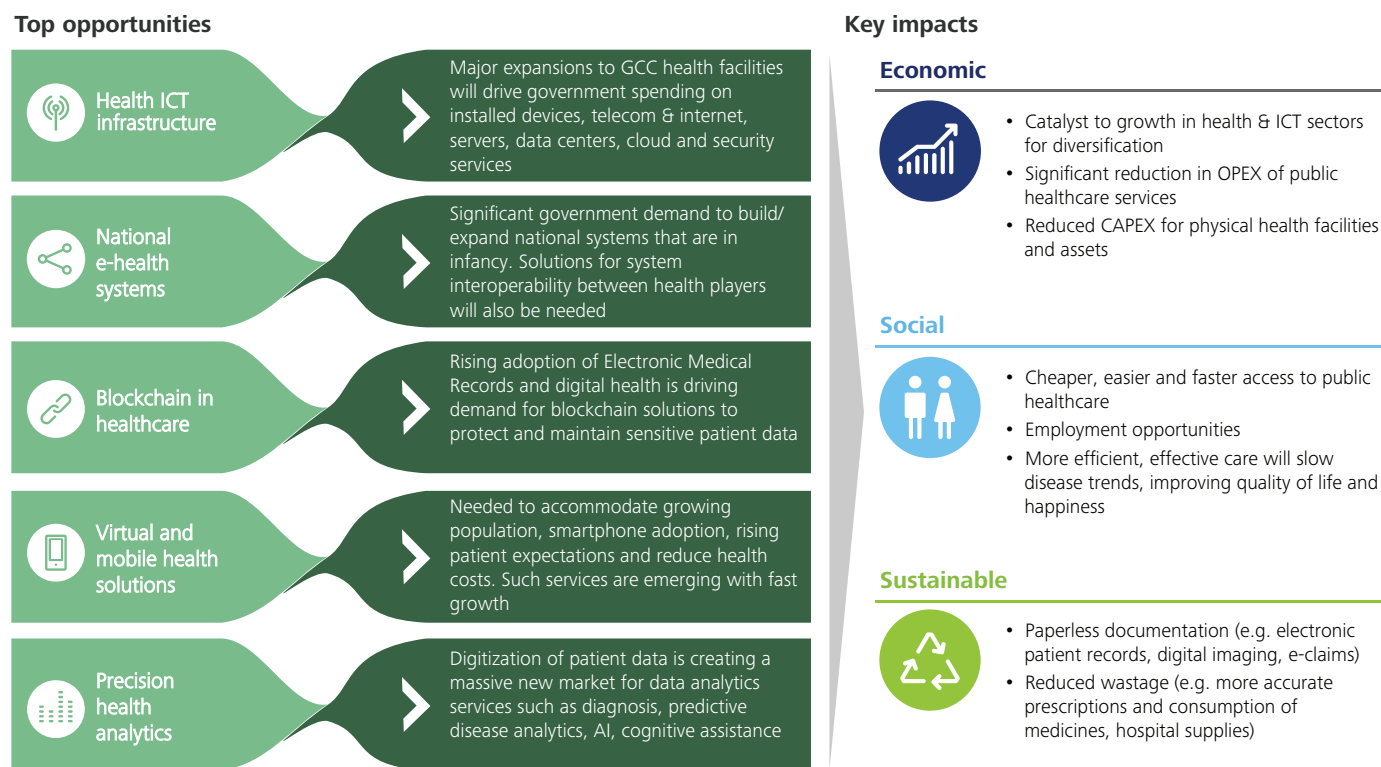
Looking forward over the next five years, GCC countries are expected to sustain strong ICT investment levels towards Next Generation Care systems and developments, a central element to their national e-health visions and plans. Analysts are forecasting the MENA healthcare market, predominantly driven by GCC markets and their national health budgets, to nearly double from US\$40 billion in 2015 to US\$71 billion in 2020⁴². This corresponds to ICT investment in the Digital Transformation of the health sector which is likely to increase at least at a similar pace.

This opens up a suite of opportunities for healthcare providers, telecoms players, ICT vendors and health-tech start-ups alike.

As national health in the GCC becomes increasingly digitized and connected, both

the scale of their healthcare systems and corresponding demand for ICT services and solutions will increase. Data centers with secure servers, security and privacy protocols will be needed to store increasing repositories of patient health records. High performance telecom networks and services will be needed to connect data servers and facilitate health information exchange between expanding numbers of hospitals, clinics, pharmacies, ambulances and other medical facilities. Data mining and analytics capabilities will be needed to draw insight, advance medical research and be used for public health policy measures. On top of the foundation systems and networks, advanced technologies and solutions using IoT, VR and AR, once proven after pilot phases, will also be needed to track and improve patients' health and experience.

Figure 15: Top opportunities in Next Generation Care and key impacts



Classroom of the Future

Definition

Classrooms of the future represent the transformation of the traditional education systems that are based on learning techniques driven by textbooks and standard teacher-student learning interactions to modern, digitally-enabled learning that exponentially enhances the student experience. Forming a critical driver to digital education, it ensures full circle access to information and knowledge for students while also preparing them to adapt to new technology and skills to eventually contribute into society and the economy.

AR applications will be a common feature in this classroom of the future, where textbook diagrams are replaced by applications driving AR-supported, immersive learning experiences. The digitalization of the classroom inherently builds its capabilities, leveraging digital and ICT technologies across cloud computing, mobile, social media and analytics among others that work in an ecosystem of providers, federal entities and institutions to deliver the experience.

Key initiatives and expected outcomes

Regional education initiatives across KSA, UAE, Qatar and Kuwait are focusing on shifting the cultural paradigm of education from the traditional model of fixed curriculum and textbook-based classes to applying new creative methods of learning and enhancing the classroom experience. Some of the trending initiatives undertaken by the Public Sector across the GCC are shown in figure 17.

Figure 16: Classroom of the future ecosystem

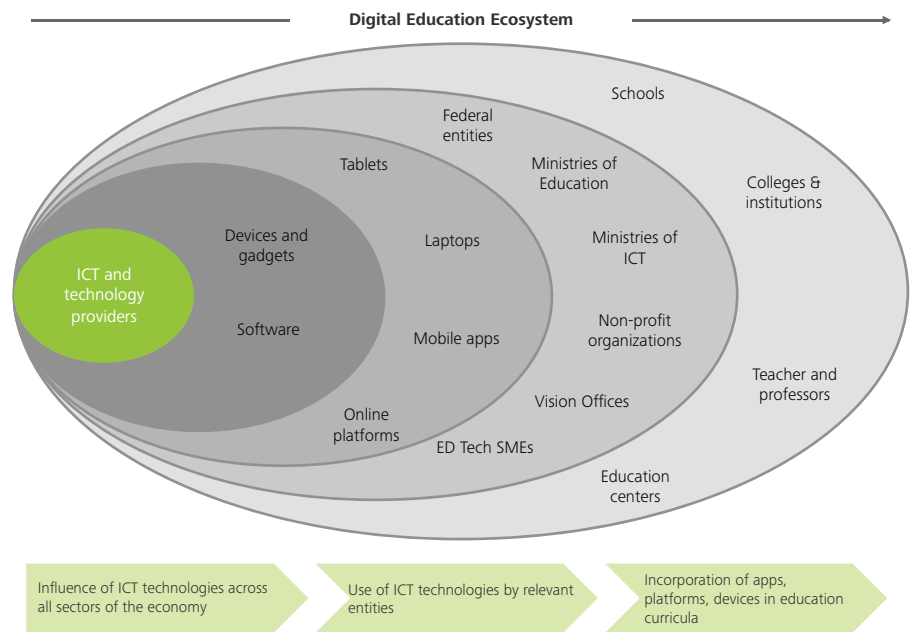
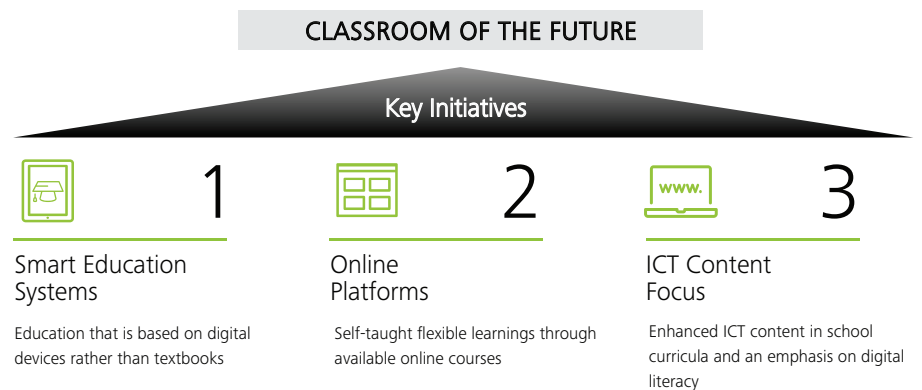


Figure 17: Key types of Classroom of the Future digital initiatives



Smart education systems

Governments are focusing on transforming classrooms to become more technology-centric and improve on information access by incorporating the use of technologies throughout learning activities in schools. The importance of digital literacy at younger ages is also imperative in preparing students for life after school.

A good example of this shift is the application of digital in reforming the education systems from the traditional textbook-based classrooms to 'online flexbooks'. The Mohammad bin Rashid Smart Learning Program in the UAE⁴³, KSA's Ministry of Education (MOE) and Qatar's Supreme Council have already replaced textbooks with tablets and gadgets with the intent to enhance overall education systems to be more digitally oriented.

These digital systems are creating more interactive classrooms where teachers effectively communicate and retain students' attention while increasing student interaction. For the KSA's MOE, this initiative delivers on a key KPI which is enhancing student and parent satisfaction.

Online platforms

Governments have also mobilized efforts to address the rising cost of education and the large gap between the quality of education supplied and the rising demand in growing GCC populations. Efforts are being made to ensure learning is accessible and flexible to all individuals across a vast range of both subjects and skillsets through available e-learning and online courses.

Furthermore, cost-effective solutions such as e-learnings, e-trainings and Massive Open Online Courses (MOOCs) have emerged across the GCC. For example,

as part of KSA's NTP, the Kingdom launched a national program for e-training under the Institute of Public Administration⁴⁴. Similarly, Doroob, an education and professional training platform sponsored by the Saudi Ministry of Labor and Social Development (MOLSD) focuses on bridging the gap between the educational system and the requirements of the labour market to achieve higher employment rates specifically among youth and women. Updates of the NTP 2.0 focus on female participation and productivity in the workforce, where platforms such as Doroob are likely to be emphasized further.

Figure 18: Doroob program and ambitions



Note: course listings shown above are not exhaustive
 Source: Deloitte research and analysis, Doroob website

The success of these online platforms is driven by underlying digital initiatives undertaken by GCC federal entities. A good case is the Noor Education Management System from the MOE in KSA where schools, teachers and parents are being digitally linked into an education management system.

ICT content focus and digital literacy

With global changes emphasizing the importance of technology and communication, the Middle East has become increasingly aware of incorporating more technical ICT skills in school curricula. There is an enhanced focus on subjects related to IT, programming, digital technology and design innovation, fueled by GCC visions that prioritize digital and connected societies.

Governments are investing in initiatives that increase awareness of ICT and digital programs such as exponential technologies, digital technologies and cyber security. Through entities like the UAE's Telecommunications Regulatory Authority (TRA), and the Communication and Information Technology Regulation Authority (CITRA) in Kuwait, for example, there are efforts under way in collaboration with universities to fund

these type of programs. The TRA in the UAE has made collaborative efforts with the Ministry of Education and the United Arab Emirates Computer Emergency Response Team (aeCERT) in providing content learning programs on cyber security as well as contributing to core IT curricula developments such as coding⁴⁵.

Furthermore, initiatives that aim to improve digital literacy skills are expanding beyond schools and youth. Elderly are now being encouraged to learn and adapt to modern technology and overcome the digital generation gap. The Ministry of Transport and Communication (MOTC) in Qatar launched Wasla, a project encouraging youth to teach digital literacy skills to the elderly. The young 'teachers' are trained and equipped with tools to guide the elderly through digital and technical material⁴⁶.

Delivery method

Governments are proactively exploring new ways to modernize their education systems. A popular method being adopted by regional governments are specialist digital learning R&D centers which serve as innovation labs to test new learning methods and tools. A good example of this is the UAE Ministry of Education's partnership with Etisalat and Microsoft to

establish the Etisalat Education Technology Center⁴⁷. The center focuses on continuous efforts in R&D to experiment with and design new education tools in line with the country's direction to implement digital schools and smart learning. The UAE's ICT Fund is playing a role in enhancing the overall ICT focus in universities by funding specific programs.

Moreover, to realize the future classroom initiatives, governments are working very closely with key private sector players, forming PPPs, which include educational technology vendors and specialists. For example, in Saudi Arabia, the government has partnered with EdX to deliver the Doroob MOOC initiative based on more than 1,600 courses and programs from EdX's extensive course library⁴⁸.

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Furthermore, a national center for e-learning has also been launched in Saudi Arabia under the MOE promoting the learning of specific technical skills, tools and programs. The center provides services ranging from training services on designing content, upgrading quality e-learning standards, teaching users how to design and manage modules and setting standards for digital content⁴⁹.

The Middle East has become increasingly aware of incorporating more technical ICT skills in school curricula. There is an enhanced focus in subjects around IT, programming, digital technology and design innovation.

Investment

Given the scale of change, the new national transformation plans seek to involve various third parties (NGOs, Ed Tech, small and medium-sized enterprises (SMEs), tech giants, telecom operators) required to deliver these initiatives. The level of government investment is significant, exceeding hundreds of millions of dollars. To complete smart learning programs, government spending on initiatives to deliver classrooms of the future is approximately US\$272 million over a five-year period in the UAE⁵⁰, and approximately US\$430 million in KSA over the next four years⁵¹. The UAE's investment in digital is in line with its overarching aim to invest US\$2.72 billion in education with a focus on transforming the IT infrastructure in schools⁵².

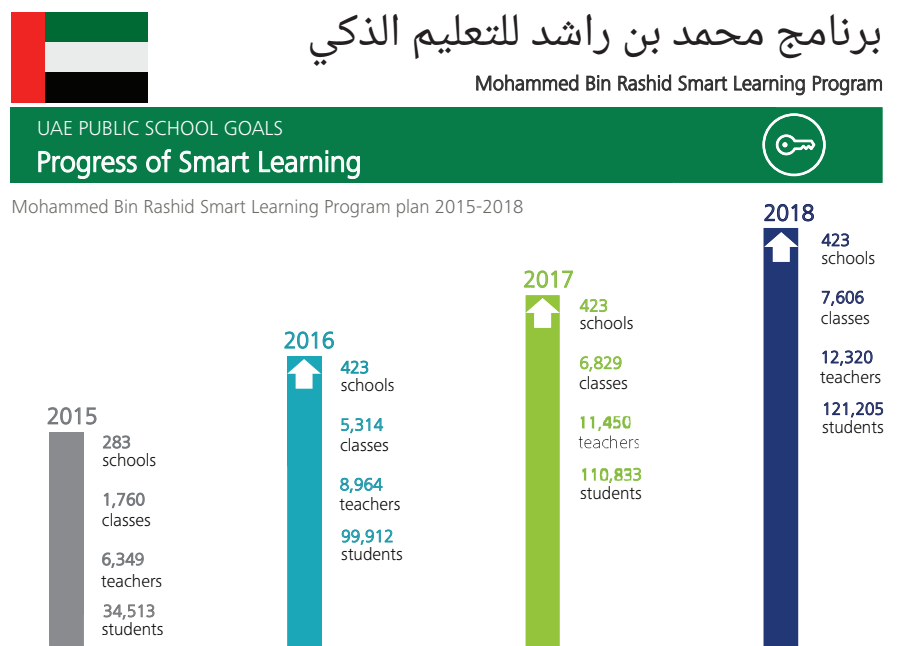
Status

GCC government efforts focusing on transforming current education systems to classrooms of the future have been progressing in the right direction. While the UAE and KSA have made obvious efforts to fully adopt digital classrooms, each country has progressed differently based on its vision and scale.

Given the smaller market and its five-year old vision, the UAE seems to be the most advanced GCC country in its adoption of smart classrooms. The Smart Learning Program, implemented in 2012, succeeded in fully adopting digital devices across all public and private school classrooms. UAE schools are utilizing Samsung tablets and Smart Boards installed with tools by ITWorx, allowing teachers to develop and teach interactive lessons and communicate with students and parents alike. Students also have the flexibility of reviewing e-lessons and accessing textbooks offline and at home⁵³.

Government spending on initiatives to deliver classrooms of the future were approximately US\$ 272 million over a 5-year period in the UAE and is approximately US\$ 430 million in KSA over the next 4 years.

Figure 19: UAE Smart Learning Programme report



Source: UAE "Smart Learning Programme" report, UAE Government

The KSA, while progressing towards smart education, is still in its early stages due to the scale of implementation. Phase 1 of its smart classrooms was expected to begin this school year, covering 150 schools, while Phase 2 will include 1,500 schools until all 30,000 schools in the Kingdom are

complete over a four-year period. Furthermore, the possibility of setting up a tablet factory collaboratively with a specialized company is still under consideration. Surveys have been conducted globally that demonstrate that mind sets are becoming more accepting of

technological transformations in the education system⁵⁴. 90 percent of students are already using digital material as they are more inclined to learn in these interactive methods. Moreover, 75 percent of teachers believe that digital learning content will completely replace printed books over the next 10 years. Such studies are convincing of the behavioral shift towards digital education across populations⁵⁵.

Current challenges and needs

There still remains a vast opportunity for Public Sector entities to transform the education sector. Connectivity across educational institutes among themselves and in relation to government entities remains a major challenge in most of the GCC. There are efforts underway led by federal entities to bring service providers and other connectivity players such as ICT vendors to address this.

Driving innovation into the public education system is another challenge

which is currently being addressed via PPP's where the private sector is also helping to drive this Digital Transformation.

Public Sector entities have the opportunity to engage in further developments to grow the educational technology sector with more progressive initiatives such as Alef, a more advanced online training platform that leverages content powered by AI and big data analytics.

The centralization of education data and its governance through designated bodies is another critical need in the GCC for the classroom of the future to succeed.

Outlook

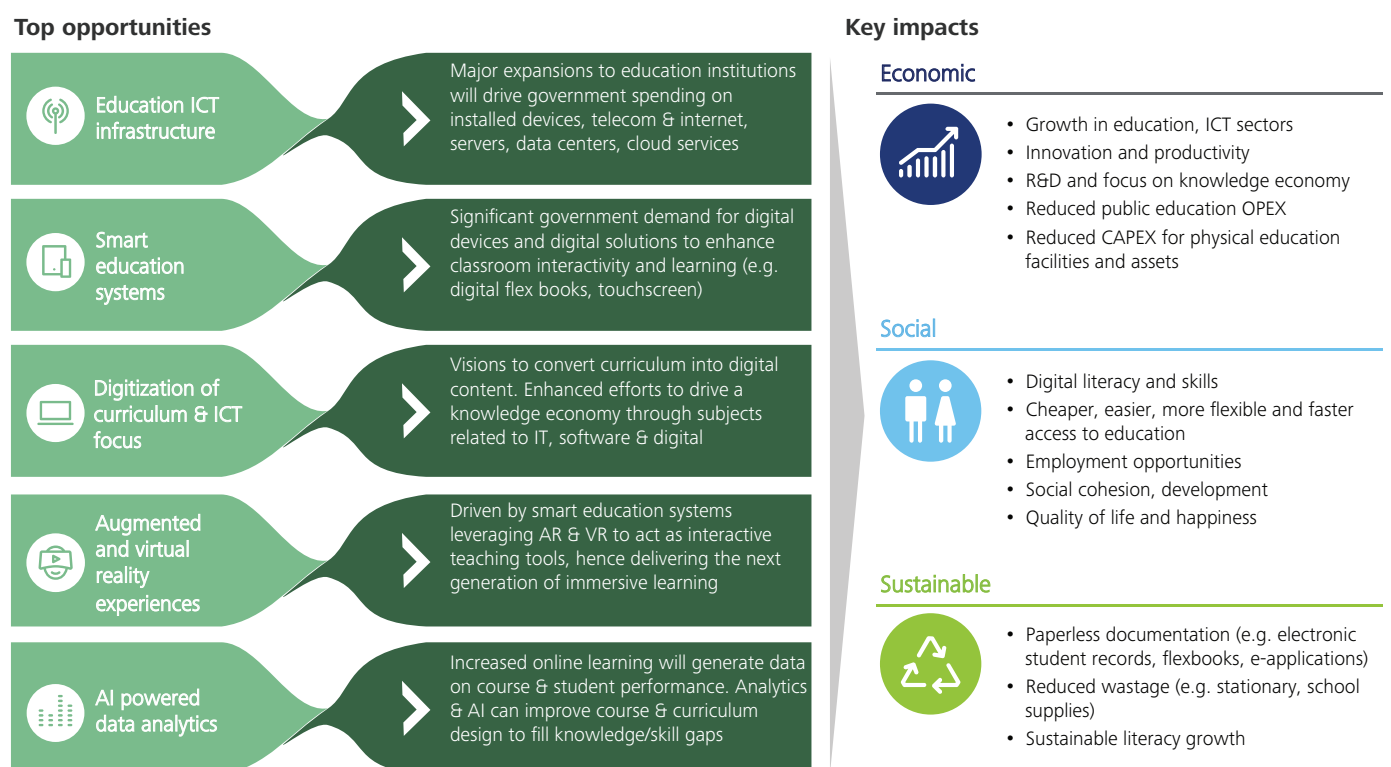
The opportunity to enrich the education sector's digital advancement is evident in the GCC, especially for Qatar and Kuwait, whose education sectors are still developing towards more technologically oriented systems versus that in the UAE and KSA. Governments will need to

leverage the private sector, non-profit sector, universities and schools to foster creative thinking towards technology and its influence on institutions.

Science, technology, engineering and math (STEM) subjects will become a priority across the GCC as students will be increasingly encouraged to follow a path that guarantees secure, demanded jobs. Furthermore, the UAE has just announced its plan to establish approximately 122 Innovation Libraries in schools, while a similar investment in innovation labs across schools is expected to support technology related programs and enhance students' technological skills⁵⁶.

Education for the disabled supported by new digital technologies will also be prioritized by government entities in the GCC. Assistive technologies such as speech synthesizing software, text-to-voice tools and electronic worksheets will take precedence for investments to ensure quality learning.

Figure 20: Top opportunities in Classroom of the Future and key impacts



Smart Tourism

Definition

Smart Tourism is the use of ICT to promote travel and tourism by enhancing a visitor's overall experience.

Key initiatives and expected outcomes

Tourism is a highly strategic sector as it is not only key to unlocking economic diversification and growth for GCC countries, but also instrumental in building a nation's image and positioning it on the world stage.

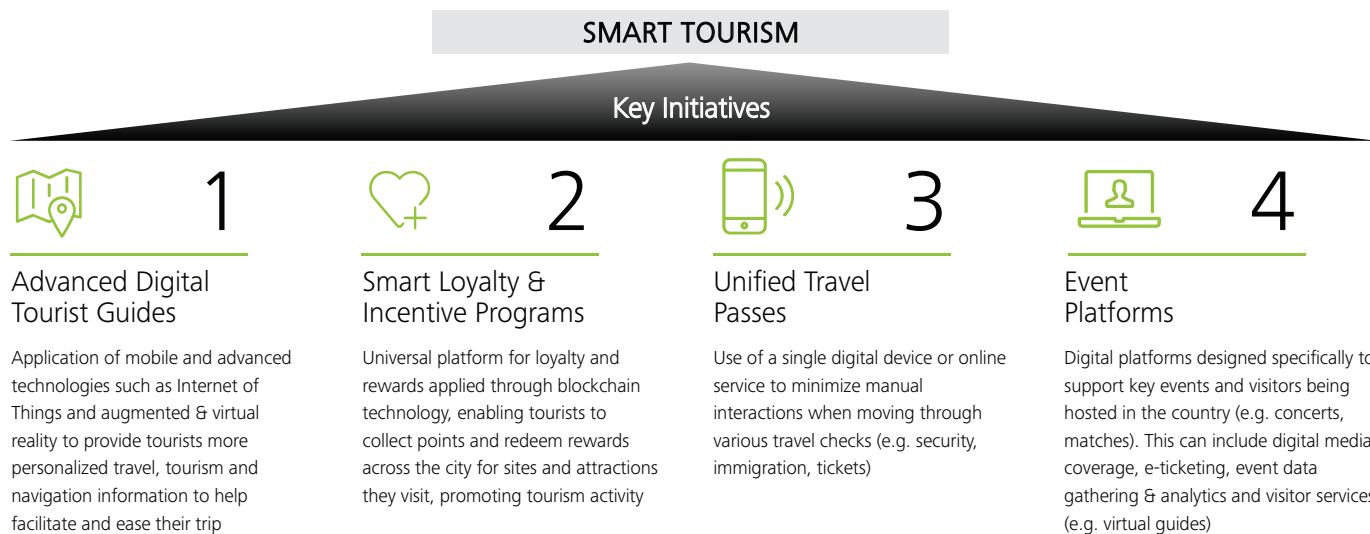
In the UAE, tourism is so important that individual tourism visions are outlined for each emirate. Abu Dhabi, for example, aims to become one of the world's most attractive places for tourists⁵⁷. Dubai is targeting 20 million per year by 2020 (double 2012 levels)⁵⁸, Sharjah is targeting ten million tourists per year by 2021⁵⁹ and Ras Al Khaimah aims to attract one million tourists per year by 2019 (end of 2018)⁶⁰.

Qatar, in the year of the FIFA World Cup, aims to attract four to five million visitors in 2022⁶¹. The KSA, with its captive

religious tourism market, seeks to boost its Hajj and Umrah tourist figures (domestic and foreign) from 7.5 million per year in 2016 to 17.5 million per year by 2020⁶². It also wants to increase its overall tourist figures (domestic and foreign) from 64.5 million in 2016 to 81.9 million per year by 2020⁶². Kuwait, as part of its new vision, has also highlighted the development of its national tourism sector as an economic priority⁶³.

Digital initiatives to support these outcomes fall into four main categories:

Figure 21: Key types of Smart Tourism digital initiatives



Advanced digital tourist guides

Application of mobile and advanced technologies such as IoT, AR and VR provide tourists with more personalized travel, tourism and navigation information to help facilitate and ease their trips.

In the UAE, the tourism and culture authorities of Dubai and Abu Dhabi have each developed award winning digital tour guides to showcase and enhance the visitor experience. Dubai Culture and Visit Abu Dhabi smartphone services both integrate a range of tourist information and services (e.g. tourist tips, interactive tourist maps, day trips, in-app hotel, travel and taxi bookings, experience sharing via social media) and apply technologies such as AR to enhance interaction with points of interest and key attractions^{64, 65}. To this end, the RTA has also released a new Nahaam tour guide system, giving information about landscapes and routes⁶⁶.

Saudi Arabia's tourism authority also released an award winning mobile tourist guide called Saudi Tourism⁶⁷. Moving forward, the Saudi Ministry of Haj and Umra is developing e-learning programs to raise awareness for visitors and provide e-training for its workers and volunteers to continue improving information and guidance services for pilgrims⁶⁸.

Qatar also aims to upgrade its digital tourist guides. Its new Digital Travel Guide, for example, aims to deliver location and preference-based points of interest, events, public transportation schedules and offers. The service features Near Field Communication (NFC) and biometric enabled identification, an automated day planner service and online tourist feedback. In conjunction with this, Qatar is also launching Contextual Indoor Navigation, providing indoor information delivery and 'turn-by-turn' navigation for key points of interest such as the airport, malls, stadiums and landmarks. Qatar's Augmented City service based on geospatial information and mobile video recognition technologies will also provide assistive contextual real-time information (e.g. descriptive text, interactive videos, targeted offers and event information) on top of smartphone device screens⁶⁹.

Unified travel passes

Use of a single digital device or online service to minimize manual interactions when moving through various travel checks (e.g. security, immigration, tickets).

Qatar's Single Transport Pass, for example, will create a single traveler profile which enables tourists to travel using Qatar's diverse transportation mediums through e-ticketing and e-payment functionalities on NFC based cards, smartphones and wearables devices⁷⁰. In the UAE, Dubai's

new Smart Wallets and One Gate initiatives will also allow travelers, based on automated biometric facial recognition technology, to use their smartphones instead of their passport or express gate cards at Dubai International Airport to move through immigration, access lounges and other touch-points more seamlessly⁷¹. New smart gates that supplement existing e-gates will offer an automated border control system as security. Furthermore, immigration checks will integrate through biometric validation as travelers pass through the new gates^{72, 73}. Last year, Saudi Arabia's Ministry of Haj introduced mandatory 'e-bracelets' for Hajj pilgrims – QR and barcoded wristbands, enabling authorities using smartphones to tag, identify and track pilgrims, as well as to differentiate between genuine and illegal pilgrims⁷⁴.

Dubai's new Smart Wallets and One Gate initiatives will also allow travelers, based on automated biometric facial recognition technology, to use their smartphones instead of their passport.

Smart loyalty and incentive programs

A universal platform for loyalty and rewards applied through blockchain technology, enabling tourists to collect points and redeem rewards across the city for sites and attractions they visit, promoting tourism activity.

Dubai Points, a new scheme supported by the Dubai Future Foundation, allows tourists to dynamically earn and redeem points at participating locations based on their unique preferences, lifestyle and other data points (e.g. time of day, past behavior, location, age). Points in exchange for tourist data also enable more customized and personalized incentives. They can be aligned with preferences to encourage tourists to visit other locations that would maximize their visit, while being rewarded with points. The advanced incentive scheme is claimed to be a world-first in the tourism industry, supporting national happiness ambitions and Dubai's objective to be the world's happiest city by 2020⁷⁵.

Event platforms

Digital platforms designed specifically to support key events and visitors being hosted in the country (e.g. entertainment concerts, sports matches, conferences, meetings, exhibitions, conventions). This can include digital media coverage, e-ticketing, event data gathering and analytics and visitor services (e.g. virtual guides).

For example, Dubai's Expo 2020 aims to be 'one of the fastest, smartest and most connected places on earth'. The event will be designed to offer a complete and seamless digital experience for visitors with digital services ranging from information security, customer relations, geolocation, augmented as well as virtual

assistance and tour guides⁷⁶. In addition, Dubai's Department of Tourism and Commerce Marketing (DTCM) has also introduced e-permit and e-ticketing platforms to support and develop Dubai's growing events sector⁷⁷.

In the build up to the FIFA World Cup, Qatar as part of its TASMU smart government program is also developing a suite of digital sports services to support the event. Examples include a universal Digital Fan Pass, a social Fan Connect platform, Event Visit Planner and Event Companion application to provide event-specific information to visitors⁷⁸.

Saudi Arabia's Ministry of Culture and Information (MOCI) this year also introduced two new platforms to support the annual Hajj pilgrimage. The new platform SaudiWelcomesTheWorld.org, tells the stories of the millions of Hajj pilgrims across the world, providing an insight into their journeys and inviting the world to learn, understand and appreciate the Islamic faith and tradition⁷⁹. It was designed in tandem with Hajj2017.org, a media portal providing journalists and the general public with information, updates, news, live streams and infographics about the event⁸⁰.

Delivery method

As with other digital themes, smart tourism initiatives, while led through government visions and objectives, are also primarily implemented and delivered through public-private partnerships. They involve a consortium of different partners in order to deliver a seamless visitor experience. For example the new Dubai Points scheme is one of the largest-ever public-private sector collaborations using blockchain and smart contract technology. The initiative brings together government

entities (Dubai Future Foundation), telecom players (du), blockchain start-ups (Loyyal, DigitUs) and participating entities related to travel, hospitality and leisure locations for points redemption and issuance (e.g. Jumeirah Group)⁸¹.

Investment

With GCC governments allocating multi-billion dollar budgets to major tourism development projects and events over the next five years, spending on supporting ICT infrastructure, major tourist events and digital smart tourism services is also significant. For example the UAE has allocated US\$100 million for its Expo Live initiative, used to identify and fund technology-inspired solutions for global issues to be showcased at Expo 2020 (e.g. mobility, sustainability)⁸². Not only would this encourage domestic and international businesses to attend, it would also attract many visiting spectators and technology enthusiasts, similar to other major international technology events such as the Global Mobile World Congress or Technology 'Disrupt' events.

Status

GCC governments have progressed in some smart tourism initiatives, while they are still in their nascent stages on others. Most, for instance, already have mature award-winning digital tourist guides in place and are only working on incremental enhancements with new technologies (e.g. AR, VR). The emergence of digital unified travel passes are another major step forward, as these initiatives are now entering pilot and early implementation phases. For example the UAE's Smart Wallets and One Gate initiatives are now being piloted in Dubai's International Airport, and reportedly mark a 'stepping-stone' towards the project's wider aim to reduce and minimize travel clearing

procedures⁸³. On the other hand, event platforms, smart loyalty and incentive programs are initiatives seeking to elevate the tourism experience to new frontiers. They are primarily still in the development phase, with the exception of Hajj platforms, which were only launched this year.

Current challenges and needs

In developing and implementing smart tourism initiatives to enhance the tourist experience and attract higher visitor figures, regional governments face a number of challenges and needs:

- **Digitally-savvy tourists with higher expectations:** the rise in digital tourist services (e.g. online bookings, ratings and reviews) and the increasing trend in millennial tourism has made the world much smaller and has risen customer expectations. Younger more digitally-savvy tourists now expect widely adopted e-gates to work smoothly and have less tolerance for waiting in queues for example, and need higher levels of digital engagement than traditionally older segments to enhance their experience and encourage spending.
- **Integrating the tourism value chain:** the tourism ecosystem is very fragmented and competitive, consisting of many entities in aviation, travel, hospitality and leisure. Tourists are still challenged with coordinating amongst many players to create their own personalized experience. GCC governments can play a role in enabling better coordination and partnership amongst players to help create a more simplified and customized end-to-end tourist experience. For example, regulation could encourage players to

share customer data across a common neutral industry platform, facilitating partnerships to serve mutual customers and digitally co-market to provide end-to-end offerings to attract tourists. Governments could be the custodians of such data and contribute to enhancing it further by sharing customer journey and behavior patterns in public spaces.

- **Tourist engagement:** most new digital initiatives are either in development, beta-stage or have been recently launched; they are yet to be proven by their end customers – tourists. To ensure these new services are optimized and successful, governments must embed mechanisms to engage tourists in a user-friendly and simple manner for their feedback. This also enables government to collect better information regarding tourists' user journeys and identify new ways to enhance their experience.
- **Seamless data security and privacy:** as identity management becomes more digital with e-passports, e-IDs, biometrics, new generations of smart gate systems, and more digital touch-points (e.g. public Wi-Fi hotspots), the risk of unauthorized tourist data access

and theft increases. Security regulation and solutions will have to be employed to ensure that tourist information remains secure, but in a seamless manner so that it does not disrupt the tourist experience. Regulation is also needed to define who may use what data, what purpose it can be used for, where it can be used and who is protecting it.

Outlook

Many of the GCC's digital and smart tourism initiatives cover discrete parts of the tourist journey and are simple services in nature. New smart gates that facilitate swift immigration and unified travel passes serve as an example. Going forward, the next stage in smart tourism is in co-creating customized and more meaningful experiences with tourists across as much of the tourist journey as possible. This customization would best take place where there are touch-points with public government provided services. Significant coordination and partnership between the public and private sector are required, as alluded to earlier, and new solutions will have to consider an integrated, end-to-end hyper-customized experience.

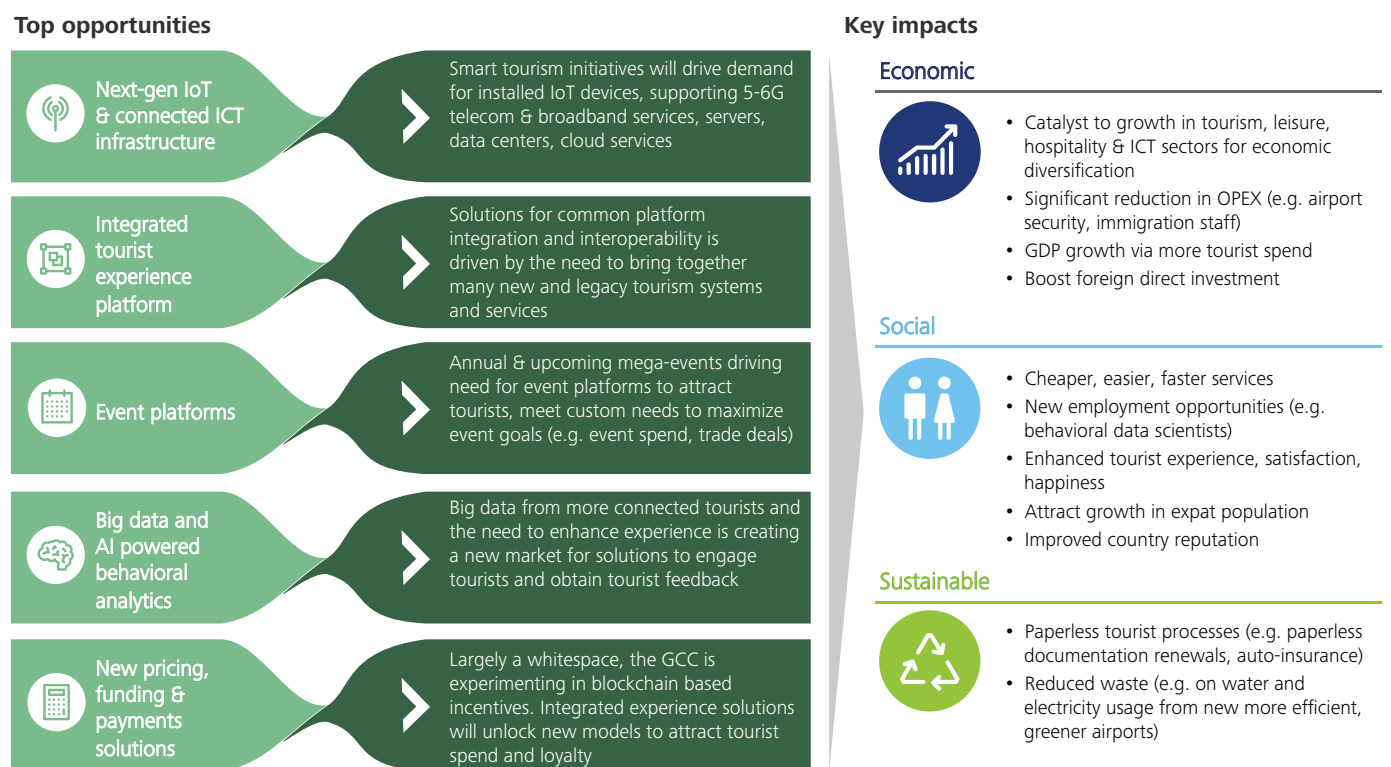
The next stage in smart tourism is in co-creating customized and more meaningful experiences with tourists, across as much of the tourist journey as possible.

GCC governments such as the UAE's Dubai Future Foundation are exploring emerging technologies and new partnerships to provide a more integrated experience⁸⁴. Equally, they are also starting to participate in new initiatives led by the private sector. The Together initiative, for instance, involves multiple government entities (e.g. Dubai Customs, Dubai Police, Dubai Airports) exploring advanced technologies to improve Dubai International Airport's passenger journey (e.g. automated check-in, baggage drop-off and tracking)⁸⁵.

Ongoing GCC government investment on new tourist attractions, events, digital infrastructure as well the next drive towards providing the ideal tourist experience leave a range of new opportunities and whitespaces to fill. Telecom operators and ICT vendors will need to expand their network and infrastructure across new tourist sites and events. Advanced technology vendors will offer new solutions to streamline the tourist journey and collect data (e.g. walk-through security scanners vs. manual security searches). SMEs can explore new G2B, B2B, G2G customer data hosting and

exchange platforms and augmented package design solutions involving tourists. Data analytics and real-time digital marketing services will be needed to provide interactive on-the-spot contextual suggestions to tourists (e.g. pop-up meal offers for hungry, price sensitive tourists walking to their gate in an airport).

Figure 22: Top opportunities in Smart Tourism and key impacts



Future of Mobility

Definition

The Future of mobility makes transportation as much about bits and bytes as it currently is about the physical infrastructure people walk, bike, drive and ride on. Existing and new advanced technologies improve mobility safety, efficiency and experience, resolving age-old transportation issues such as congestion, capacity and sustainability. This includes⁸⁶:

- **Digital-age transportation:** social transport, connected and driverless vehicles, real-time traffic management, shared transport, online transport services (e.g. smart parking, smart tolls, smart traffic lights, smart signs)
- **Innovations in pricing, funding and payments:** dynamic pricing models based on sensor data, unified travel pass, PPP transport models, incentive-based pricing (e.g. price per mile driven vs. per gallon of gas to refuel)
- **Rise of the alternatives:** electric vehicles and bikes
- **The airport re-imagined:** swift security, civilian drones, augmented and self-service airports, mobile air travel apps (covered also in the Smart Tourism section)

Key initiatives and expected outcomes

Globally, the GCC is one of the world's fastest emerging transport markets, driven by national plans to significantly expand its infrastructure, modes of transport and services⁸⁷.

Physically, transport infrastructure and networks across the GCC are undergoing major extensions and additions. New 'state-of-the-art' projects include terminals and airports (e.g. King Abdul Aziz International in Jeddah, Kuwait City International Airport), roads, bridges, waterways (e.g. Dubai canal), railways (e.g. GCC Rail) as well as tram and metro systems (e.g. Doha, Riyadh, Kuwait City). This also includes new alternative modes of transport, notably the Abu Dhabi-Dubai Hyperloop project and Dubai's drone taxi project; both world-firsts. Dubai's electric vehicle and bike projects serve as another example.

Digitally, GCC countries are also transforming their ever-expanding transport networks through mass digitalization, high-speed connectivity, and introduction of newer, smarter, more integrated services and management systems.

Proactive 'digital-first' transport strategies are driving new digital initiatives towards a regional future of mobility.

Good examples include the UAE Road and Transport Authority (RTA) Smart Transport Strategy 2017-2021, Dubai Autonomous Transportation Strategy 2030 (ATS), Abu Dhabi Transportation Mobility Management Strategy 2030 (TMMS)^{88, 89}, Smart Qatar Transportation Plan (part of TASMU)⁹⁰ and KSA's Ministry of Municipal and Rural Affairs (MOMRA) recently announced Smart Transport Systems (part of its smart cities program)⁹¹.

Key strategic goals and benefits include:

- **Reduction in road traffic deaths:** in Saudi Arabia at least 25 percent reduction by 2020⁹², in Qatar 50-60 percent by 2022⁹³, and in UAE elimination of road deaths. For example Dubai Police target zero road deaths by 2020⁹⁴ and the Dubai's ATS also aims to reduce traffic accidents and losses by 12 percent, worth around US\$545 million annually⁹⁵.
- **Increased network adoption and capacity:** for example UAE's RTA aims to raise the share of public transport in the mobility of people to 30 percent by 2030⁹⁶.
- **Reduced congestion and emissions:** migration from fossil-fuel driven cars to electric cars and greener and smarter public transport alternatives. Dubai's ATS aims to reduce pollution by 12 percent, worth around US\$400 million per year⁹⁷.
- **Revenue and cost benefits:** such as reduced fuel subsidies and new e-ticket revenue streams. Dubai's ATS aims to cut transport costs by 44 percent, worth US\$245 million annually⁹⁸. The Saudi Ministry of Transport aims via new income streams to increase its self-funding from 5 percent currently to 20 percent by 2020⁹⁹.
- **Faster mobility:** reduced commuter times, saving millions of hours wasted in conventional transport (around 400 million hours annually in Dubai¹⁰⁰)

- **Economic diversification impact:** increased private sector involvement and overall economic contribution of the transport sector. Dubai's ATS aims to generate US\$4.9 billion in annual returns¹⁰¹.
- **Multiplier effects:** across other sectors such as tourism and real estate (e.g. fewer car parks for more efficient use of prime real estate).

To realize these outcomes, GCC governments, especially the UAE and Qatar, have introduced a range of new advanced digital initiatives highlighted in figure 23.

Connected autonomous transport

Includes manned as well as unmanned connected vehicles of all types (e.g. cars, trucks, boats, bikes, drones).

- **Connected vehicles:** usage of built-in IoT sensors and mobile machine-to-machine (M2M) communications to connect all types of transport vehicles to each other, central transport control, users, and other transport ecosystem players (e.g. insurance providers).

Qatar's Safe Journey initiative introduces a range of new services to enhance car safety and risk management. For instance, it's Connected Vehicle (V2V) project enables vehicles to sense and share perceived threats with other vehicles, based on telematics data¹⁰². It's Smart Vehicle Monitoring service aims to monitor driving, equipment and maintenance patterns in cars, the data of which can be leveraged to generate demand forecasts for parts, maintenance services as well as inform car insurance schemes¹⁰³. It's Mobility Guardian service provides end-to-end visibility for families to track dependents, a service that can also be used on school and public transport buses¹⁰⁴.

- **Autonomous transport and services:** all types of unmanned transport and vehicle-based public services, which are either pre-programmed or controlled remotely. This can include individual modes of unmanned transport such as cars, but also unmanned collective transport such as metros, trams and aerial vehicles.

This initiative is central to UAE's future strategy. To this end, Dubai is targeting 50 percent of private cars to have self-driving features within the next 10 years (by 2027), 12 percent of city trips to be driverless by 2021 and 25 percent of all trips to be driverless by 2030^{105,106}.

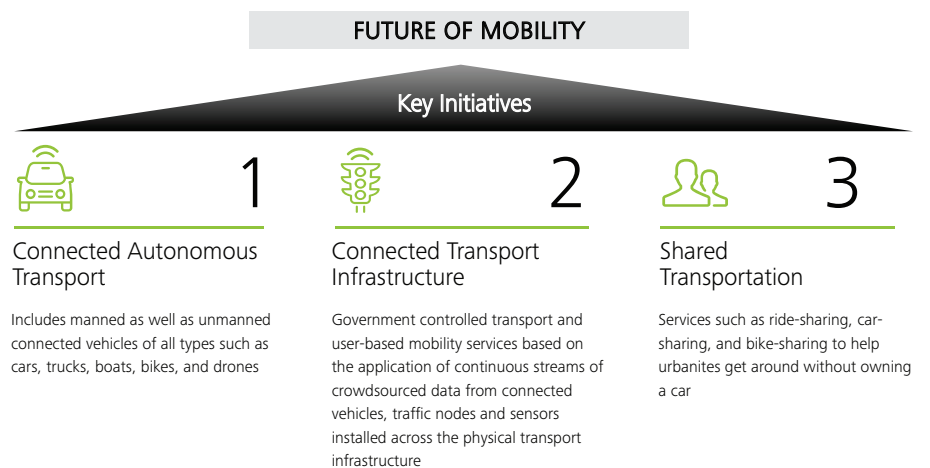
Dubai is targeting 25 percent of all trips to be driverless by 2030.

Notable examples include the RTA and Careem joint Driverless Electric Modular Pods project in the UAE. Electrically

powered, the pod is a new 'door-to-door' mode of transport which picks-up residents from different locations via the Careem app and connects to other pods heading in the same direction. Like a metro-interchange, residents can switch to other connected pods that will later separate and head to different destinations. The new solution is designed to significantly reduce traffic congestion, where instead of having 80 cars for 80 people, 10 pods can move 80 people¹⁰⁷.

Other use cases include Dubai Police's Driverless Mini Police Cars scheme, which, powered by robotics and biometric recognition software, can patrol different areas of Dubai to detect and track any unusual activity, objects, people, suspects and known criminals. The vehicles are accompanied with their own assistant drones, both of which can be controlled remotely by a police officer, via a link to the central command room¹⁰⁸.

Figure 23: Key types of Future of Mobility digital initiatives



RTAs Flying Taxi project is another notable use case. The Volocopter is a mini helicopter powered by drone technology with autopilot capability. Measuring two meters in height and seven meters in width, the flying taxi can seat two people, cruise at a speed of 50-100km/h, with a 30 min flying time and 40 min battery charge time. For passenger safety it comes with an emergency parachute in case of malfunction. The flying taxi service, the world's first, will eventually be made available to the public, which can be booked and tracked via a smartphone app. It is hoped this service will ease transport, for example, between high-rises and key destinations within the city^{109, 110}.

Qatar's planned Autonomous Neighbourhood Fleet project is a 'door-to-door' pick-up and drop-off service that bridges the last mile of the transportation gap between public transport drop-off points (i.e. metro and bus stations) and final traveler destinations. These fleets will be deployed as feeder transport systems, with their own special lanes allowing passengers to reach metro and bus stations more conveniently and safely¹¹¹.

Connected transport infrastructure

Government-controlled transport and user-based mobility services are based on the application of continuous streams of crowdsourced data from connected vehicles, traffic nodes and sensors installed across the physical transport infrastructure. It is a fundamental initiative required for future mobility to be a successful reality and is especially important in the GCC, given rapidly expanding transport networks and advanced new transport modes such as Hyperloop. Use cases coming to light in the region include:

- **Central transport control networks:** a single command center that centrally monitors and controls all modes of transport. Through centralized data gathering and analytics, such centers can perform real-time and predictive traffic management, faster emergency response, and hazard prevention via automated enforcement of road safety standards (e.g. controlling cars to remain within speed limits).

A good example of this is in Dubai, where RTA launched its new Enterprise Command Control Centre (EC3). EC3 is a unified mobility platform of platforms linking all city transport networks and traffic control systems (e.g. Dubai Metro, Dubai Tram, Dubai Taxis and various RTA agencies), integrating even ride-sharing platforms Uber and Careem. The center aims to help ease traffic congestions, reduce transit time and cost, fend off traffic accidents, and curb environmental pollution by adopting smart planning in addressing transport challenges of the emirate.

- **Transport network-based services:** user services such as journey planning based on real-time location and contextual information downloaded from the central transport network.

Qatar's new Connected Transport Network service under its seamless mobility initiative is an example of this. The service guides user journey planning and booking by recommending the optimal transit package based on real-time transport network data and user preferences (e.g. price, distance, time, preferred transport)¹¹².

Shared transportation

These are services such as ride-sharing, car-sharing, and bike-sharing to help urbanites get around without owning a car. GCC governments have jumped on the bandwagon with taxi sharing services such as Uber and Careem.

In the UAE, RTA signed an agreement with Careem to allow users to book an RTA taxi, track it and check details of their bookings via the Careem app¹¹³. Saudi Arabia's Public Investment Fund (PIF) also invested in the ride-sharing app Uber, encouraging its usage¹¹⁴. On the other hand in Qatar, government-owned taxi company Mowasalat has launched its own ride-sharing service Karwa, offering an alternative to Uber and Careem in the country. In addition to the core taxi service, users can also use it for other transport services such as public buses, school buses and private hire coaches^{115, 116}.

Delivery method

The creative new mobility initiatives launching in the region have only been made possible through a number of PPPs and collaboration efforts between GCC governments, telecom operators, private sector tech giants, SMEs and other ecosystem players. Under these partnerships, digital initiatives are each co-designed and implemented in a phased manner.

RTA in the UAE for example have partnered with a number of private sector organizations across the various initiatives and projects they are working on. Careem is a key partner for RTA, which has enabled RTA ride-sharing services on the Careem platform as well as the new Driverless Electric Modular Pods project. RTA has also partnered with German company

Volocopter to bring its dream of flying taxis to life. Additional deals to bring alternative sustainable transport have been signed with Tesla for self-driving electric vehicles and with Hyperloop One as a new alternative mode of transport¹¹⁷. Qatar, Saudi Arabia and Kuwait have also signed major deals with transport and ICT developers in pursuit of their smart transport networks.

Interviews also reveal that cross-coordination between government entities and authorities is essential as these future services need to be properly regulated, field tested and carefully managed. As such, RTA has coordinated with Dubai Civil Aviation Authority (DCAA) to define flying taxi regulations, governance and obtain approval for the usage of the new service airspace in Dubai. Similarly, RTA has joined forces with Dubai Silicon Oasis Authority (DSOA) to allocate and launch dedicated transport routes in the DSOA park to pilot and test new autonomous vehicles in the field. In addition, DSOA will contribute towards autonomous mobility R&D¹¹⁸.

Equally, involving various ecosystem players in the Digital Transformation journey is also key. The Dubai World Autonomous Transportation Challenge for instance, launched by the Dubai Future Foundation, reaches out to the broader international community of vehicle manufacturers, SMEs and R&D centers, inviting them to compete and work towards innovative solutions for 'last-mile' transportation from metro stations as well as autonomous neighbourhood buses¹¹⁹.

Investment

While total figures on future of mobility budgets remain undisclosed, it is clear that significant planning and investments in new mobility infrastructure, solutions and services have been made. For example, the UAE invested over US\$91 million to build Dubai's new EC3 mobility center. Saudi Arabia has reportedly earmarked US\$140 billion on mobility

optimization over the next ten years, the largest share of which is reported to be on traffic management and public transport¹²⁰. In addition to the multi-billion dollar new transport construction projects in Saudi Arabia, the PIF invested US\$3.5 billion in the taxi-sharing service, Uber, last year¹²¹, and government-owned incumbent Saudi Telecom purchased a 10 percent stake in Careem.

Saudi Arabia has reportedly earmarked US\$140 billion on mobility optimization over the next ten years.

Status

GCC governments have made good progress on the future of mobility initiatives they have embarked on. While dreams of autonomous mobility may seem ambitious and distant, in some ways it is already here. For example UAE has been operating a driverless metro system since 2009, and has recently complemented that with a new tram system¹²². Qatar, Saudi Arabia and Kuwait have all also made significant progress in developing similar new smart transport infrastructure and networks. GCC countries have also seen the rise and quick adoption of shared transportation, which are being harnessed by governments in different ways.

However, the UAE, and Dubai in particular, has established itself as a clear leader in this space, with the most defined autonomous transport strategy and plan in place, having signed agreements with a range of organizations for multiple projects. Many of these are already prototyped and are being piloted. Dubai, for example, was the first city in the world to successfully field test a new flying taxi service. It is followed closely by Qatar, aiming to release its own range of future

mobility services in 2018. Saudi Arabia and Kuwait, dealing with much larger scale expansions in their transport networks are following a more steady and gradual path.

Dubai for example was the first city in the world to successfully field test a new flying taxi service.

However, even with such progress, wide-scale connected autonomous transport deployments should not be expected before 2020. Many of the new initiatives (with the exception of shared transportation which is well established across the GCC) are still in their experimental stages, and will require adequate time to be rigorously tested before being accepted as 'proven' and fit for public use. In addition, major aspects of the future of mobility, namely innovations in pricing, funding and payments are yet to be conceptualized and implemented to develop a real ecosystem around connected autonomous transport. Some progress has been made on this, but much more remains to be done to effect the Digital Transformation of the transport sector.

Challenges and needs

In developing and implementing future mobility initiatives, GCC governments also need to tackle a number of challenges and needs:

- **Supporting policies, regulations, standards:** public policies need to be defined to support new solutions, and their adoption with regulations and standards need to be defined to govern them (e.g. safety regulations for driverless cars and drones, communication and data interoperability standards for connected vehicles).

- Integration and consolidation:** many services have migrated to smart e-government and m-government platforms. However there are more than 170 transport services in UAE, which need to be further consolidated.
- Public safety and security:** from a physical perspective, the public still needs to be convinced over the reliability and travel-worthiness of autonomous vehicles and from a digital perspective, transport network data and control over all vehicles within that network need to be strongly protected.
- Coordination:** integrated mobility solutions require close and consistent coordination across the transport network and ecosystem. Both government entities and private sector agencies need to focus on broad coordinated development, implementation, operations and maintenance, which could take time.
- Car-centric usage:** higher incomes and lower fuel prices compared to other countries enables people to afford their own cars for transport. Coupled with the fact that current public transport networks are not developed to the last mile, private cars remain the primary mode of transport. This could generate inertia in the adoption of new public 'smart' transport networks and services, which stood at only 13 percent in 2013¹²³.
- Tight timescale and delays:** many new 'smart' public transport projects (e.g. airports, metros, railways) are being developed from scratch within very short timelines to meet GCC envisioned ambitions. Transport developers cite this as a key challenge as such 'state-of-the-art' projects are large-scale and complex, require thorough testing and are sensitive to delays without full government support and financing in place¹²⁴. A number of projects across GCC states have been delayed for various reasons already, which could push-back future mobility advancements.

Outlook

The GCC auto market will expand significantly to the extent that by 2021, more stringent regulations and standards could drive auto-makers to manufacture nearly 3 million cars in the region. This creates an opportunity for GCC governments to establish a new home-grown industry and ecosystem around connected autonomous vehicles¹²⁵. The figure below depicts the potential opportunities a new autonomous transport network could provide, illustrating business transformations in adjacent industries that could emanate from this. With the great progress already made by the GCC and pathway of opportunities ahead, what is clear is that the governments in this region have only begun to scratch the surface.

Figure 24: Top opportunities in Future of Mobility and key impacts

Top opportunities



Key impacts

Economic



- Productivity: Dubai to recover approximately 400 million lost travel hours
- Revenues: Dubai to generate US\$4.9 billion in annual returns
- Reduced transport OPEX & CAPEX (e.g. bus drivers, call centers)
- Catalyst of growth in ICT and transport sectors

Social



- Cheaper, easier, faster mobility: approx. 70 percent cost reduction per mile
- New employment opportunities (e.g. mobility control managers)
- Reduced road deaths: globally 1.24 million lives saved annually
- Citizen satisfaction, happiness

Sustainable



- Greater use of viable alternatives (e.g. Hyperloop, electric vehicles, clean public transport)
- Emissions: 40 to 90 percent decrease from automobiles
- Paperless mobility processes (e.g. vehicle documentation renewals, auto-insurance)

Source: "Future of Mobility" report, Deloitte University Press, 2016

Smart Government

Definition

Smart government refers to the use of integrated information and communication technologies in government policies, services and processes to enhance customer experience and satisfaction, develop efficient and cost-effective ways of doing business and improve policy making.

Smart government programs implemented globally have delivered significant and tangible benefits to their economies. Digitizing more than 1,100 services has saved the state of Utah US\$500 million annually¹²⁶. It also converted 99 percent of public services in Estonia to e-services, saving 800 years of working time¹²⁷. The government of Dubai has also saved approximately US\$1.17 billion over the past twelve years through

its development of smart services¹²⁸. Similar initiatives adopted by the rest of the GCC reveal better business outcomes and subsequent cost saving opportunities.

Key initiatives and expected outcomes

This paper chose three initiatives that are the most prevalent as part of GCC planning towards smarter governments:

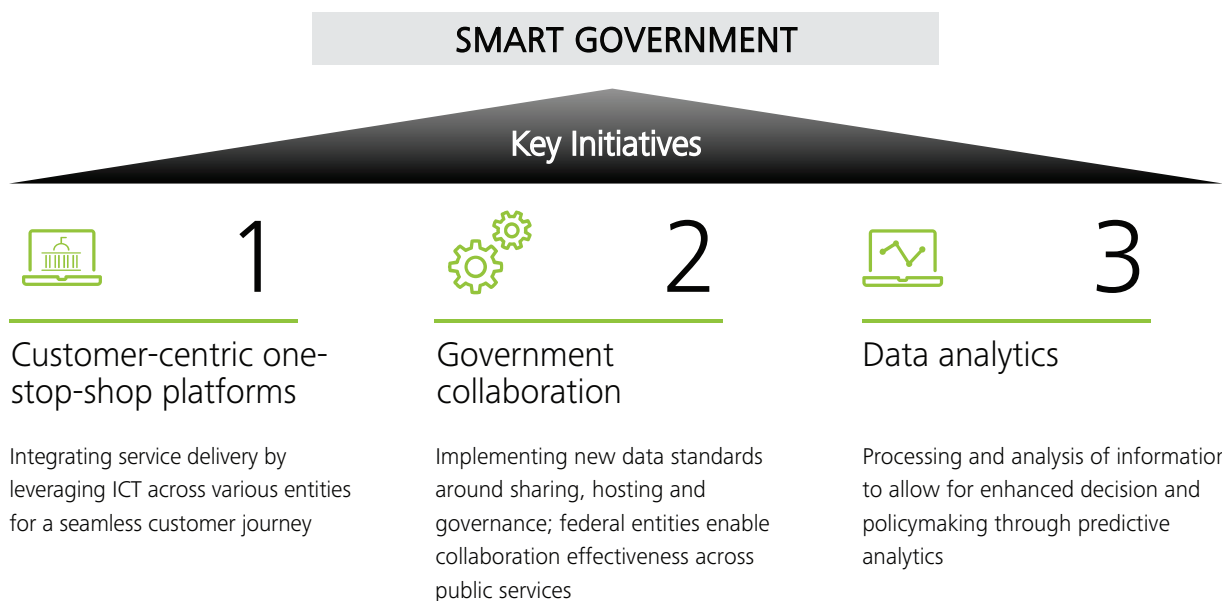
Customer-centric one-stop-shop platforms

Governments are making strides in their technology choices to simplify processes for citizens. Across the GCC, Public Sector entities have emphasized the development of mobile applications as a means of conducting government services at any point in time. For instance, mobile phones are the most used device by

individuals across all electronics. Governments, across a wide range of sectors (i.e., transport, communication, security, health, education, social affairs) are developing mobile applications to provide on-the-go services with enhanced user experiences.

Mobile apps provide individuals with easy access to information, the ability to communicate with relevant personnel from government entities, receive advance notifications, complete their government linked transactions and more. Likewise, these apps allow government officials to keep track of activity, increase efficiency in processing transactions and foster real-time public engagement.

Figure 25: Key types of Smart Government digital initiatives








After enabling m-services, governments are collaborating together and in some cases, with private sector entities, to create fully integrated platforms. These smart apps or e-government services act as a one-stop-shop for all day-to-day customer services, such as payments, top-ups, location finders and information directories.

Platforms such as Dubai Now have emerged, allowing citizens in Dubai to access various government services in one single location. The app integrates more than fifty services such as payment for traffic violations, utility bills, top-up options, charity donation and visa application tracking¹²⁹.

Delivering on its customer-centric approach and happiness metric, Dubai's smart e-service center is driven by IBM Watson artificial intelligence and a robot that provides more than 100 services ensuring only one time visits. Some services include ID renewal, marriage certificates and birth certificates¹³⁰.

Figure 26: GCC mobile Smart Government applications

Country	Application Name	Developed By	Description
	Dubai Now	Dubai Smart Government	Integrates over 50 smart services across 22 government entities to enable user access to a comprehensive list of services across the city
	MyGOSI	GOSI	Allows users to view social security status & application instructions, track and cancel applications, and file complaints
	Visit Abu Dhabi	Abu Dhabi Tourism & Culture Authority	Provides users with a list of attractions, hotels, restaurants and interactive maps; options to book taxis, hotels and flights are available in 10 languages
	Kahramaa	Qatar General Electricity & Water Corporation	Allows users to view and pay bills, access lists of services, track the status of services demanded, locate service centers and send suggestions & complaints
	Kuwait Festivals	Ministry of Information	Allows users to view all events and festivals; it provides relevant details and manages a personal calendar of interested events

Source: Deloitte research and analysis, GCC government websites

Figure 27: Dubai Now mobile application



Source: Deloitte research and analysis, Dubai government websites

Dubai's smart e-service center is driven by IBM Watson artificial intelligence and a robot that provides more than 100 services ensuring only one time visits.

Qatar's Hukoomi is another step in this direction. Customers will be able to complete more than 650 government related transactions from their mobile phones¹³¹.

Government collaboration

The evolving use, storage and sharing of data along with its regulatory standards is picking up as a major enabler for government collaboration. Although GCC countries are still maturing in this initiative with their current ranking all below the 50th position in the Open Data Barometer¹³², there is a strong emphasis on the importance of transparency between governments and citizens to promote development. This transparency contributes to the provision of public service, ease of doing business for SMEs, start-ups and other enterprises as the availability of public data and information allows for more innovation and growth while reducing challenges.

Aiming to achieve smarter practices, Dubai's Open Data platform addresses this development by sharing all government-related, non-confidential data and information with the public¹³³. Similarly, Qatar has established Open Data policies giving entities a framework and approach for releasing different types of data. Moreover, the UAE Federal Network (FN), a G2G network is now available for

information sharing services across all federal entities through smart clouding solutions¹³⁴.

From a regulatory standpoint, the UAE's TRA has undertaken work to review existing data legislations, update the guidelines and conduct an outreach program in order to adopt data standards for seamless data integration and analytics. Regional data hubs are the way in which future governments would leverage data integration. In that context, the UN recently designated Dubai as the local data hub for the MENA and South Asia regions. On one hand, this solidifies Dubai's positioning and vision on government data collaboration, while on the other, brings GCC into the foreplay of data governance¹³⁵.

Data analytics

With data sharing becoming more common, the use of data analytics to track patterns, predict outcomes and adapt to changing conditions is becoming more critical in the GCC. Data analytics will enable better and faster decision making amongst government entities as well as adhere to the requirements of citizens. While still popularizing across the region, the UAE has already made plans to adopt these technologies.

Dubai just launched the Dubai Pulse Platform initiative in an effort to switch to smarter technologies in the Public Sector space. This central platform will aim to house government data and will be available to all relevant government officials allowing them to aggregate, process and analyze information to make more informed decisions, enhance operational efficiency and lower data access costs¹³⁶.

Delivery method

Integrated delivery is a result of efficient and effective collaboration between all entities – public (federal and local), semi-government, private and non-profit sectors. Across all entities there remains a high demand for IT programmers as well as web and app developers. Government organizations are able to better integrate data through this collaboration to leverage integration into a seamless service delivery.

Dedicated programs are also a means for enhancing e-government services and initiatives. For example, KSA recognized the essential role of e-government and consequently created Yesser, the designation program governing the implementation of e-government initiatives in the Kingdom¹³⁷. Similarly, Dubai is allocating Area 2071 as a mini Silicon Valley to empower start-ups, venture capitals and other digital enterprises that contribute to the digital sector in the UAE.

Investment

Investing in digital innovation to establish smart governments can reap great returns for the country, as seen in best practice examples. Predictions estimate that if the UAE government and businesses alike optimize their digital skills, technologies and accelerators, its GDP would increase by US\$13.8 billion by 2020, 3 percent of GDP. Saudi Arabia could add more than US\$31 billion (4.1 percent of GDP¹³⁸) and Qatar US\$7.8 billion (3.6 percent of GDP) by 2020, through these investments¹³⁹.

Status

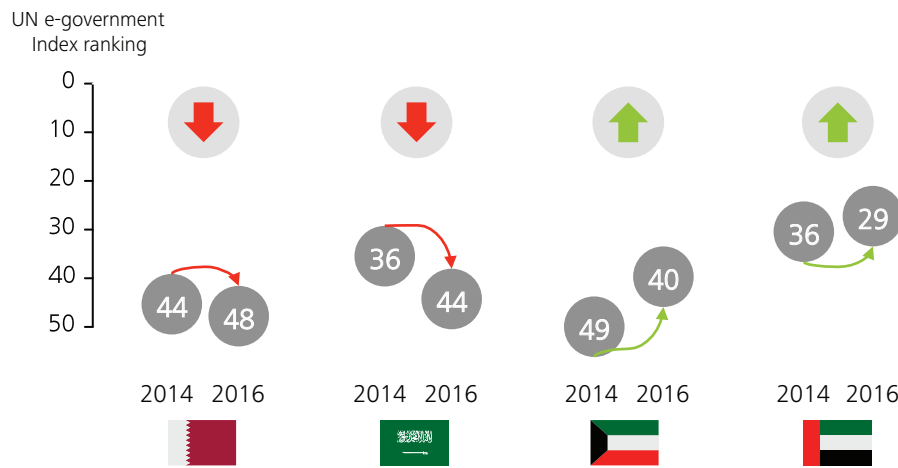
According to the UN E-Government Index¹⁴⁰ – an index assessing a country’s e-government development based on the adequacy of its ICT infrastructure, the UAE, KSA, Qatar and Kuwait all rank in the top 50 in terms of education and adaptability to ICT. While the ranks have varied over the years, efforts are being made in line with government visions to ensure smarter governments.

Kuwait improved its e-government ranking drastically by increasing nine ranks. Qatar, although downgraded by four, is moving in the right direction. MOTC’s establishment of TASMU, which encompasses over 80 digital initiatives, aims to launch in 2018, picking up the pace of digital in the country.

KSA has risen rapidly in the rankings over the years and despite its fallen rank over the past two years, the country is currently making great efforts in enhancing its ICT infrastructure and digital ecosystem in line with Vision 2030.

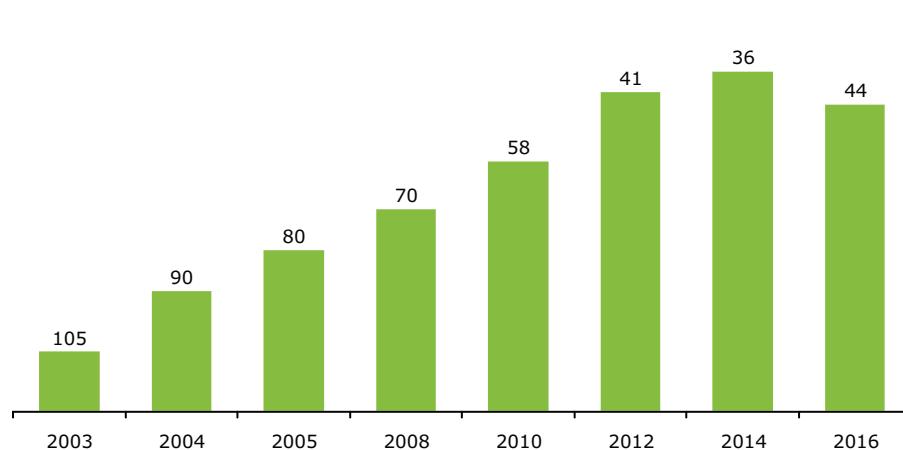
Dubai, ranking the highest at 29, has made plans to become the smartest city in the world by 2021. Its platform, ‘Dubai Now’ was named the Best Mobile Government Service in the UAE at the World Government Summit in 2016¹⁴¹.

Figure 28: GCC ranking in the e-government Index



Source: “e-Government Survey” 2014 and 2016 reports, United Nations

Figure 29: KSA e-government rankings (2003–2016)



Note: after 2005 e-government survey was next done from 2008 on a bi-annual basis
 Source: “e-Government Survey” 2014 and 2016 reports, United Nations

Current challenges and needs

Digital talent is a global challenge that is also prevalent in the UAE. Expertise in app development, software development, digital manufacturing and other related services is required for markets to keep up with the pace of global transformation. This expertise is especially crucial for in-house initiatives. Entities need skilled employees to manage, maintain and troubleshoot these digital applications regularly.

Stronger promotional efforts, especially among older generations, are crucial to increase awareness and assure individuals that online transactions are more efficient, safe, up-to-date and reliable.

Data ownership and data sharing are also challenges in the GCC, specifically for integrated information. The large number of entities participating in integrated information and service delivery contributes to issues of bureaucracy and in some cases, reduces stakeholder interest in taking ownership and responsibility.

Entities are reluctant to share their data specifically when it relates to a project or an initiative that they are not taking ownership of.

The security and privacy of content plays a major role in the ability of governments to implement these programs. Governments must ensure the highest level of sophistication in digital security to secure data, personal credentials and other confidential information input into their systems.

Finally, government regulation is a key concern in fully digitalizing and adopting emerging technologies as part of an e-government. Legislation must be clear and effective covering all types of e-transactions and functionalities, while also ensuring that it does not limit the adoption of new technologies, such as drones.

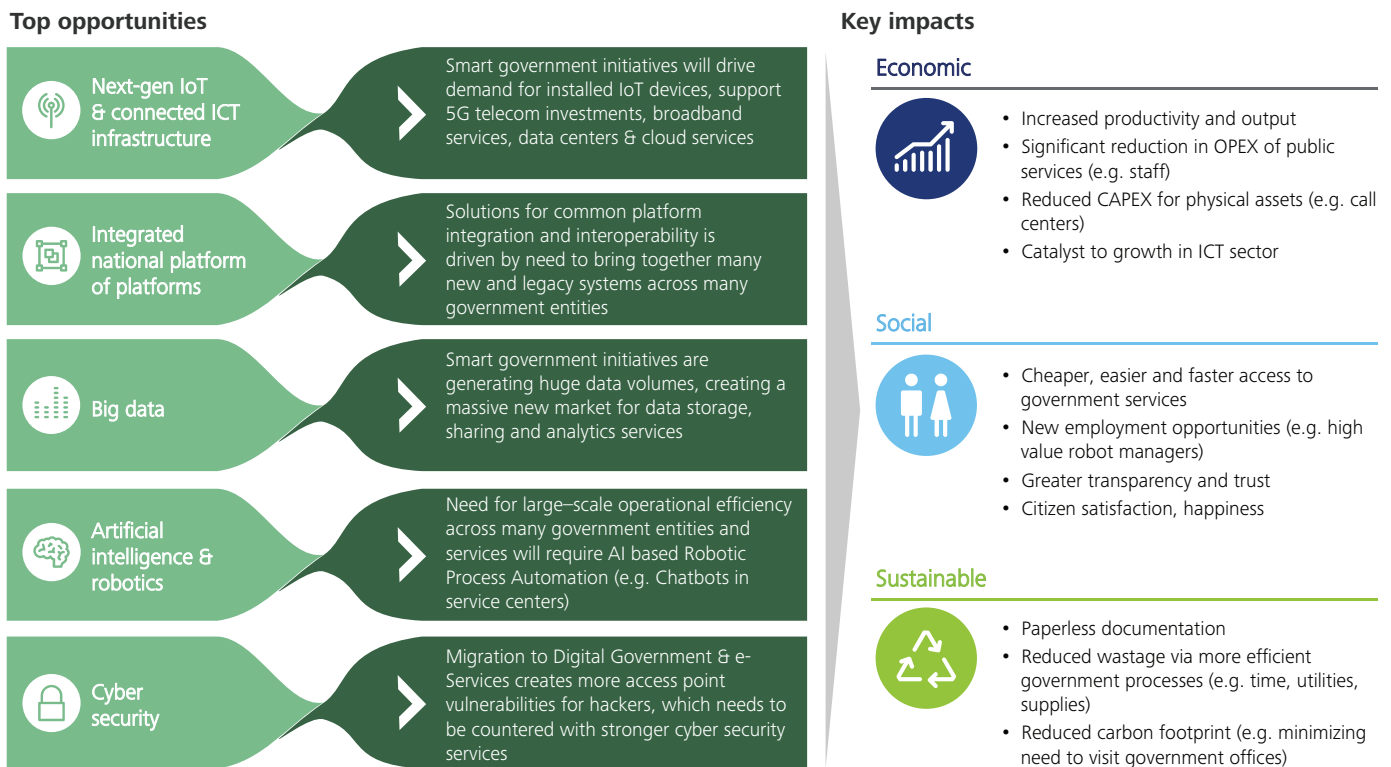
Outlook

GCC countries are aiming to achieve a model similar to more advanced smart government implementations like Estonia, where all government services are made available online and can be completed within minutes. GCC governments are testing digital and exponential technologies to encourage effortless, quick and paperless integrated transactions.

Moving forward, the focus and interest in data warehouses, cloud platforms, enhanced data, cyber security, smart devices and applications, blockchain, robotics and big data analytics are a few areas of high impact and certainty when it comes to ICT investment. These will play a critical role in enabling governments to deliver on the smart government promise.

GCC countries are aiming to achieve a model similar to more advanced smart government implementations like Estonia, where all government services are made available online and can be completed within minutes.

Figure 30: Top opportunities in Smart Government and key impacts



Smart Cities

Definition

As the world is becoming far more urbanized, and mega cities with populations greater than ten to twenty million people are emerging, there is a greater need for large-scale operations and management for cities to effectively serve its inhabitants. As societies are becoming more connected through digital and mobile, they are also becoming much busier. With this comes an increasing number of demands and challenges to be met in an ever-more dense and active city life. These conditions make 'Smart City' living the next necessary evolution in the way of life.

Smart cities are cities that use smart technologies, data analysis and innovation to improve the quality of life, efficiency of urban operations, services and competitiveness, while ensuring the city meets the needs of present and future generations with respect to economic, social, environmental and cultural aspects.

For a city to be 'Smart' it needs to be digitally connected and integrated across the key domains of society. Offering the people, businesses and governments a seamless and outcome driven experience across key levers of economy, mobility, security, education, environment and living.

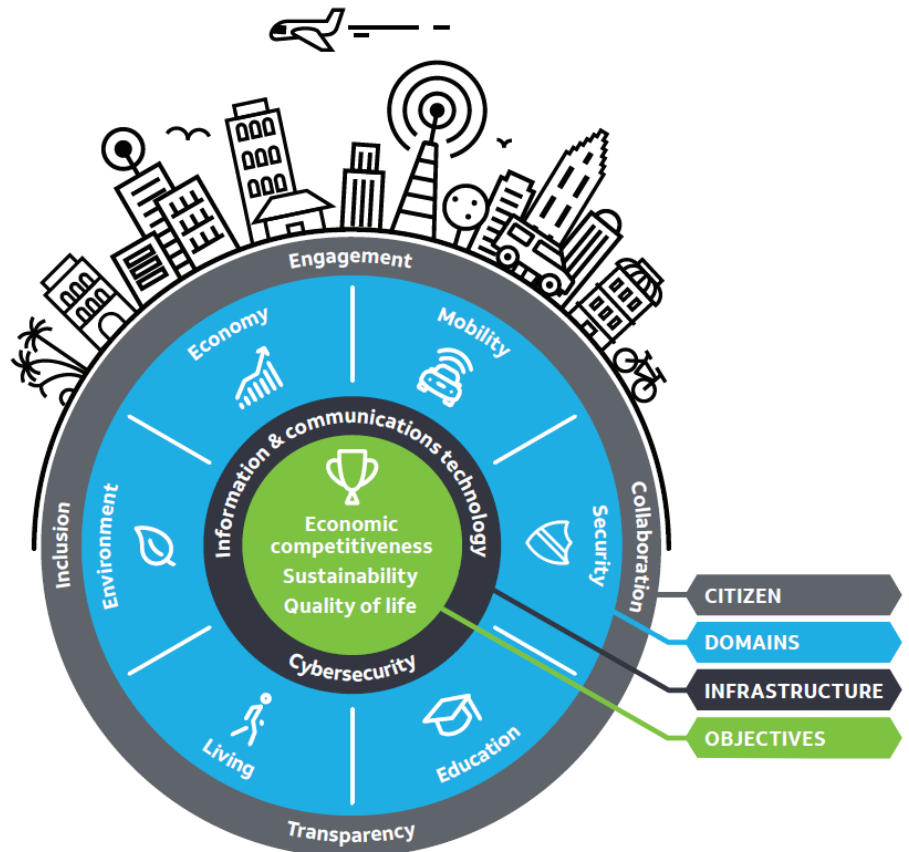
Digital and exponential technologies ranging from AI integrated sensors, robotics, big data analytics and IoT are just

some of the innovations enabling governments to implement new smart city programs. The demographic change component is a key driver in smart city developments as also seen in the GCC where the cities are being shaped by the youth who are growing up in such an integrated society.

Key initiatives and expected outcomes

In line with other developed countries across the world, the GCC is also leveraging digital technologies to accelerate the development and implementation of smart city solutions to enhance their current and future urban development.

Figure 31: Deloitte Smart Cities framework



As such, GCC governments have introduced various digital initiatives along the six smart city pillars: economy, mobility, security, environment, education and living.

Economy

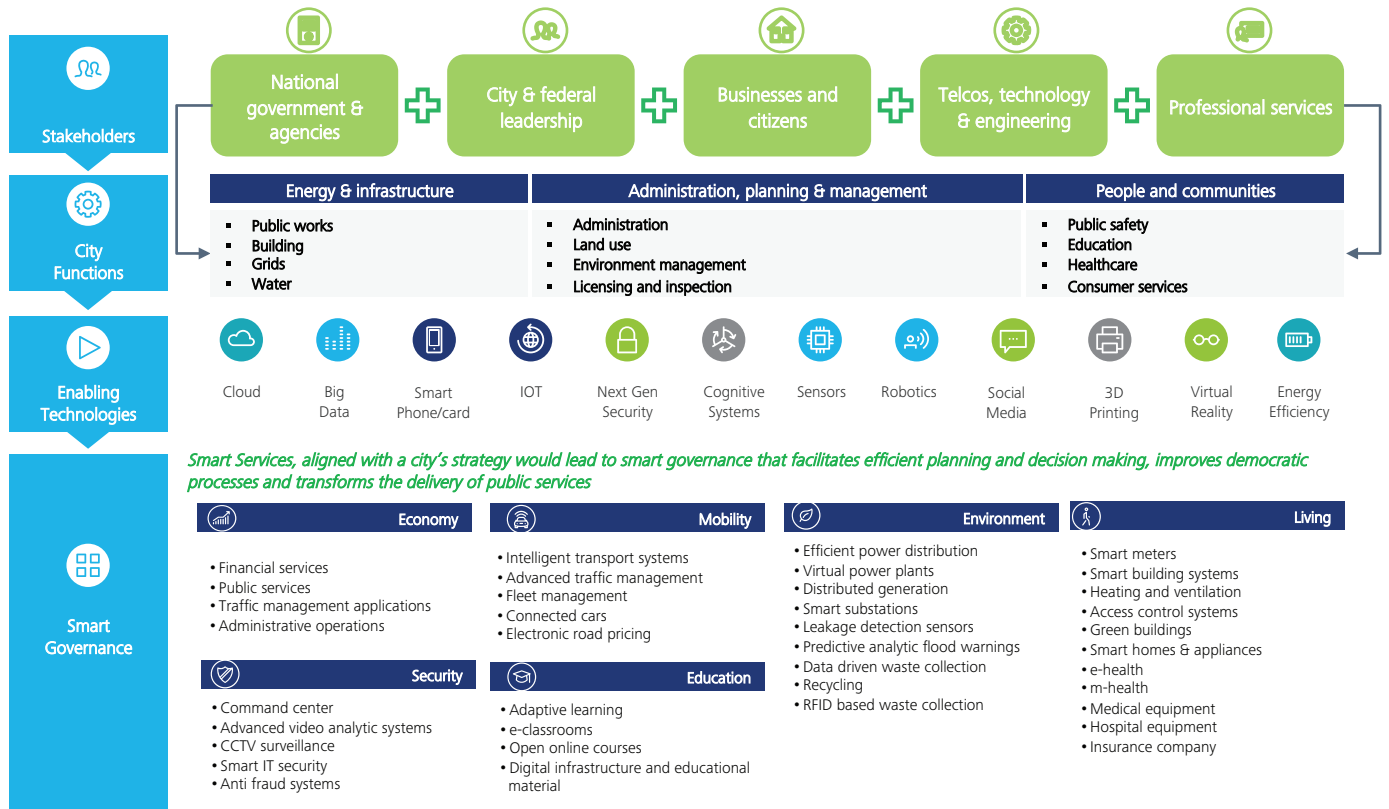
The economy pillar represents the prosperity and wealth of a city and its residents. Cities with a 'smart economy' have an edge to prosper via easier ways of doing business, finding work (meeting the needs of a borderless workforce), and gaining access to financial opportunities, all empowered through ICT. For instance, robotics automating government procedures (e.g. permitting and licensing). Digitization and big data analytics improve

city regulators' ability to track economic performance and outcomes.

The economy pillar is arguably the most significant dimension as GCC countries adopt technologies that optimize internal processes and develop new industries. Dubai, for example, has made a smart economy initiative to implement blockchain technology to save and redistribute 25.1 million hours of economic productivity. In the KSA, MOMRA has announced its plan to implement ten smart cities across the country. Operations in such cities would include improving efficiency on city management, attracting local and foreign investment as well as creating job opportunities.

Dubai has made a smart economy initiative to implement blockchain technology to save and redistribute 25.1 million hours of economic productivity.

Figure 32: Smart Cities ecosystem and stakeholder map



Source: Deloitte research and analysis, MI analysis, Technavio

Mobility

Mobility, as alluded to in the Future of Mobility section, represents both the physical and digital infrastructure that supports services and help people and goods move more safely, cheaply, quickly, cleanly and happily. A smart city with true advanced mobility is equipped with digital-age transport (e.g. autonomous vehicles and drones), applies innovations in mobility service pricing, funding and payments (e.g. sensor-driven dynamic pricing models), uses alternative sustainable modes of transport (e.g. electric vehicles) and re-imagined infrastructure (e.g. airports).

GCC countries have some of the most rapidly advancing transport systems in the world, and in many ways are leading new mobility innovations. Key digital initiatives in the GCC include connected autonomous transport, connected infrastructure as well as shared transportation. Notable examples include Dubai's recently tested flying taxi project and its integrated transport control center (EC3)¹⁴². For a detailed review of mobility and examples see the "Future of Mobility" theme.

Security

Security is paramount for any city before it can thrive. Over time, ICT has played an increasingly central role in security, both physically and digitally. Physically, technologies such as security drones, facial-recognition and predictive analytics are applied to ensure a city and its inhabitants are protected from any physical breach or harm (e.g. prevention of street crimes). Digitally, cyber security technologies are equally critical to ensure the protection of sensitive data relating to business, people and operations within

the city (e.g. prevention of identity theft, digital financial theft). Secure data platforms, clear governance and smart access protocols ensure that data is safeguarded against cyber threats. Big data and predictive analytics are helping security agencies to proactively control crime rates.

This domain is arguably top of the agenda for the GCC countries as they have introduced a number of digital initiatives to develop smarter, tougher and stronger national and city level security to fight and prevent crime at home and on their borders. Examples of initiatives include MOMRA's plan to implement smart-street lighting systems which not only reduce power consumption but also enhance security by increasing light brightness when movement is detected. In Dubai, the police recently deployed a smart controller device that can assist officers from traffic departments to maintain safety on the roads, improve electronic road surveillance and capture serious violations by drivers.

Education

Education, which was outlined in the Classroom of the Future theme, is the learning and application of ICT to transform one's way of learning. Technology solutions such as virtual learning, digitization, and AR transform the way individuals learn. Unbundled, personalized, and blended education can be more accessible thanks to rich data and analytics, which helps shift the focus of education from digital content in the classroom, to real-world experiential learning. In a smart city context the smart connectivity of digital education platforms in government service offerings delivers a seamless citizen experience.

GCC governments are attempting to incorporate smart technologies specifically in the education sector. Digital initiatives broadly fall into the following categories: smart education systems (based on digital devices rather than textbooks), online platforms (self-taught, flexible and accessible learning via online courses) and digital literacy (ICT content focus in school curricula).

Environment

Environment represents the natural ecosystem and surroundings of a city's inhabitants, encompassing components such as vegetation, air quality, climate and livestock. Cities today are notorious for being a source of pollution, ultimately causing environmental damage and climate change. Smart cities, however, aim to shift the paradigm from harming to supporting by applying new technologies to preserve, protect and even to enhance the environment. This could include sensors that detect leakage of preserved natural resources, such as water, or responsive devices (e.g. washing machines) that temporarily stop consuming energy when demand for energy (and prices) increase.

As concerns about sustainability and energy conservation arise across the world, GCC governments are taking serious measures to ensure more efficient practices are being exercised through the use of new technologies. These come from sensory and monitoring tools, including resource saving systems and offer more reliable and efficient services. Furthermore, such technologies are prioritized to achieve lower pollution, gas emission and cleaner resources to ensure sustainable and productive lives.

With plans to become the smartest city in the world, Dubai, is working on connecting all of its resources and infrastructure. Water, energy, drainage, waste distribution networks, buildings and traffic lights will be connected and monitored to provide more reliable and efficient services. This network of connectivity allows for easier detection of outages, leaks and consumption levels.

Furthermore, the Dubai Electricity & Water Authority (DEWA) is the region's smart utility pioneer. It is focused on upgrading its infrastructure and is planning to implement smart grids which will include high-tech energy efficient resources, thirteen photovoltaic solar power facilities and a planned investment of 250,000 smart meters by 2021. The city aims to ease residents' lives by providing 90 percent of day-to-day requirements through digital services¹⁴³.

Living

Living encompasses the sustainable health and quality of life of each person. Smart cities apply ICT technologies to improve the lives of its inhabitants to achieve greater citizen happiness and social cohesiveness. Applications of smart living include connected communities through smart buildings, health care innovation and the use of data to monitor and enhance social programs, all of which contribute to improved health, quality of life and sustainability.

Alongside its interest in sustainability, increasing attention is being directed by the GCC in the form of smart homes. Smart home and smart building solutions are becoming increasingly prevalent in the GCC and consist of sensory technologies that automate systems. Such technologies can automate televisions, lighting, air conditioning and even grocery lists in

order to ease the day-to-day processes for home owners, all while minimizing energy consumption and inefficient energy practices. Smart homes also have capabilities that allow residents to monitor the environment inside and outside their homes remotely, and provide sensors that activate alerts based on changes in temperature, leaks, movements and motions.

Telecom service providers including du and Etisalat are already making way for smart homes integrated offerings through connectivity, networking, managed services and automation as well as a mobile apps that connect to devices, equipment and kitchen appliances¹⁴⁴.

Delivery method

Smart city developments are large scale projects with a complex ecosystem and an impact on multiple economic sectors. To deploy a smart city, an ecosystem of technologies, service providers and operators must be in place to enable these programs. Operating as an integrated city plan of smart programs is critical in order to deliver smart city outcomes.

To ensure these components are provided effectively, GCC governments are proactively seeking partnerships with ICT experts across developers, suppliers and service providers to help deliver efficient infrastructure. For example, the Royal Commission of Jubail and Yanbu (KSA) have started a strategic partnership with technology providers to implement a smart city. They have signed a milestone agreement with Huawei to establish a training academy and a smart city innovation center in the Yanbu region to analyze and collect data which will allow developers, students, and academics to benefit through open data technology.

The development of integrated smart city projects in the region such as Dubai's Design District, Dubai Silicon Park, Qatar's Lusail City development project, and Yanbu City also encourage enhanced digital integration across sectors. Such developments also aim to develop intelligent green solutions, improve process and operational efficiency and leverage ICT capabilities to contribute to overall growth.

The Royal Commission of Jubail and Yanbu have signed a milestone agreement with Huawei to establish a training academy and a smart city innovation center in the Yanbu region to analyze and collect data which will allow developers, students, and academics to benefit through open data technology.

Investment

As outlined above, GCC countries are focusing on investments in upgraded network infrastructure, ambitious smart city projects and complementary digital initiatives. The UAE's telecom provider, Etisalat, plans to invest more than US\$820 million in 2017 to develop infrastructure and to expand its mobile and fiber-optic networks to improve coverage across the country as well as prepare the network for 5G¹⁴⁵. Another example includes the Dubai Silicon Park project, valued at US\$350 million which will be built in Dubai Silicon Oasis and aims to create intelligent solutions across the smart city¹⁴⁶.

In an attempt to move away from an oil-based economy, KSA is also investing in smart city projects that aim to create a knowledge-based economy. It is expected to invest US\$70 billion toward smart cities, with a vision to generate a US\$150 billion

contribution to GDP (20 percent of GDP) and create over one million jobs by 2020¹⁴⁷.

Furthermore, Qatar's Lusail City development project, which will build a fully integrated smart city from scratch has a total investment of US\$45 billion.

Status

Dubai and Abu Dhabi rank the highest out of Middle Eastern countries (66th and 64th respectively) in the world smart city rankings, according to the IESE Cities in Motion Index 2017 – an index that analyzes all aspects that make up the sustainability and quality of life in 180 key cities¹⁴⁸. The UAE is moving fast with initiatives such as smart school buses, in which it aims to cover all 383 public school buses in Dubai¹⁴⁹. Its smart home market is expected to grow at a 14.8 percent CAGR between 2016 and 2022¹⁵⁰.

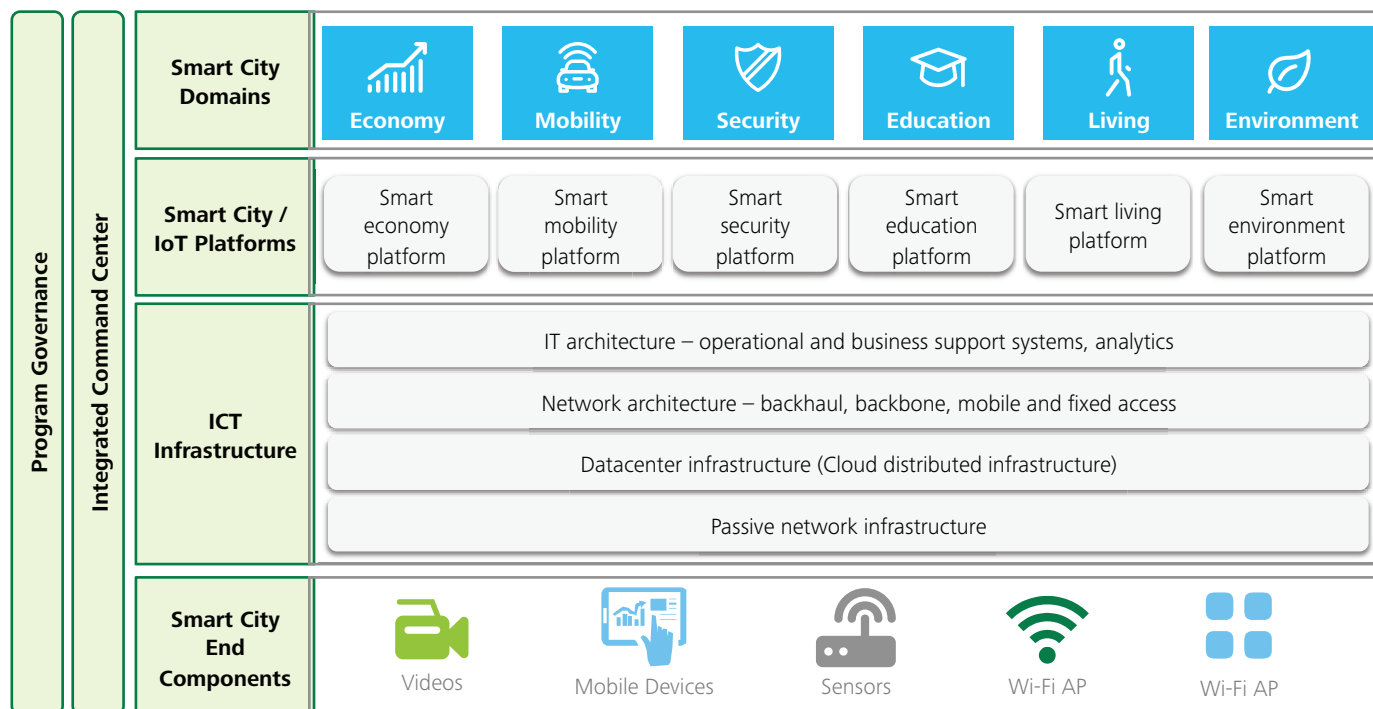
While Riyadh and Jeddah rank lower (123rd and 115th respectively), these cities are making improvements and prioritizing initiatives as a part of the Saudi NTP.

Doha currently ranks 117, but has ambitious plans to create a smart city (Msheireb Downtown) which will equate to the largest project in Qatar dedicated to future innovative developments. The smart city will aim to have one principle control center, 500,000 sensors, 33 services and 2 data centers.

Current challenges and needs

The first group of challenges are related to a smart city strategy. It is paramount to understand for each specific city what services can be smart according to its ambitions and constraints. There are various cases of cities with a few so-called smart services only to justify receiving the smart city title. Moreover, a smart city boils

Figure 33: Smart multi-layered ecosystem



down to collaboration between all parties that comprise a society, meaning an engaged citizen is required to transform a city into a smart city by engaging with Public Sector entities using smart services. Digital inclusion also comes into consideration in determining which part of society will benefit from smart services. A government strategy also needs to address this issue to cater to the larger population.

Creating a safe and reliable smart city is also replete with challenges related to technological matters such as information security, privacy, and seamless connectivity across all aspects of the smart city ecosystem. A major concern when implementing smart city initiatives is to develop an ICT master plan that will enable smart service deployment. When it comes to GCC ICT development levels, ITU's 2016 index (analyzing 175 countries) positioned the UAE and KSA at the 38th and 45th rank, meaning these countries are investing, but there is space to improve. Specifically, the KSA's scale in size compared to rest of the GCC adds a complexity to the challenge to speed up ICT development due to the sheer cost of expanding the country's optical backbone.

Outlook

Emerging technologies will play a relevant role in Digital Transformation, and hence on Smart cities. Take 5G network mobility as an example, forecasted to be ready by Q2 2018. 5G will be a flexible technology that smart cities will rely on for connectivity, dealing with very high data throughput, massive connections with very low throughput (IoT, for example), and ultra-reliable, low latency communication (critical public services).

Looking forward, smart city investment is positioned to grow in most of the GCC with an increased focus in KSA and UAE. Smart building and smart transportation programs are leading the way with CAGRs estimated at 10 percent and 9 percent respectively by 2020¹⁵¹.

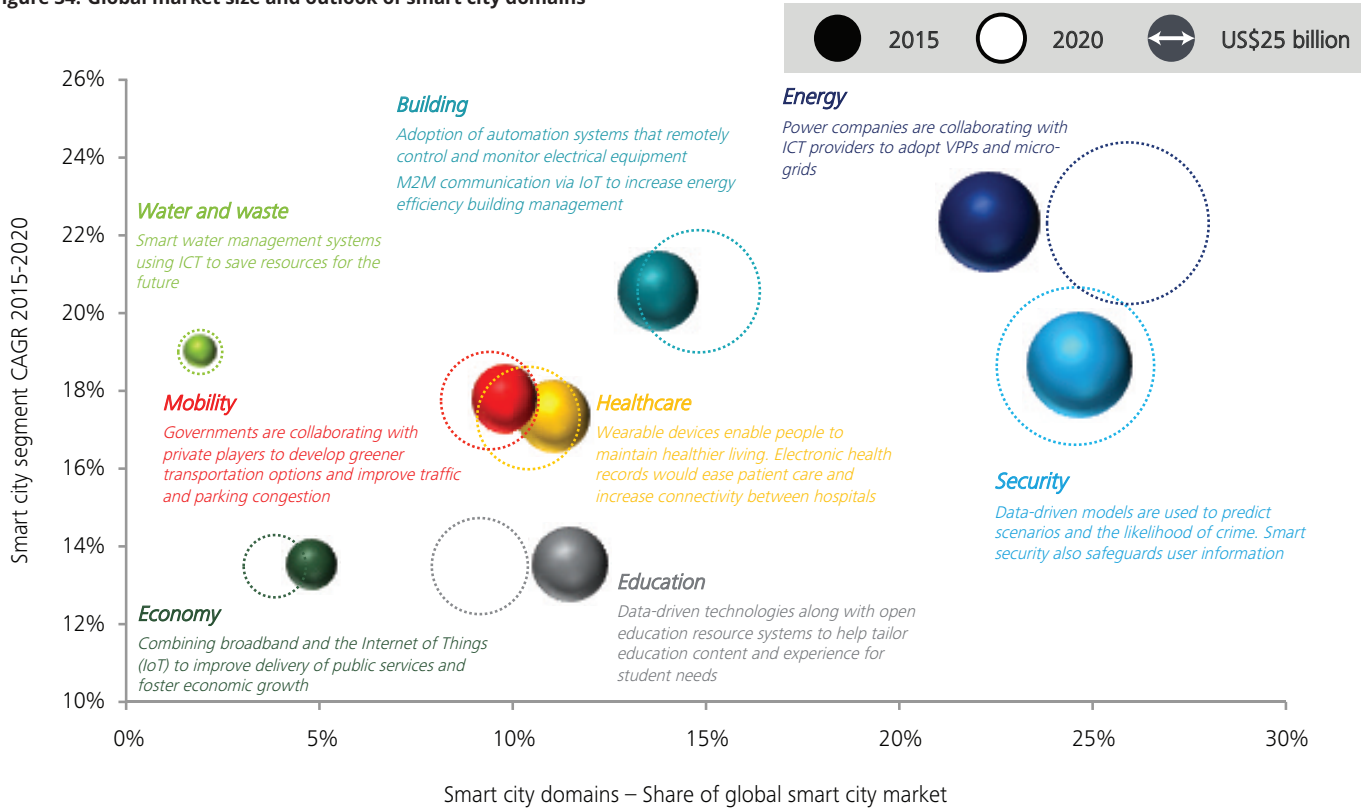
By 2018, there will already be a few smart city projects that will have launched in the GCC. One of the most audacious projects will take place in Jeddah, valued at US\$1.2 billion, and estimated to be completed by 2020.

Such initiatives generate a positive outlook for the overall sector and for ICT players in specific. Innovative technologies such as 5G, IoT, AI, blockchain and VR will serve as key enablers to many of these regional programs.

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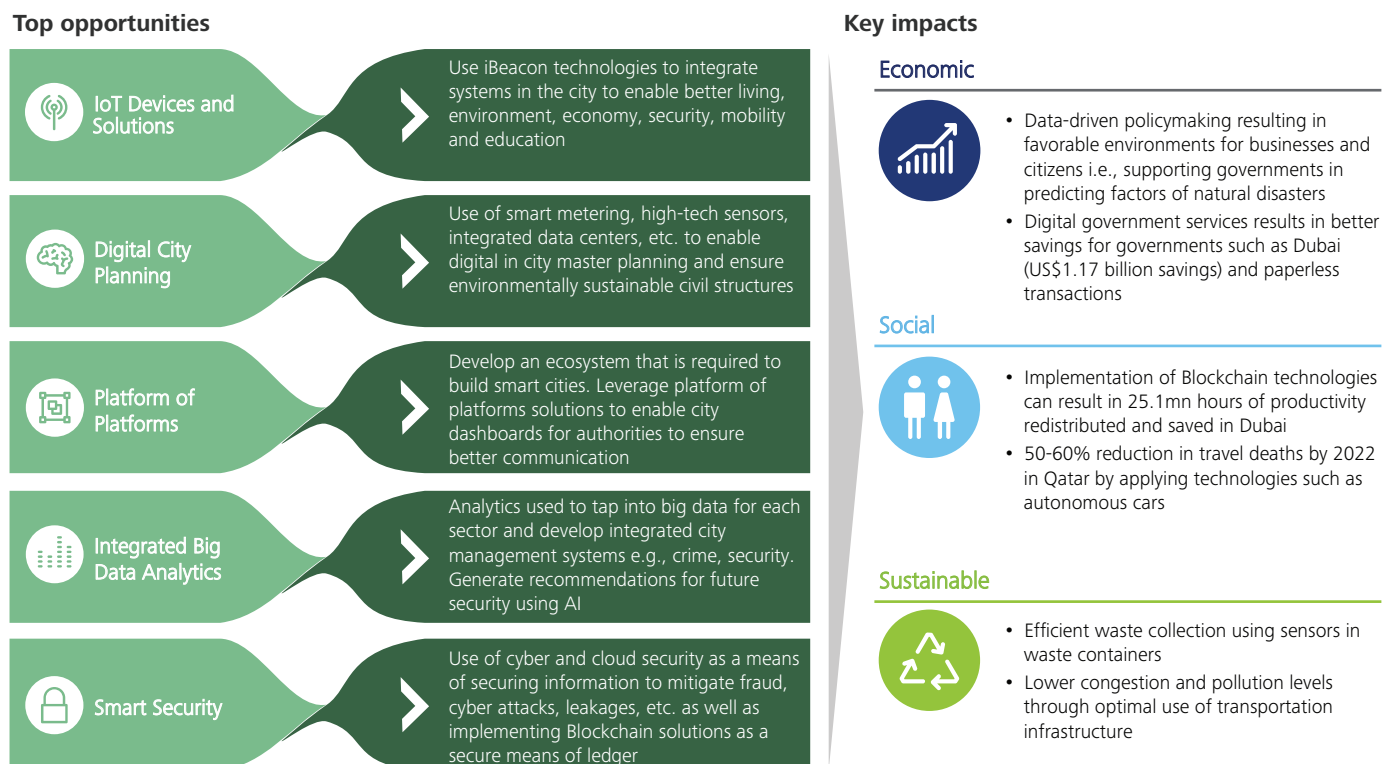
Figure 34: Global market size and outlook of smart city domains



Note: Size of the bubble represents the global market size in US\$ billion

Source: Deloitte research and analysis, based on data from Technavio, Automation.com, Techcrunch, Smart City Council, "Global Smart Cities Market 2016-2020" report, "Global Smart Water Network Market 2015-2019" report

Figure 35. Top opportunities in Smart Cities and key impacts



3. The GCC on the Digital Transformation journey

3. The GCC on the Digital Transformation journey

Assessing the digital state in GCC

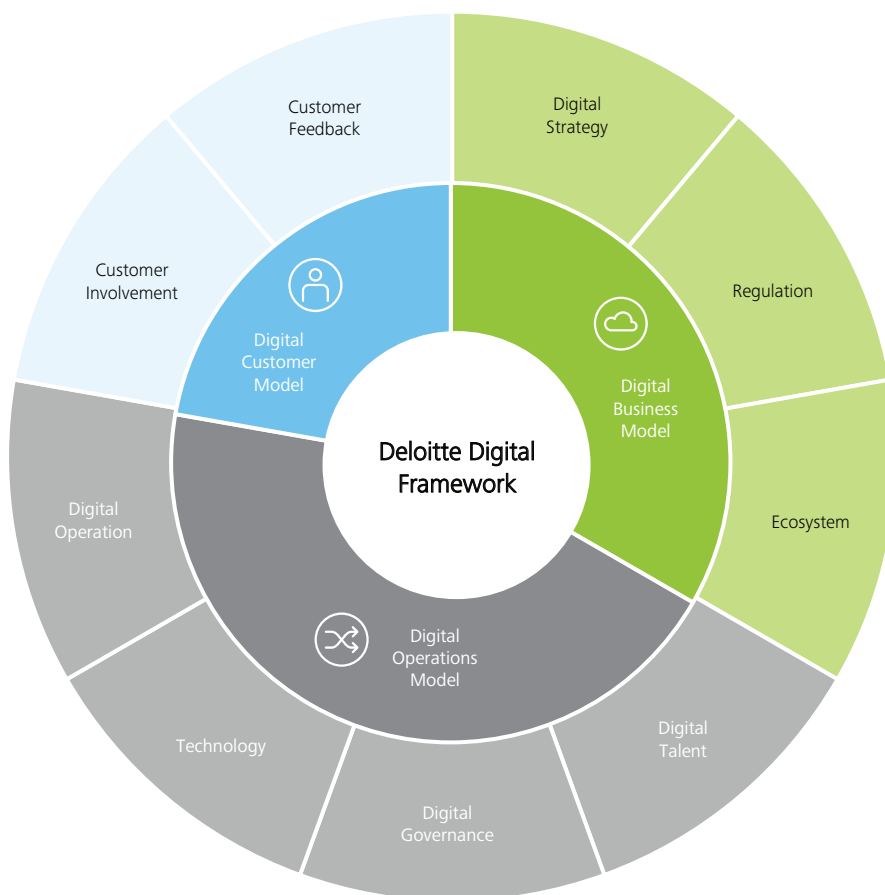
As presented in the previous section, digital ranks very high on Middle Eastern agendas as it is regarded as a key enabler in the successful implementation of transformation plans. This being said, as per the Digital Government Index presented earlier, countries in the region are not always at a similar stage of development with regard to government digitization levels.

Each country has taken a different path on its respective Digital Transformation journey. For this reason, complexity arises when attempting to compare the maturity level of digitization across countries on both a regional and international basis. Keeping this in mind, Deloitte's Digital Transformation Framework highlights the digitization status achieved by Public Sector entities across their transformation. Particularly, the framework assesses multiple layers of each entity's operating model, business model, and customer model while also mapping to the TM Forum Framework criteria (strategy, organization, culture, customer, technology).

Additionally, each level of transformation has a specific set of criteria as presented in Deloitte's Digital Transformation assessment framework (see appendix for detailed assessment criteria). This assessment ultimately presents a holistic overview on what steps need to be taken while showcasing the missing milestones to reach the next level.







Overall, this framework is used as a way to measure the progress achieved by each GCC country across the different themes. They are shown on the table of selected GCC countries for each key theme (Classroom of the Future, Next Generation Care, Smart Government, Smart Tourism, Smart Cities, Future of Mobility) and is complemented by key learnings from best practice countries.

Figure 36: Deloitte's Digital Transformation assessment framework and criteria



For each key theme, one country was selected based on the below rationale which will be subsequently assessed across Deloitte's Digital Transformation layers:

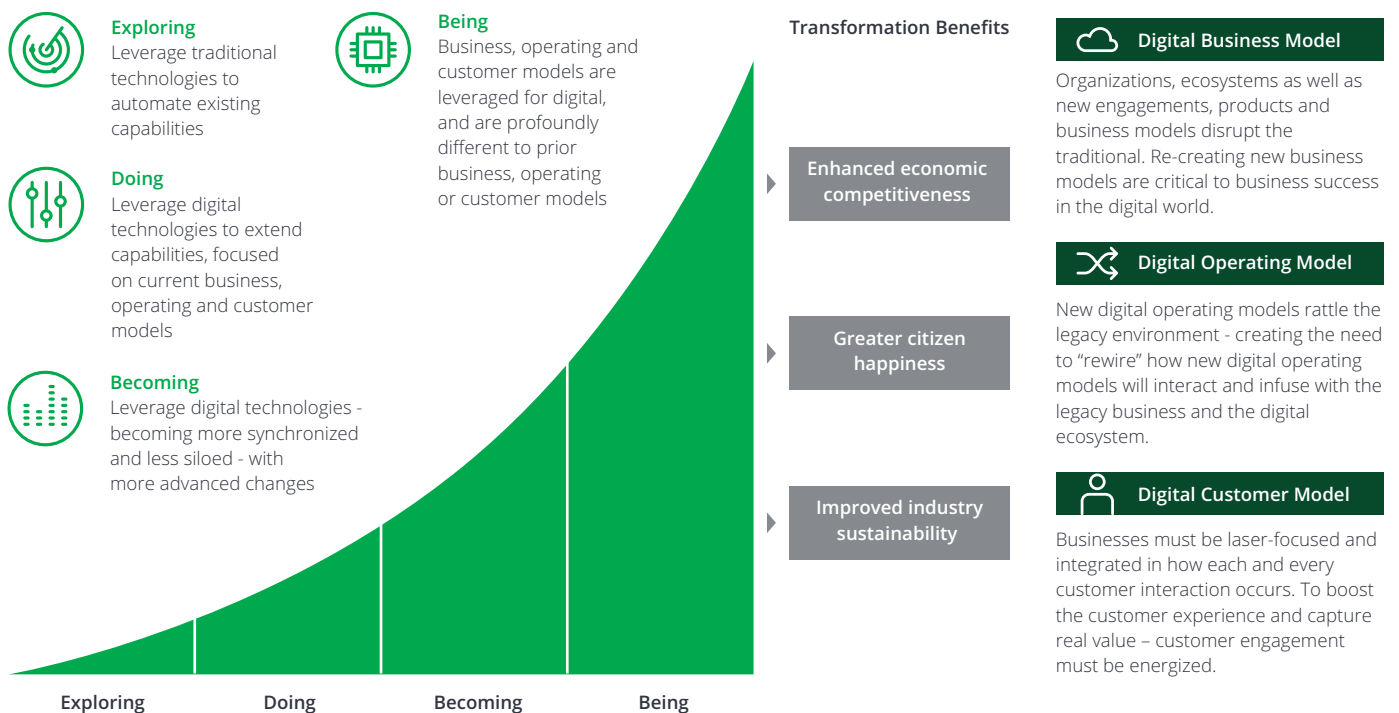
Figure 37: Selected GCC countries for each key theme

Key themes	Selected countries*	Rationale
Classroom of the Future		With more than 60 percent of the Saudi population under the age of 30, the Kingdom is putting an increasing focus on its education sector ¹⁵²
Next Generation Care		With the recent launch of TASMU, Qatar is going through transformational changes, especially in the healthcare sector
Smart Government		The UAE has the highest regional ranking in the National ICT Index and as such is introducing innovative services and solutions to become a Smart Government
Smart Tourism		With the NTP and an increased focus on religious tourism, the Kingdom has launched multiple digital initiatives such as e-bracelets and digital platforms for pilgrims
Smart Cities		Dubai has launched a Smart City program with the ambition to become the Smartest City
Future of Mobility		In addition to Dubai's smart city plan, the UAE is introducing innovative transport solutions such as Hyperloop, driverless cars and flying taxis

Note: not exhaustive

The below Digital Transformation framework is a four step journey which maps the digital stage of an entity across the following three models: business, operations and customers.

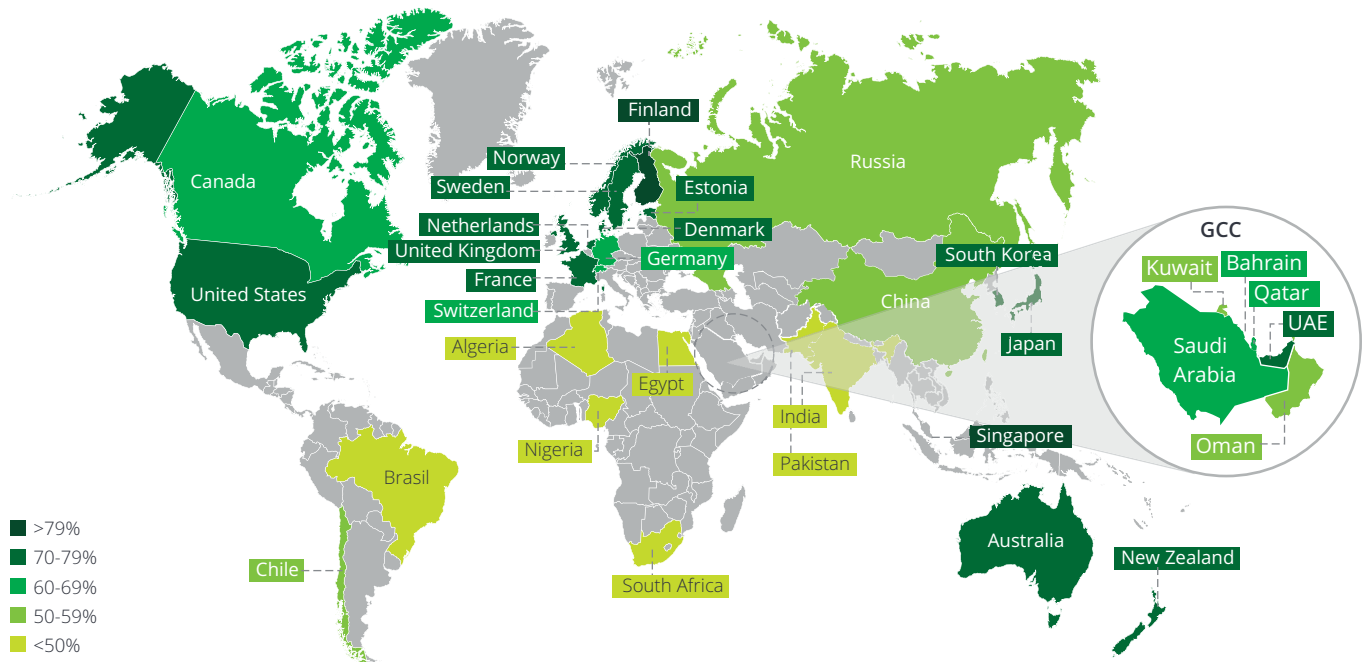
Figure 38: Deloitte's framework to assess the Digital Transformation journey



Digital evolution and maturity across the world

Several countries were selected and benchmarked to the six key themes by not only looking at their ranking in the National ICT Index, but by also assessing specific use cases undertaken by these countries with regard to digitization.

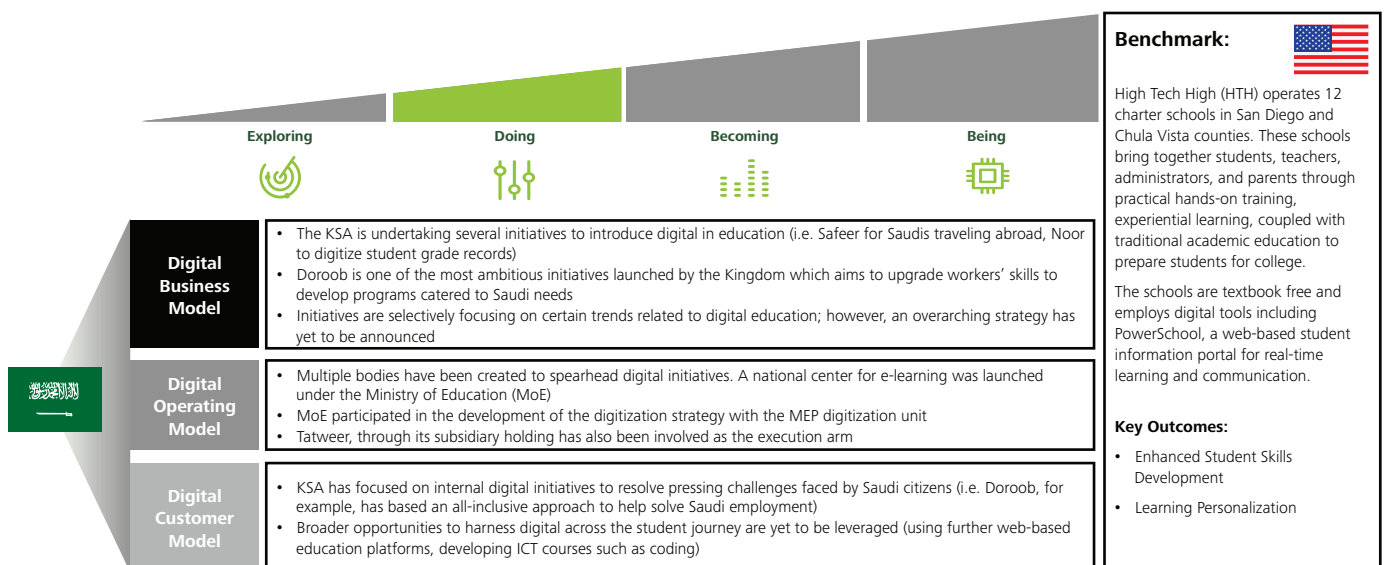
Figure 39: Map of countries assessed against National ICT Index



Source: Deloitte research and analysis, based on various published national indices and indicators from World Economic Forum

Classroom of the Future

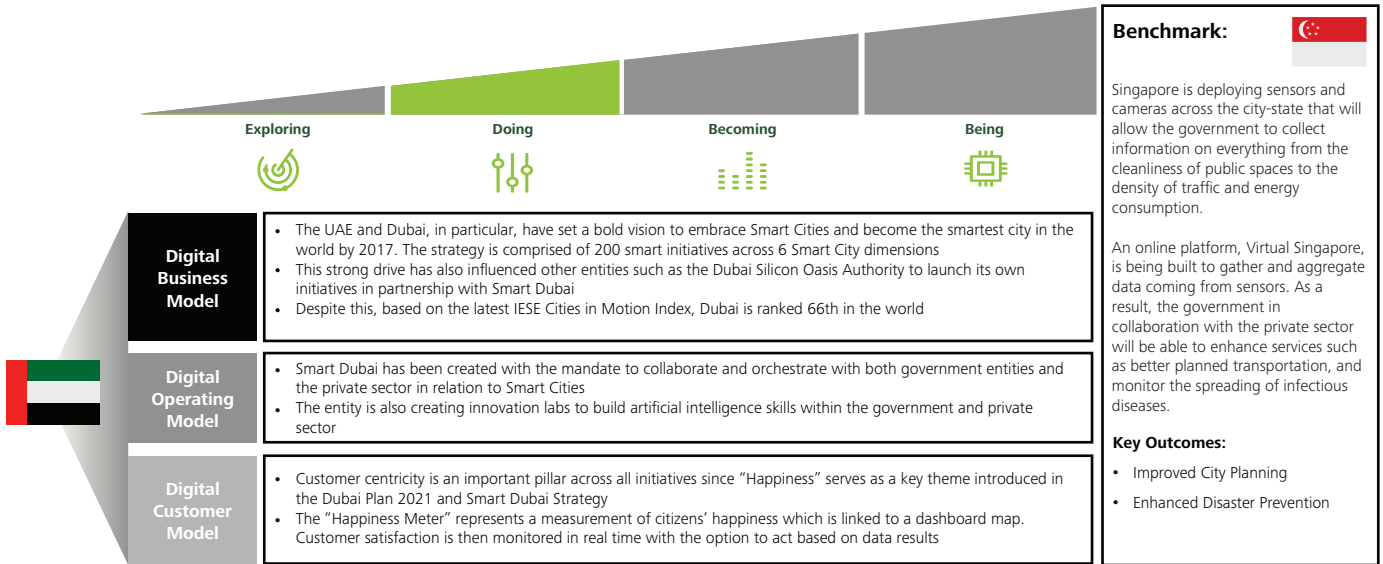
Figure 40: Digital Transformation journey assessment for Classroom of the Future



Source: Deloitte research and analysis, government websites and reports¹⁵³

Smart Cities

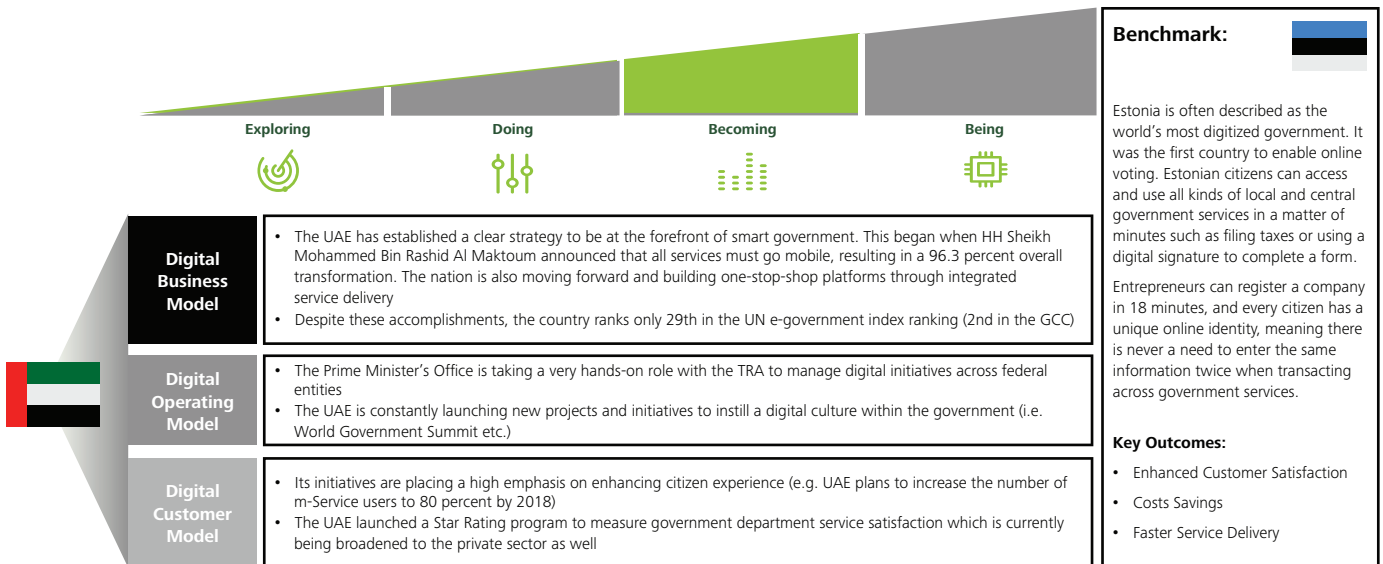
Figure 41: Digital Transformation journey assessment for Smart Cities



Source: Deloitte research and analysis, government websites and reports¹⁵⁴

Smart Government

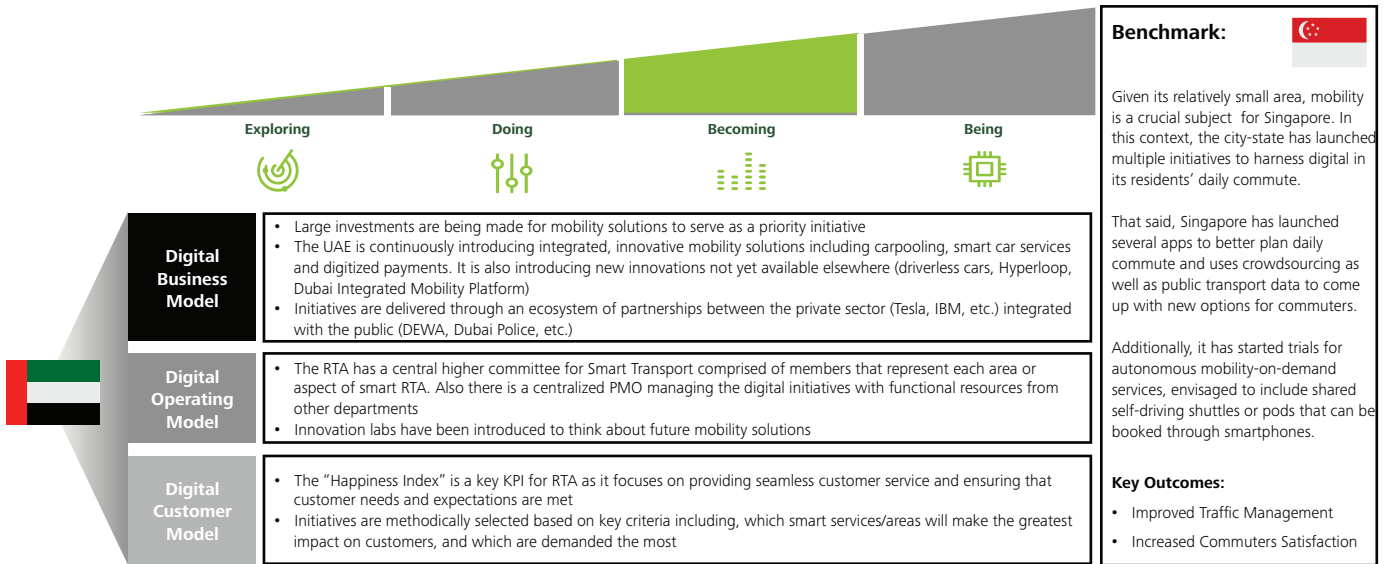
Figure 42: Digital Transformation journey assessment for Smart Government



Source: Deloitte research and analysis, government websites and reports¹⁵⁵

Future of Mobility

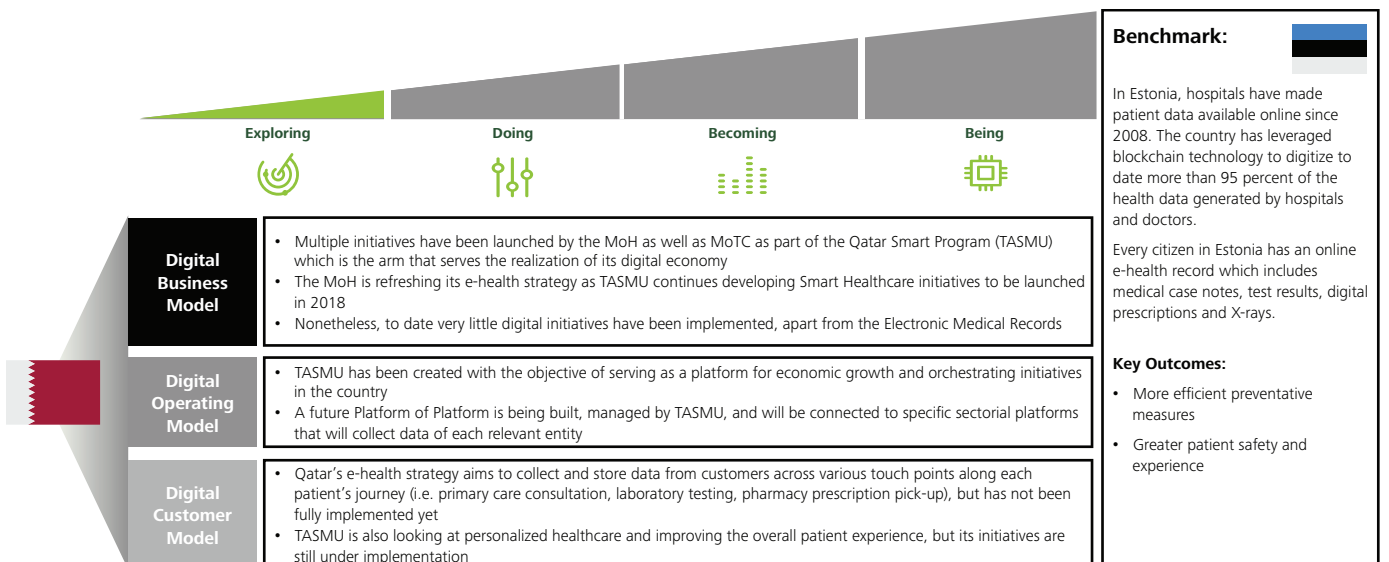
Figure 43: Digital Transformation journey assessment for Future of Mobility



Source: Deloitte research and analysis, government websites and reports¹⁵⁶

Next Generation Care

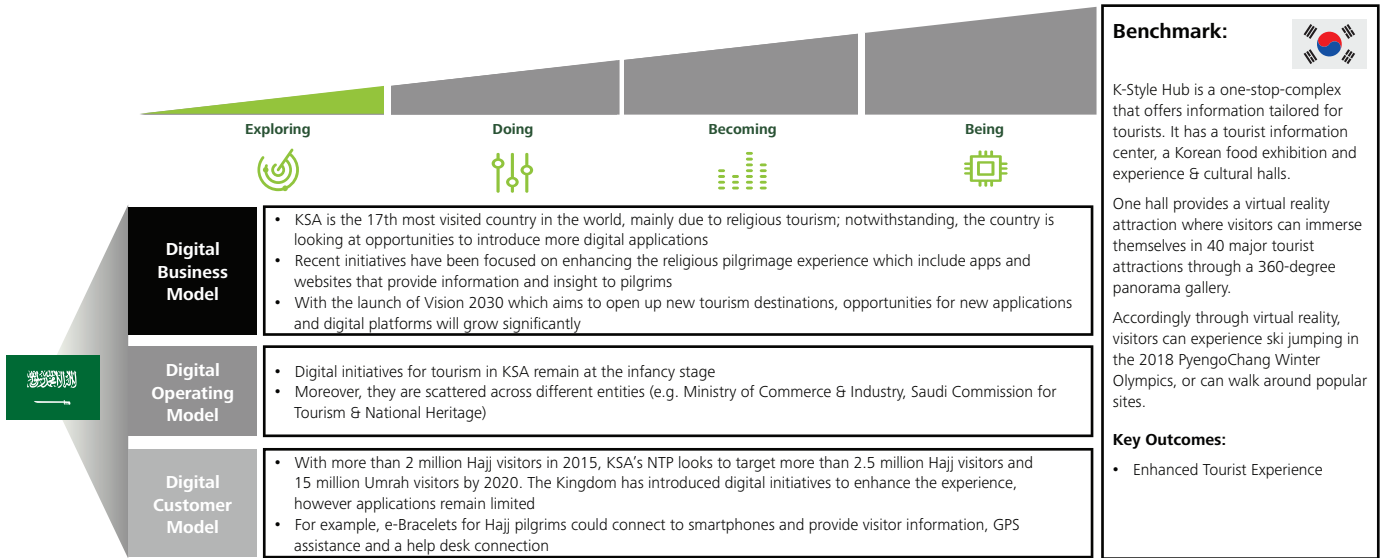
Figure 44: Digital Transformation journey assessment for Next Generation Care



Source: Deloitte research and analysis, government websites and reports¹⁵⁷

Smart Tourism

Figure 45: Digital Transformation journey assessment for Smart Tourism



Source: Deloitte research and analysis, government websites and reports¹⁵⁸







Best practice countries (i.e. Estonia, Singapore, and South Korea) have set high standards in terms of digitization, and provide insightful case studies for regional countries to help drive national digital agendas.

With regards to the regional context, multiple initiatives are being undertaken to ramp up digital capabilities. However, GCC countries often encounter hurdles

limiting their ascent in the National ICT Index. Some of these challenges are common across the region whereas others are only applicable to specific countries.

Only by addressing these challenges methodically can the region move forward with their digital plan and fulfil their ambition to become fully digitized nations.

Figure 46: Digital maturity assessment of selected countries across the six themes

	Selected countries	Exploring	Doing	Becoming	Being	Comments
Classroom of the Future			<input checked="" type="checkbox"/>			With more than 60 percent of the Saudi population under the age of 30, the Kingdom is putting great focus on its education sector
Smart Government				<input checked="" type="checkbox"/>		The UAE is introducing innovative services and solutions in becoming a smart government
Smart Cities			<input checked="" type="checkbox"/>			Dubai has launched an ambitious Smart City program with the aim to become the smartest city by 2017
Future of Mobility				<input checked="" type="checkbox"/>		In addition to Dubai's Smart City plan, the UAE overall is introducing innovative transport solutions
Next Generation Care			<input checked="" type="checkbox"/>			With the recent launch of TASMU, Qatar is going through transformational changes especially in the healthcare sector
Smart Tourism			<input checked="" type="checkbox"/>			With the NTP and an increased focus on religious tourism, multiple digital initiatives are being set up

While the Middle East Public Sector entities are likely to spend over US\$15 billion in Digital Transformation enabling technologies in 2018, the GCC overall lags behind many developed countries in Digital Government. Countries in the region are not all at a similar stage of development with regard to government digitization levels.

4. Implementing Digital Transformation

4. Implementing Digital Transformation

“Customer-centric design: a government decides on having many smart services in theory, but customers are rarely involved in the design stage”, UAE government entity.

Overview of challenges

GCC economies are undergoing a profound transformation in adapting to the needs of the fourth industrial revolution. As described in the previous sections, there are visions, strategies and initiatives in place to run the implementation of this transformation. Yet, any long-term transformation program comes with an even greater challenge in managing the actual initiatives to the desired outcome.

Indeed, these challenges vary on a country basis depending on both the local context and its overall position on the National ICT Index. Nevertheless, common patterns can be extracted and categorized across business, operations and customers in the digital framework. These common patterns relate to the entire operating model layers from strategy, channels,

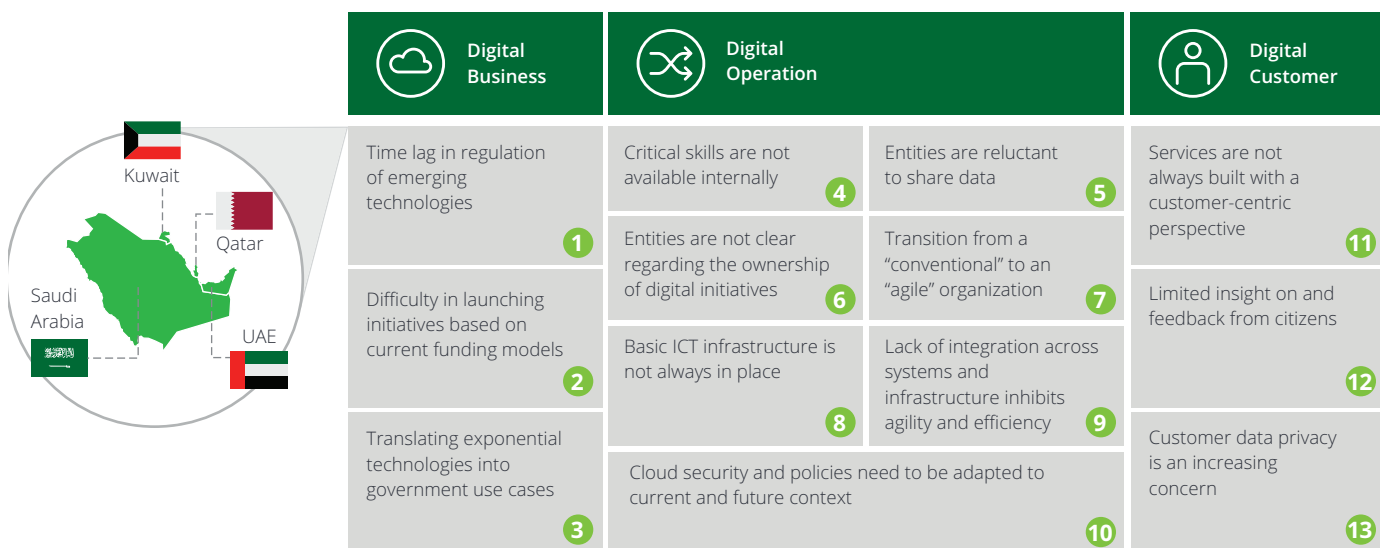
processes, people, technology to engaged customers.

Digital business

- **Regulation is too often “reactive” and not “proactive” enough:** with rapid, innovation-driven digital technologies, regulators across the world struggle to anticipate the magnitude of the shifts brought by disruptive technologies.

- **Difficulties to launch initiatives based on the funding / governance model:** due to the exponentially evolving nature of these technologies, elaborating a viable business case is often a challenge. Moreover, in certain countries, budget allocation between federal and local level entities remain an issue.

Figure 47: Digital Transformation challenges faced by Public Sector entities in GCC



“Innovation exists but more at an individual level as opposed to a group level”, KSA government entity.

- **The GCC is not leveraging the full potential of exponential technologies:** understanding the business viability and feasibility of several exponential technologies is still a challenge in some of the GCC countries, especially when it comes to big data, AI and blockchain.

Indeed, these challenges vary on a country basis depending on both the local context and its overall position on the National ICT Index. Nevertheless, common patterns can be extracted and categorized across the layers of the digital framework: business model, operations model and customers model. These map with the TM Framework Operation operating model layers, namely, strategy, digital, citizens, technology and people/organization/skills.

Digital operations People

- **Critical skills are not available internally:** sourcing talent has always been considered a top challenge by the Public Sector. This is even more relevant to finding digitally savvy skills (i.e. data science, coding, digital marketing) which are scarce resources in the region.
- **Entities are not clear about the ownership of digital initiatives:** given the scale of changes and integration required for the full implementation of government initiatives, project ownership is critical. Nevertheless, entities in charge

of executing the digital agenda are not always empowered with the right cross-entity mandate to ensure that initiatives are implemented.

- **Transition from a “conventional” to an “agile” organization:** bureaucratic inertia is a common challenge in government organizations. When they reach a stage where the “status quo” is not an option anymore, these entities face usually the greatest challenge to re-adapt their organization. Moreover, effective application of agile methodologies requires cross-collaboration across departments. Yet, too often, departments are launching initiatives without consulting other entities.

Operations

- **Entities are reluctant to share data between themselves:** data is a sensitive topic in the region for cultural reasons. Despite the push by governments to start making data accessible through, for example, open data portals, entities remain reluctant to open up and little progress has been witnessed on this front.
- **Cloud Security and policies needs to be adapted:** with the sharp rise of cyber attacks in the region, cyber security remains a key risk for regional chief information officers (CIO) that often hinder adoption and investment in digital platforms and cloud computing.

Technology

- **Basic connectivity infrastructure is not always in place:** due to the geographic spread and population distribution of some countries and difficult landscapes, basic ICT infrastructure is not always accessible across certain parts of the country which becomes a challenge to deliver digital services.

“Security is also a major concern, data sharing can pose a threat to security and privacy”, Qatar government entity.

- **Full automation, agility and flexibility cannot be unlocked without the integration of ICT systems:** the type, configuration and impact of technology is changing at a rapid pace in which two major challenges unfold. One, regarding the backward compatibility of new technologies with legacy. And second, which comes with a lack of overarching integration platforms needed to bring the underlying technologies to a bigger impact.

Digital customer

- **Services are not always built with a customer-centric perspective:** too often digital services are launched with little focus on end users resulting in low adoption and little impact. Moreover, as entities are shifting their focus to digitizing services, certain segments remain secluded from these changes as they have not adopted these technologies yet.

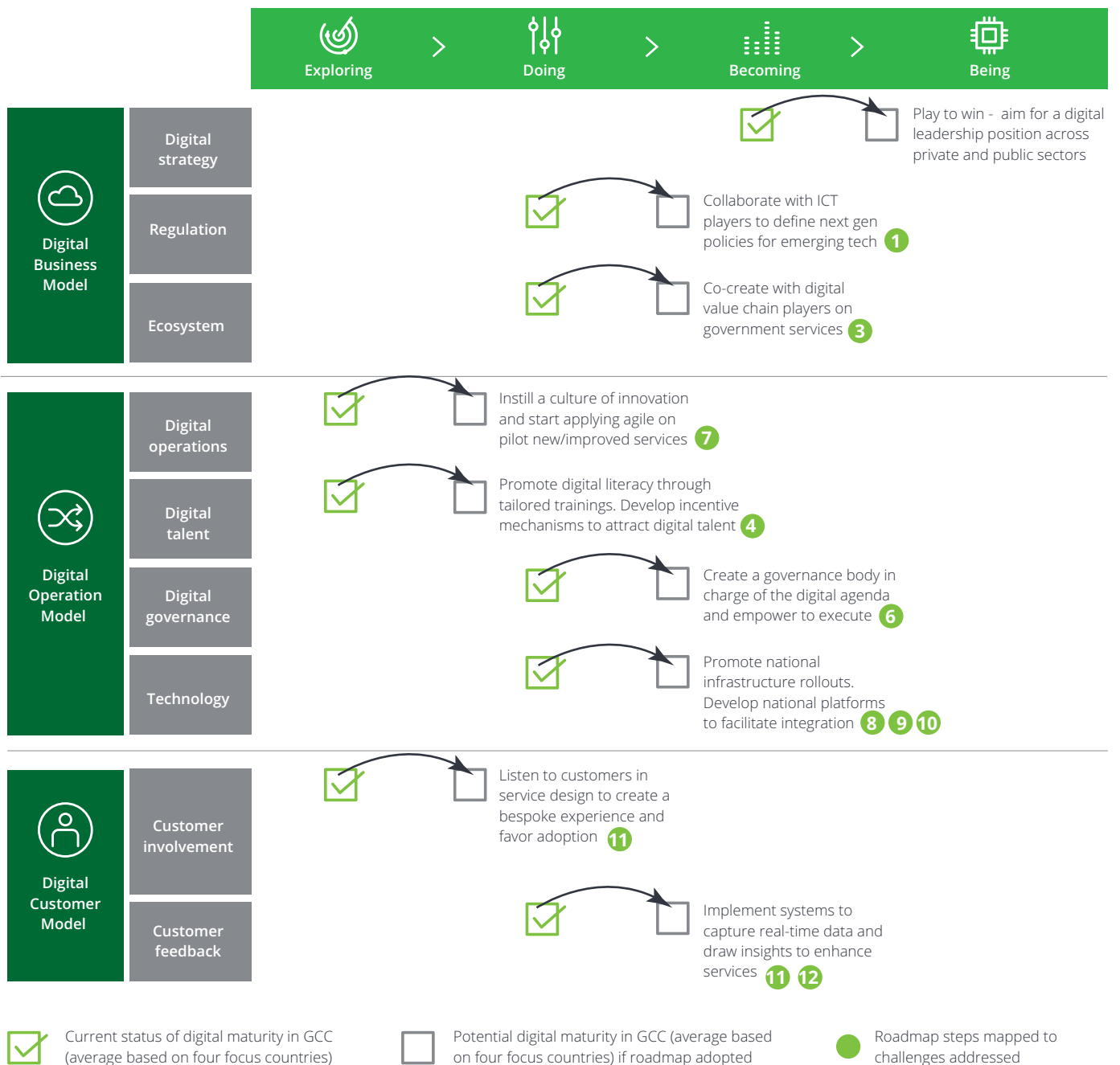
A phased approach through each step of the Digital Transformation journey

Transforming from legacy to digital, a country's journey requires time, patience and most importantly a clear vision and objectives complemented by rigorous execution.

Jumping steps bears the risk of missing critical components while also overlooking key dependencies. For these reasons, it is important to detail the necessary actions that need to be undertaken across each stage of the Digital Transformation framework and operating model layers.

This will give a clear roadmap with concrete steps and actions to become a good practice digital organization.

Figure 48: Roadmap to Digital Transformation



Digital Transformation governance

Digital Transformation implementation programs are a complex set of cross functional activities that require management office structures which blend in the mandates to strategize, plan, innovate and implement change. One such concept is a digital value office (DVO) that combines these functions into a purpose built agile organization.

The implementation of the digital value office, empowered to support and enable the full lifecycle of a transformation, addresses a wide variety of digital implementation challenges for governments.

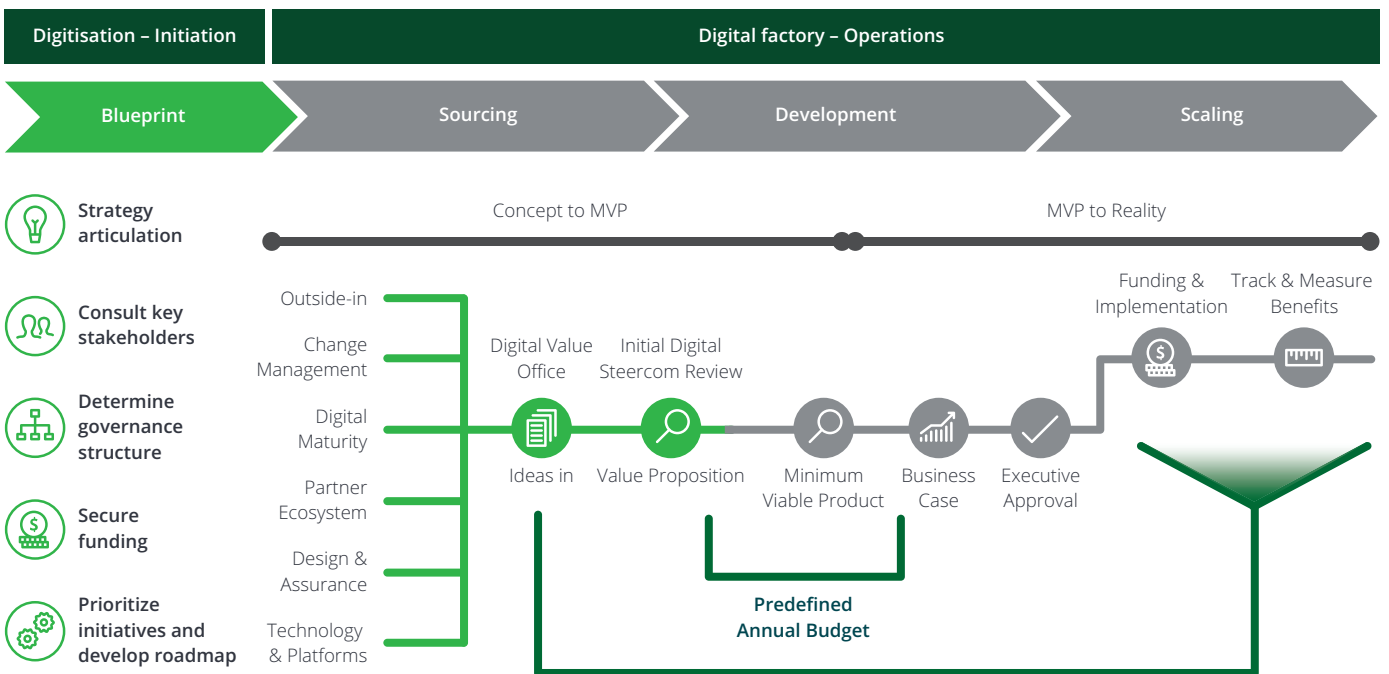
The transformation lifecycle begins with a clear blueprint of strategic initiatives, involved stakeholders, governance structures and funding plans for the implementation of digital initiatives. The

assessments undertaken and roadmaps developed during the sourcing stage will feed into the DVO's ideation process to produce minimum viable products (MVPs) at each stage of development.

This ensures that the customer's persona is brought into context. Consequently with a viable business case and executive approval coupled with a solid concept plan (including market research, customer persona), these products will be scaled and receive funding support.

Responsible for the overall implementation of Digital Transformation in Public Sector organizations, the DVO will deliver success across the lifecycle in two key approaches: 1) govern all stages and enable the digitalization of functions, 2) apply rapid innovation to ensure the feasibility, viability and desirability of digital outcomes.

Figure 49: Role of DVO in the Digital Transformation lifecycle



Application of DVO to successfully implement Digital Transformation in the Public Sector

























The DVO is set up to incubate all the enablers required for a successful Digital Transformation. Enablers can include identifying strategic direction, understanding citizen needs and trends, instilling an innovation culture in organizations, regulating policies, developing agile solutions, monitoring digital maturity and securing suitable technological and ICT infrastructure and partnerships. Through these enablers, the DVO acts as the custodian of entities' maturity to digital and the prime authority responsible for delivering the digital outcomes.

Operating across its six dimensions, the DVO first becomes the agency to bring an outside-in view to the federal entity. A good example is assessing the level of customer satisfaction with potentially fully automating e-service centers.

The DVO acts as a change champion to overcome the issue of status-quo mind sets that create inertia to the pace of change. New regulation and policies around data sharing, managing and hosting is a good case in point.

Technically, the DVO drives innovation through its ideation of new digital use cases and agile development to continuously enhance solutions (i.e. the use of robotics in government services, automation in smart buildings). To complement this evolution of ideas, the DVO ensures data management, security,

Figure 50: DVO enablers for Digital Transformation

DVO Dimensions	Enablers			Description
 Outside-In View	 Research	 Trends	 Citizen Needs	Monitoring exponential technology trends across sectors with a focus on customer needs
 Change Management	 Culture of Innovation	 Buy In + Awareness	 Efficient Organization	Driving change and encouraging the adoption of digital in organizations to make an impact
 Measure & Track Digital Maturity	 Digital Maturity	 Transparency	 Risk Management	Measuring and tracking digital maturity and managing risks of adoption and transparency
 Design Thinking and Delivery Assurance	 Agile Approach	 Best Suited Delivery	 Evolve Roadmap	Ideation of new digital use cases with an agile approach against the digital roadmap
 Integrating and Establishing the Partner Ecosystem	 ICT Vendors	 Start-Ups	 Platforms	Deliver solutions with partners across the full value chain with funding and expert support
 Digital Technology Architecture	 Information Management Architecture	 Digital Design Authority	 Infrastructure & Security	Enabling better ICT infrastructure, security and managed services

networks and infrastructure are updated and aligned to the technologies they were designed for (e.g. cloud computing, blockchain).

For the effective implementation of digital initiatives with minimized costs and expedited delivery, the DVO forms partnerships across all relevant entities. For example, governance authorities such as the DVO will increasingly play an important part of bridging the gap between local and federal entities in the UAE by enabling policies and decisions that encourage local entities' joint digital collaboration with federal entities.

Cutting across all these critical implementation functions, the DVO delivers a consistent mechanism to ideate, conceptualize, run and manage the transformation implementation program.

Innovation as a key success factor to enable fast-paced Digital Transformation

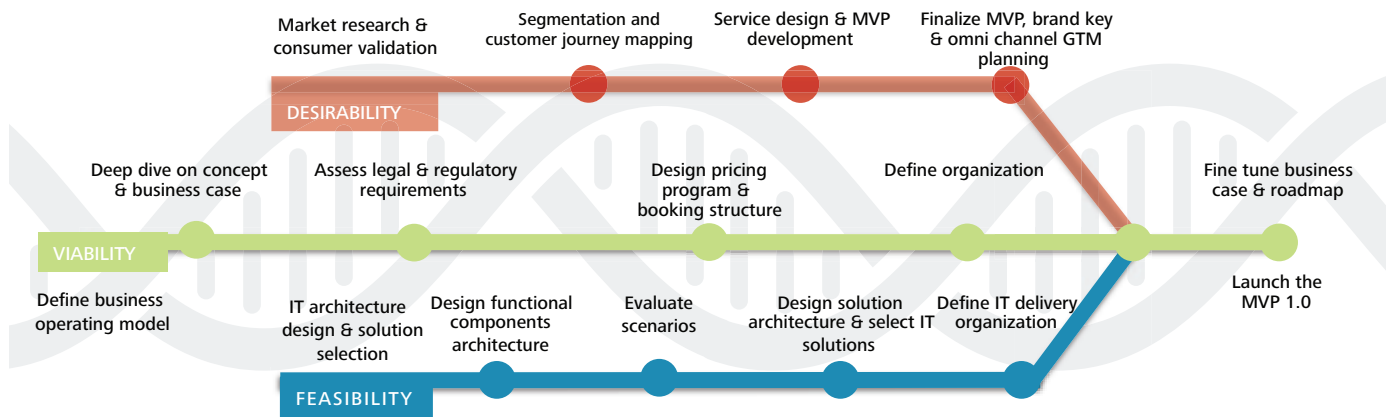
Innovation management sits at the core of a successful Digital Transformation plan, and inherently, Public Sector entities in the region and across the globe are challenged to be the best at incubating innovation. Transformation will ensure the optimization of organizations, however without innovation, governments will struggle to rapidly create ideas that simultaneously adhere to changing customer behaviors, adopting emerging and exponential technologies and achieving strategic business plans.

DVO drives an agile approach into the innovation stages of the implementation program. This is achieved by introducing minimum viable products delivery throughout the lifecycle. This iterative way

of working in sprints begins with innovatively imagining an idea, delivering the desired product and continuously improving to match customer needs and desired outcomes

Through this approach, DVO delivers innovative solutions across that are feasible – designed with sound IT infrastructure, viable – aligned with the business operating model, desirable – adhered to shifting customer needs and requirements.

Figure 51: Pathway according to the DVO agile approach to launch a MVP



Outcomes and impact

Successful Digital Transformation, when implemented in the Public Sector delivers a high impact both on economy and society. Implementation of digital technologies enable governments to deliver sustainable solutions to lower operational costs and contribute to savings. Dubai, through its transition to e-government services has made a savings impact of US\$1.17 billion¹⁵⁹. Similarly, Chicago's smart solutions to vehicle traffic are aimed to deliver US\$14 billion to GDP under energy efficiency, traffic congestion and fuel costs¹⁶⁰.

Implementing digital solutions further drives the knowledge economy agendas again contributing to the skills and learning impacts.

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5. Public Service in its broader ecosystem

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The digital transition of the Public Sector value chain

The journey to maturity in digital services is charted by re-defining ambitions with matched scales, engaging in new levels of experience, evolving to achieve more efficient operations and finding ways to engage with new ecosystems. The ICT sector plays a key role in innovation and integration to lay the foundation across this journey from ambition to engagement.

• Ambition and scale:

governments in the GCC are focused on defining new horizons of play. It is critical for these governments to strike the right balance between ambition and scale in terms of where they stand on the digital maturity scale and ICT adoption

• Experience and engagement:

governments will re-think customer and citizen engagements; customer-centricity will be able to be put to use through design thinking, technology and digital best practices

• Operational evolution:

governments will continue to undertake large scale operational transformations. This will be driven by changes to organizational DNA, employee engagement and automation. ICT players will lead in innovation across digital technologies to enable this evolution

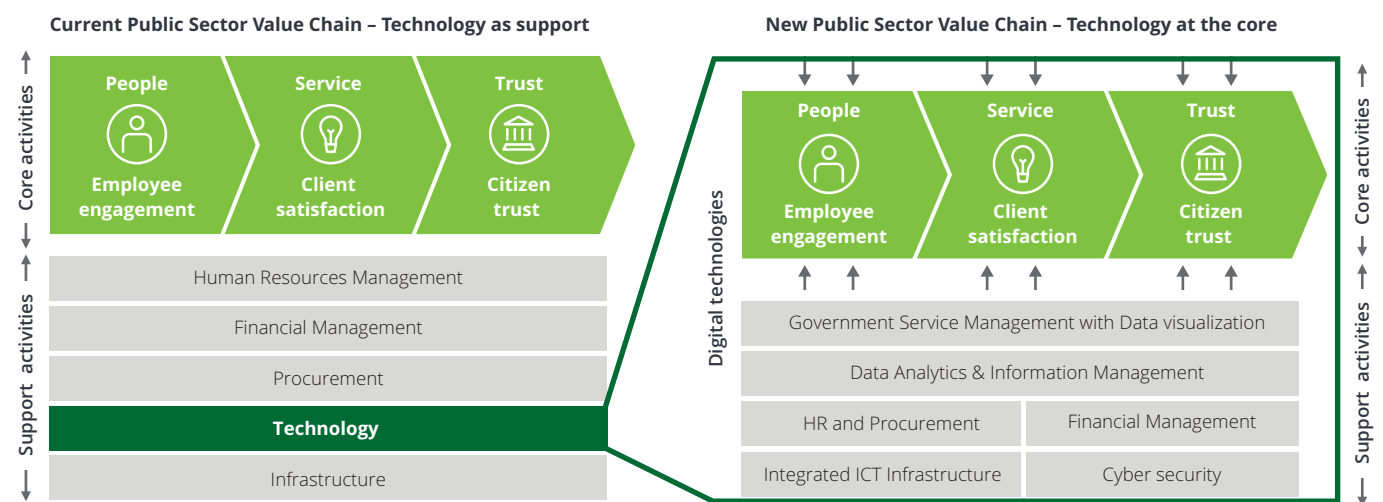
• Engagement platforms:

last but not least, the ecosystem dynamics of the Public Sector will change profoundly. Suppliers, customers, providers and governing bodies will

interact in ways that are seamless and digital. Integrated national platforms that encompass emerging technologies, digital ecosystem players and the whole of government will enable this new future.

The role of ICT in the Public Sector service delivery value chain will dramatically change in the digital age. This role is being rapidly redefined from that of a passive, supporting enabler to that of a matrix, that feeds the entire value chain while actively driving how governments operate and serve their citizens. New technologies will be closely embedded in the fulfillment of core government activities. This applies to the entire value chain from policy formulation to service delivery.

Figure 52: Legacy and future Public Sector value chain



Embedding emerging technologies and customer-centricity in an agile, prototype-based approach will give regional governments the opportunity to resolve certain challenges faced when delivering core services. Such activities will increase the GCC's position as a leader in Public Sector innovation across the world.

Redefining the ecosystem: from technology enablers to platforms

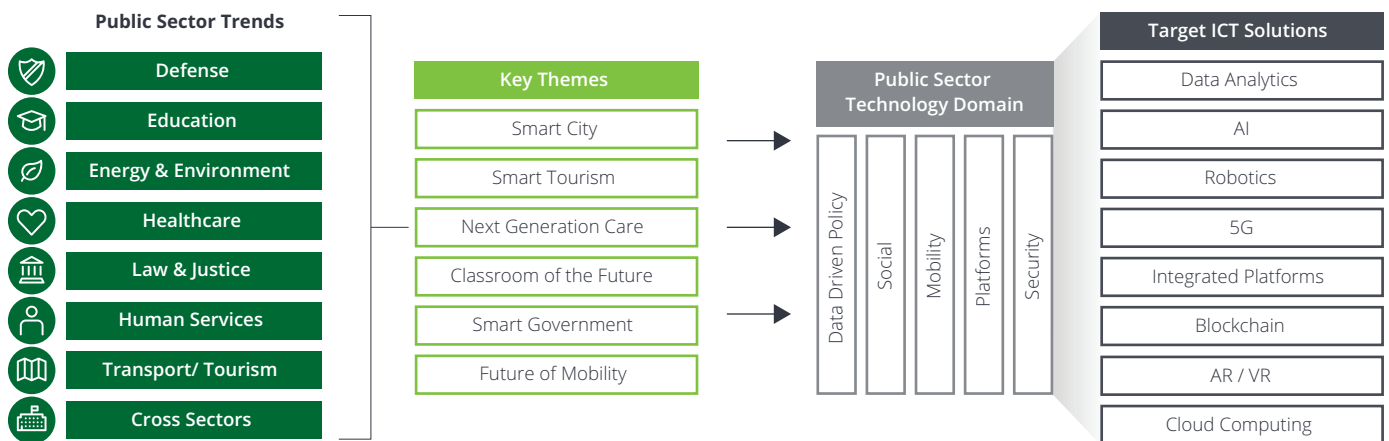
The emerging technologies layer in the new Public Sector value chain is complex and rapidly evolving. Public Sector technology domains have emerged as a common set of verticals that are high impact with regard to ICT investment areas. These include social, mobility, data driven policy, platforms and security. In turn, each of these domains consist of a number of ICT solutions ranging from analytics to cloud. More often than not, such ICT solutions are also tailored to key themes, or sectors, as discussed earlier in this paper. For instance, plans to develop smart cities include the implementation of next generation infrastructure such as IoT,

5G and cloud services combined with applications based on AI and analytics.

As expressed earlier in this paper, governments and regulators face a daunting task of coping with the fast moving pace of emerging technologies, especially when it comes to identifying their relevance in policy making or service delivery. Data analytics will likely shape policy and decision making through predictions of health diseases, consumer behaviors and trends, and scenarios for the likelihood of crimes. The use of cloud computing and blockchain solutions will emerge in response to the demand for data sharing between the government and public. Cyber security and smart security services, in some cases are already being implemented to complement data sharing platforms and safeguard user information, while cloud computing and blockchain also have the potential to be used for integrating medical records, tourism bundles, e-learning content and the majority of e-government services for citizens.

Embedding emerging technologies and customer-centricity in an agile, prototype-based approach will give regional governments the opportunity to resolve certain challenges faced when delivering core services.

Figure 53: ICT mapping to Public Sector domains



Other examples include: AR and VR, which can be leveraged in education systems to drive immersive learning and a more inclusive environment in digitalized classrooms. AI can be applied in classrooms to develop better curricula as well as in the development of autonomous cars. Robotics, an emerging technology that exists in the form of Robotics Process Automation reduces the rate of human errors and automates smart buildings through remote-controlled electrical equipment that reduces energy consumption.

How can governments overcome the complexity of fast evolving technologies as the digital ecosystem is becoming increasingly complex (pure play digital players, start-ups etc.)? How can they best address daunting stakeholder management tasks with multiple government agencies and scattered data?

One element of response is the concept of Platform of Platforms (figure 54). By easing the integration between government stakeholders, digital private sector providers and technology players, the Platform of Platforms concept addresses a number of the key concerns outlined earlier. Furthermore, it decreases risk in Public Sector investment by moving to a platform concept, it accelerates the adoption of data sharing between entities (through a data lake or service bus), it promotes closer collaboration between partners in the ecosystem, and lastly, it reduces the hurdles of technology adoption by government players.

In a platform oriented world, supported by a new digital ecosystem, the flow of value and relationships between governments, citizens and private entities will be redefined around the “government cloud” as described in figure 55.

In a platform orientated world, supported by a new digital ecosystem, the flow of value and relationships between governments, citizens and private entities will be redefined around the “government cloud”.

Figure 54: Platform of Platforms

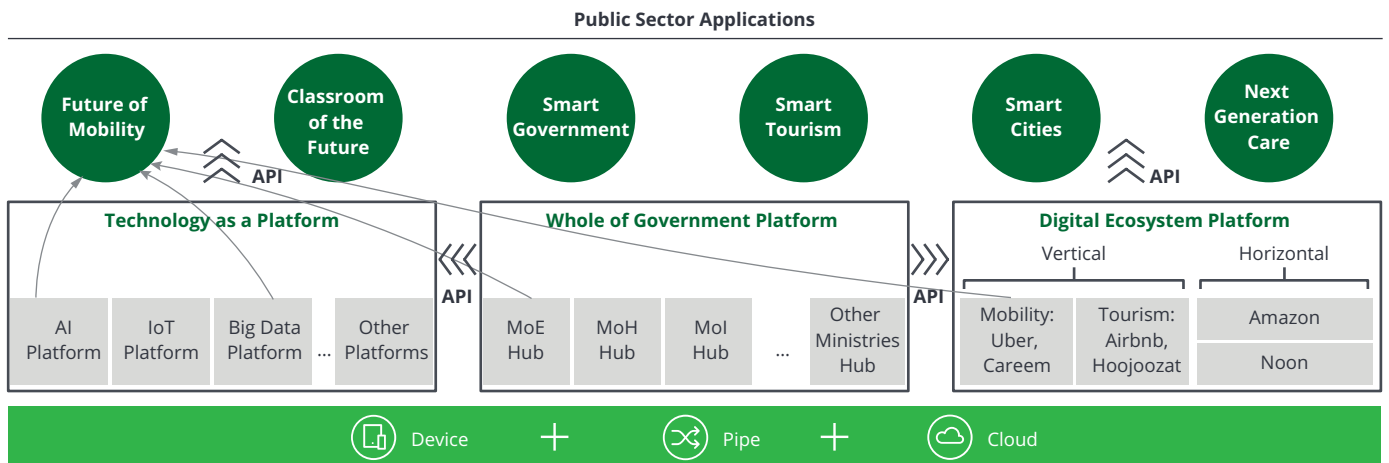
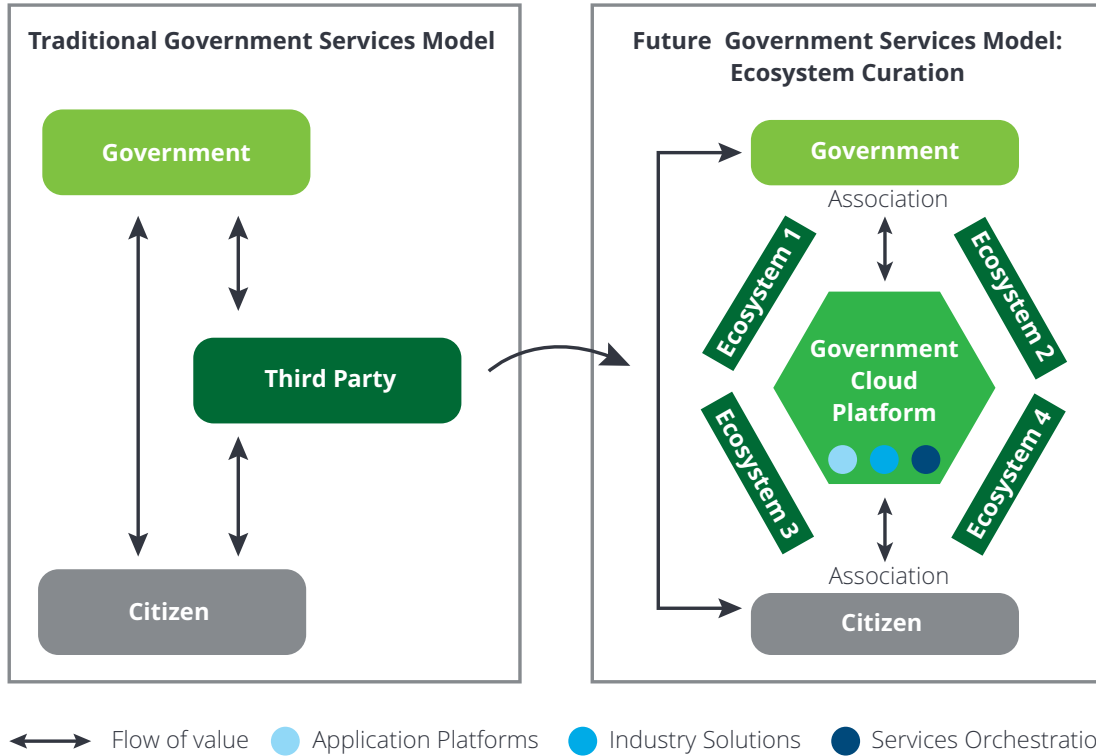


Figure 55: Flow of value in an ecosystem-based government services model¹⁶¹



The digital opportunity: from concept to reality

The opportunities presented by digital technologies are substantial and have the potential to reshape Middle Eastern economies. Governments have an extraordinary role to play in building the industry organically. They have the power to not only expand partnerships with major technology players, but also to roll out tailored incentives to encourage an ecosystem of startups, accelerators, VCs, and other relevant players.

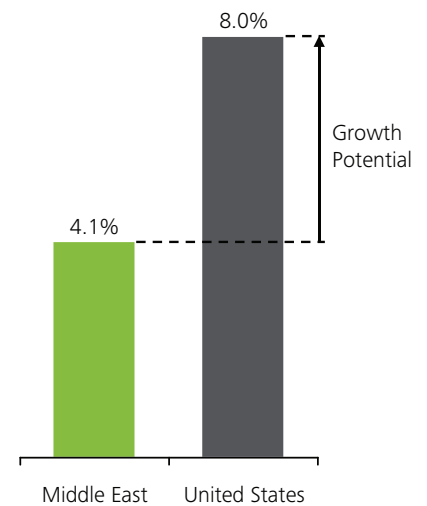
By catalyzing these changes, the potential contribution of digital to GDP could double in the years to come if it were to reach that of more advanced countries. For the GCC only, this could represent a US\$50 billion increment, to be compared with the US\$15 billion of yearly investment in Digital Transformation enabling

technologies in these countries currently. This, in turn, fulfills the objectives of increased economic diversification objectives set out in national strategies.

Going forward, national digital strategies must be underpinned by four key principles:

- **Riding the disruption wave:** Public Sector entities should adopt disruption not only as a mode of operation, but as a way of formulating policies. Governments should not consider these changes as threats to their business model, but as an opportunity to redefine themselves and their economies. An example would include breaking up economic bottlenecks in certain industries which could ultimately help attract new players and foster innovation.

Figure 56: Digital contribution to GDP*



Note: *As measured by digital share in private consumption, private investment, government expenditure, imports & exports

Source: Deloitte research and analysis, based also on data from multiple sources: Euromonitor, IDC, UN, World Bank, others ^{162, 163, 164}

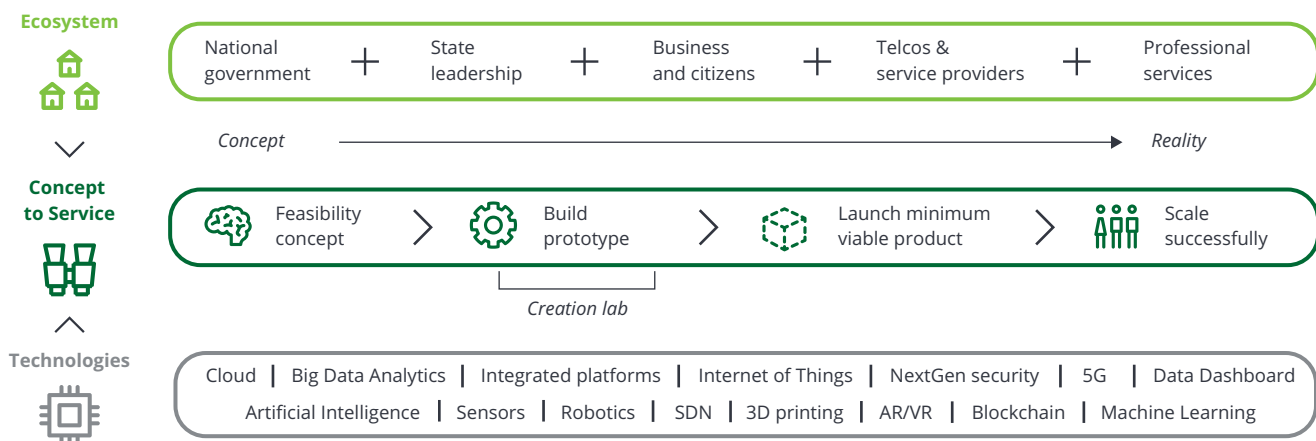
- **Creating new horizons:** Making sense of new technologies is not always easy. Exponential technologies open up new avenues and applications that have the potential to dramatically change the way services are being delivered. As opposed to other parts of the world, governments in the GCC play the role of a catalyst with regards to technology adoption. Rather, staying at the forefront of technology adoption would incentivize regional private sector companies to embrace the wave and increase their share of digital technology spending.
- **Delivering an experience:** Bringing customers into the heart of innovation will change the entire service delivery

concept from that of traditional service delivery, to that of experience delivery. By doing this, governments will not only be able to enhance citizen satisfaction, but also have other indirect effects such as an increased adoption of services and population digital literacy rate.

- **Fail fast, adjust quickly:** Incorporating strategies for agile methods of “concept to service” development (as detailed in figure 57) when designing a new service translates into enhanced delivery speed, and greater service performance that is more adapted to customer expectations, translating ultimately into greater satisfaction and adoption.

Going forward, national digital strategies must be underpinned by four key principles: riding the disruption wave, creating new horizons, delivering an experience and fail fast, but adjust quickly.

Figure 57: Delivering Digital Transformation from concept to reality¹⁶⁵



By catalyzing these changes, the potential contribution of digital to GDP could double in the years to come if the region were to reach that of more advanced countries. For the GCC only, this could represent a US\$50 billion increment, compared to the US\$15 billion currently spent on Digital Transformation enabling technologies.

6. Implications for Government and Industry

Digital maturity area	Key Issue	Implication
Digital Business Model	Time lag in regulation of emerging technologies	Collaborate with ICT players to define next gen policies for emerging tech
	Difficulty in launching initiatives based on current funding models	Co-create with digital value chain players on government services
	Translating exponential technologies into government use cases	
Digital Operating Model	Critical skills are not available internally	Promote digital literacy through tailored trainings. Develop incentive mechanisms to attract digital talent
	Entities are not clear regarding the ownership of digital initiatives	Create a governance body in charge of the digital agenda and empowered to execute
	Basic infrastructure is not always in place	Promote national infrastructure rollouts
	Entities are reluctant to share data	Create a governance body in charge of the digital agenda and empowered to execute and develop national platforms to facilitate integration
	Transition from a “conventional” to an “agile” organization	Instill a culture of innovation and start applying agile on pilot new/improved services
	Lack of integration across systems and infrastructure inhibits agility and efficiency	Develop national platforms to facilitate integration
	Cloud security and policies need to be adapted to current and future context	Develop national platforms to facilitate integration and develop overarching cloud policies on these platforms
Digital Customer Model	Services are not always built with a customer-centric perspective	Listen to customers in service design to create a bespoke experience and favor adoption
	Limited insight on and feedback from citizens	Implement systems to capture real-time data and draw insights to enhance services
	Customer data privacy is an increasing concern	Enforce data privacy legislations and include anonymization rules in big data policies

Appendix

Appendix 1: Deloitte National ICT Index methodology

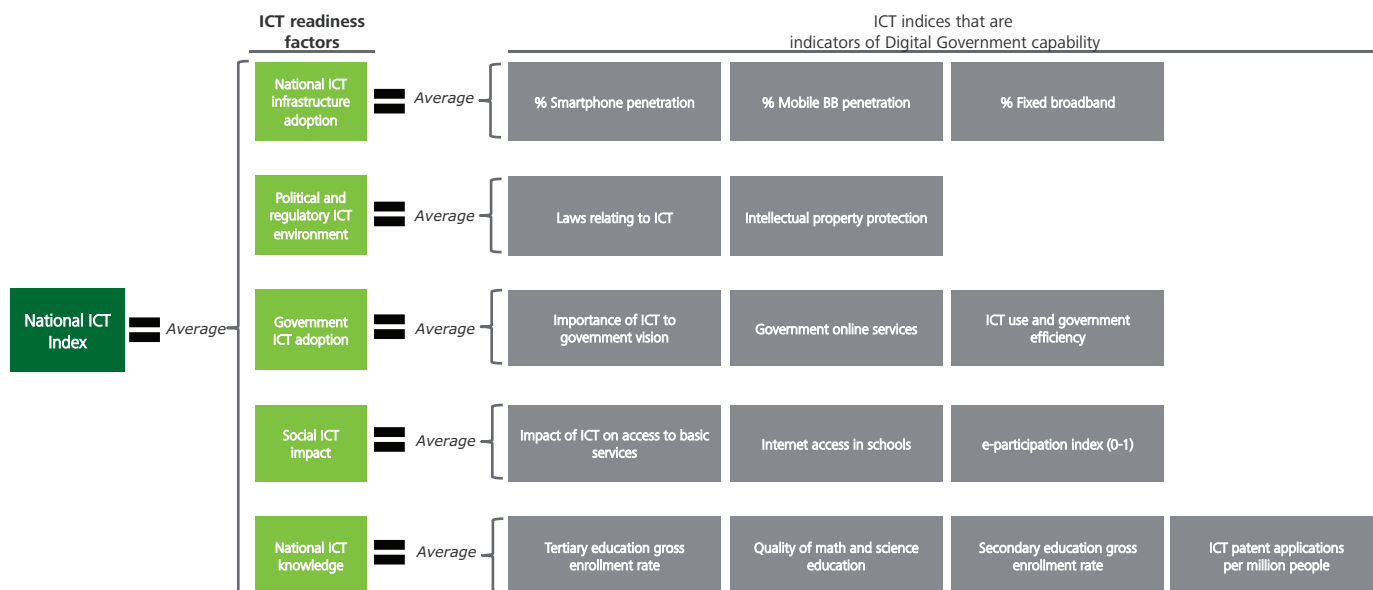
Deloitte's National ICT Index is a metric that indicates the Digital Government capabilities of a country. It is an average of a variety of specific ICT readiness factors related to Digital Government:

- Infrastructure adoption (i.e. telecommunications infrastructure adoption)
- Political and regulatory ICT environment
- Government ICT adoption
- Social ICT impact
- ICT knowledge

Each of the ICT readiness factors are calculated as an average of ICT indices that are indicators of Digital Government capability. These indices have been compiled and averaged from global ICT reports and national government statistics to calculate the National ICT Index.

This methodology, components and calculation of the Deloitte National ICT Index are illustrated in the following figure.







Figure 58: National ICT Index methodology, components and calculation



Note: No figures for the Tertiary education gross enrollment rate criteria were available for Canada as per the 2016 WEF Global Information Report. Consequently, the average index calculation did not include this criteria.

Source: "Global Information Technology Report 2016", World Economic Forum – for all components except smartphone penetration. Sources for smartphone penetration include eMarketer, GSMA, Statista and GCC government statistics (e.g. Qatar Ministry of Transport and Communications in Qatar)

Appendix 2: Digital initiatives list

 Classroom of the Future	 Future of Mobility	 Smart Tourism	 Next Generation Care	 Smart Cities	 Smart Government
Saudi Arabia					
<ul style="list-style-type: none"> University e-services framework (Jame3a) Digital education for students & teachers ICT training centers Digital innovation contests for schools Guidance for ICT industry job seekers Modern curriculums Training for ICT industry job seekers Digital literacy program Education platform (Doroob) National e-Training program Digital government capability building Central national students database 	<ul style="list-style-type: none"> Expansion of Hajj & Umrah capacity e-transport customer services 	<ul style="list-style-type: none"> Info platform for Hajj & Umrah visitors e-Training for Hajj & Umrah workers 	<ul style="list-style-type: none"> e-Appointments and referrals Electronic Health Record e-Health program 	<ul style="list-style-type: none"> Yanbu Smart City 	<ul style="list-style-type: none"> Automate customs procedures e-Service center for investors e-Services for SMEs New Authority for Yasser e-Gov program Smart Government service center Charity platform (Namaa System) e-Commerce stimulus and support program New e-commerce council Civil Service information center
United Arab Emirates					
<ul style="list-style-type: none"> Smart equipment for schools & universities Digital classroom platform Schools innovation libraries Smart learning and teaching technologies e-learning between government schools and ICT firms Educational apps accessible offline Training & learning solutions provider Smart school buses 	<ul style="list-style-type: none"> Adopt autonomous mobility technologies Integrated IoT based transport systems Driverless vehicles Unified transport & traffic control center 	<ul style="list-style-type: none"> Mobile passports & wallets for travelers Mobile biometric & facial recognition Integrated airline and partner services Automated border control (one gate) 	<ul style="list-style-type: none"> Electronic medical records (NUMR) e-Health checks Telemedicine center Mobile healthcare Integrated healthcare provision Develop talent for digital health sector Paperless hospitals e-store for medical equipment & supplies Develop e-Health solutions with ICT sector 	<ul style="list-style-type: none"> New integrated free zone technology park Integrated IoT-enabled city infrastructure Innovative business community services 	<ul style="list-style-type: none"> Remote, paperless & cashless e-Services Integrated gov. data & collaboration platform Smart government cloud infrastructure (CloudOne) Digitalize gov services with mPay platform
Qatar					
<ul style="list-style-type: none"> ICT learning platform for elderly (Wasla) e-education learning & services program e-training program for graduates Integrated education infrastructure 	<ul style="list-style-type: none"> IoT-based smart parking solutions Connected transport network Digitally-enabled high quality taxi systems Intelligent transport systems 	<ul style="list-style-type: none"> Augmented reality city system for visitors Indoor navigation for key locations Single Transport Pass for universal ticketing 	<ul style="list-style-type: none"> Smart health services (TASMU) Healthcare innovation (Your Health First) eHealth solutions implementation Integrated system of healthcare providers 	<ul style="list-style-type: none"> Lusail Smart City Smart water network City pollution watch (data & analytics) Next generation broadband 	<ul style="list-style-type: none"> Automate government HR operations e-business program to connect businesses Integrated government data sharing platform Enrich ICT environment Expand e-Gov services
Kuwait					
<ul style="list-style-type: none"> e-learning platform for education system Smart education products and services 	<ul style="list-style-type: none"> Build ICT-enabled transport systems 		<ul style="list-style-type: none"> e-Health services & management system IoT-enabled personal health solutions 	<ul style="list-style-type: none"> Build Smart Cities 	<ul style="list-style-type: none"> e-Government program

Note: digital initiatives list above is not exhaustive

Source: Official government websites and press releases, Monitor Deloitte research and analysis¹⁶⁶

Appendix 3: Deloitte Digital Maturity Assessment framework

The tables below define each of the digital maturity stages across each organizational layer (business, operations, customers) and criteria.

Figure 58: Digital business model

Digital Business Model				
	Exploring	Doing	Becoming	Being
Digital strategy	Digital is not seen as a priority and very limited initiatives are being undertaken	Digital initiatives are undertaken in a siloed way with no clear strategic framework to follow that cuts across the organization	A clear digital strategy is in place with key digital initiatives under implementation	Clear and ambitious strategy with initiatives being implemented placing the country at the forefront of digital
Regulation	No regulatory framework is in place and organizations that do have this in place have not adapted it to current needs	A regulatory framework is being developed by consulting partners across the ecosystem	A regulatory framework has been implemented favoring the development of an innovation-driven ecosystem across certain technology dimensions	A best in class regulatory framework has been implemented fostering innovation across all the technology dimensions
Digital ecosystem	No or very limited supporting digital ecosystem in place (i.e. the organization is not leveraging digital ecosystem players to enhance their business)	Specific digital initiatives are built in cooperation with the private sector and other governmental entities	An organized framework is in place to ensure that broader stakeholders are involved in implementing digital initiatives	The private sector and other entities play an integral role in the digital initiatives being undertaken by the organization to ensure success

Figure 59: Digital operating model

Digital Operating Model				
	Exploring	Doing	Becoming	Being
Technology	Very few applications of digital technologies and very limited exploration of use cases through proof of concepts	Digital technologies are being deployed and integrated with the organization's systems (legacy and new)	Digital technologies are enabling agility, efficiencies, flexibility, and the benefits are transforming the organization's business	The organization is leveraging exponential disruptive technologies (e.g. AI, AR, blockchain, machine learning, 5G) to be an industry leader
Digital operations	Internal processes are mainly manual	Some functions/aspects are looking to embrace agility and are more agile in their approach than others	Significant application of agile processes, technology & operations for greater flexibility and performance	Organization is an industry leader through its universal embracement of agility as the way of getting things done
Digital talent	No digital talent available in-house	Limited talent available but the organization is seeking to enhance its digital capability with digital talent recruitment plans in place	Some digital talent is already in-house and an agile learning approach is increasingly used to train current and new employees	The organization has a very strong digital talent force both in terms of size and the wide range of digital skills it commands
Digital governance	No dedicated entity/function related to digital	A digital entity/function is being set up but is not yet empowered with the right mandate to truly embark on Digital Transformation	A central digital entity/function is in place with a governance body allowing it to explore and pursue Digital Transformation efforts	A central digital entity/function is in place with a strong governance body with the authority to push and drive Digital Transformation across the organization

Figure 60: Digital customer model

Digital Customer Model				
	Exploring	Doing	Becoming	Being
Customer Involvement	Customers are taken for granted and their needs are not gauged. The organization does not offer digital services of value to customers	Digital services are designed for customers to an extent. Second hand customer behaviors and feedback are analyzed (e.g. via analytics and social sensing) to develop an understanding of the customer's needs in the design stage	The organization actively engages with customers to solicit first hand customer feedback, involving them in the design process to shape the organization's products and services together	The organization is fundamentally customer-centric, placing the customer at the heart of the design process of all products and services. Customers express loyalty and are highly satisfied with the experience
Customer Feedback	No initiative / process in place for improving digital services based on customer feedback	The organization has a defined customer feedback process and mechanism in place to receive feedback and complaints. Customer feedback is incorporated to identify opportunities to improve offerings	Customer feedback processes and mechanisms are centralized in one place to capture real-time and infrequent feedback which is used to drive customer insight based improvement in the organization's offerings	The organization across all functions adopts iterative processes to incorporate customer feedback from a wide range of sources (e.g. social medial, survey) to continuously improve product and service quality

Glossary

aeCERT	UAE Computer Emergency Response Team	MOCI	Saudi Ministry of Culture and Information
AI	Artificial Intelligence	MOE	Ministry of Education
API	Application Programmable Interface	MOH	Ministry of Health
AR	Augmented Reality	MOHAP	UAE Ministry of Health and Prevention
ATS	Dubai Autonomous Transportation Strategy	MOLSD	Saudi Ministry of Labor and Social Development
CAGR	Compound Annual Growth Rate	MOMRA	Saudi Ministry of Municipal and Rural Affairs
CAPEX	Capital Expenditure	MOOC	Massive Open Online Course
CIO	Chief Information Officer	MOTC	Qatar Ministry of Transport and Communication
CITRA	Kuwait Communication and Information Technology Regulatory Authority	MoU	Memorandum of Understanding
DCAA	Dubai Civil Aviation Authority	MVP	Minimum Viable Product
DEWA	Dubai Electricity & Water Authority	NFC	Near Field Communication
DSOA	Dubai Silicon Oasis Authority	NGO	Non-governmental Organization
DTCM	Dubai Department of Tourism and Commerce Marketing	NTP	Saudi National Transformation Plan
DVO	Digital Value Office	NUMR	UAE National United Medical Record Project
EC3	Enterprise Command Control Centre	QNeDP	Qatar's Updated National E-Health and Data Program
EHR	Electronic Health Record	OPEX	Operating Expenses
FN	Federal Network	PIF	Saudi Public Investment Fund
G2B	Government-to-Business	PMO	Project Management Office
G2C	Government-to-Citizen	PPP	Public-Private Partnership
G2G	Government-to-Government	RTA	Road and Transport Authority
GCC	Gulf Cooperation Council	R&D	Research and Development
GDP	Gross Domestic Product	SME	Small & Medium-Sized Enterprises
HAAD	Health Authority of Abu Dhabi	STEM	Science, Technology, Engineering and Math
ICT	Information & Communications Technology	TMMS	Abu Dhabi Transportation Mobility Management Strategy
IIS	Qatar Integrated Intelligence Services	TRA	UAE Telecommunications Regulatory Authority
IoT	Internet of Things	UAE	United Arab Emirates
IT	Information Technology	UN	United Nations
KDP	Kuwait Development Plan	US\$	United States Dollars
KPI	Key Performance Indicator	VR	Virtual Reality
KSA	Kingdom of Saudi Arabia		
M2M	Machine-to-Machine		
MENA	Middle East & North Africa		

Endnotes

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