جامـعة الدول الـعربية
League of Arab States

ARAB DIGITAL ECONOMY VISION
TOWARDS A SUSTAINABLE INCLUSIVE AND SECURE DIGITAL FUTURE

ARAB COMMISSION FOR DIGITAL ECONOMY

Endorsed by

جامـعة الدول الـعربية
League of Arab States

Arab Vision for Digital Economy

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Contents

List of Figures

List of Tables

Appreciation

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The UAE provided its full support for this strategic Arab project, and it left the content of this work entirely to project teams and experts to ensure its integrity and cohesiveness.

EXECUTIVE SUMMARY

The digital economy is changing the world view on **value creation**. It will not only transform the way we convert our resources into economic **value-added** outcomes, but it will also redefine our views on the available resources and how to utilize them to address existing economic and social challenges.

The main resource that drives the digital economy is the people, and this is where the Arab World can have a real chance to join the new age economic revolution. With youth representing more than 60% of the total Arab population, and a future focus on innovation and digital augmentation of the way **we live and work**, we will be able to change the way the Arab world creates value and **leaves a mark.**

This strategy has identified three major challenges to work on:

1. **Sustainability**
2. **Inclusiveness**
3. **Security**

Embracing the digital economy will not only help us address our pressing problem today (such as depletion of natural resources, dependency, unemployment, government inefficiency, etc.) but will also improve our ability to achieve the Sustainable Development Goals (SDGs). We will accelerate economic growth, create job opportunities for our growing youth population, improve our productivity, and achieve transparency while ensuring security and privacy.

Our vision is to transform the Arab world into a digitally-enabled economy and advance the region towards a sustainable, inclusive and secure digital future towards an innovative, empowered and integrated Arab community.

International statistics

The digital economy is estimated to contribute to around **USD 1.2 trillion** to the US economy and around **USD 3.8 trillion** to the Chinese economy. An IDC (International Data Corporation) study has indicated that the digital economy in Asia Pacific will be worth **USD 1.16 trillion** by 2021 accounting for **60% of the gross domestic product (GDP)**. Similarly, Europe's Digital Single Market creates opportunities for new startups and allows existing companies to reach a market of over 500 million people. Completing a Digital Single Market will contribute **USD 465 billion (EUR 415 billion)** per year to Europe's economy, create jobs and transform public services.

Compared to a global average of 22%, the digital economy represents around only 4% of the Arab world GDP. The impact of digital economy on fostering economic growth is five times higher compared to other traditional methods. This is why it is of optimal importance for the Arab states to adopt a digital transformation strategy.

The following report presents a concise description of the Arab Digital Economy Strategy. The strategy is reviewed by around 75 distinguished experts representing many global organizations and entities such as the European Commission, OECD, The World Bank, UNDP, UNDESA, Harvard University and others.

It has also benefitted from three studies: **The International Benchmark study,** The **Sectoral Benchmark** study and The **Arab World Current Situation** study. Nine high-performing countries are benchmarked and several relevant lessons are distilled from their digitization journey. Best practices are also presented from six selected economic sectors that have shown notable potential to be digitized in the Arab Countries. These sectors are healthcare, manufacturing, financial services, education, agriculture and commerce.

The Arab vision for digital economy structure

The strategy is built on **five dimensions:**

- **Digital foundation**
- **Digital Innovation**
- **Digital Government**
- **Digital Business**
- **Digital Citizen**

Twenty objectives, 15 themes and **50 programs** are developed for the five dimensions. The programs are then directed to selected Arab countries.

The impact of the digital transformation on the Arab world economy is significant. By 2030, The Arab countries GDP can grow due to digital economy from **USD 2.6 trillion** up to **USD 4.15 trillion**. The cost to implement the strategy is estimated at **USD 60 billion per year.** Total digital growth effect at full maturity could reach up to **USD 333 billion per year** creating around 60 million new jobs in the coming two decades.

Selected lessons are distilled from a variety of countries that have pioneered in their digital transformation. The selection of benchmark countries was based on the state and the rate of digital evolution. The chosen countries are the EU states, China, USA, Singapore, Malaysia and South Africa. The following describes the main lessons learnt from the international benchmark study.

1. **Digital foundation:** Responsible authorities, infrastructure, policies and regulations act as key pillars for achieving digital innovation. Digital foundations are required to activate the process of digital transformation and ensure its effectiveness.

2. **National digital government strategy** is the key enabler for the development of the digital economy agenda. Digital adoption by government, business and individuals should be improved in order to achieve significant socioeconomic impact by using national capabilities.

3. **Sectoral innovation plays a crucial role** in digital transformation by disrupting traditional business models and creating new ones. Incorporation of technology at the sectoral level adds value to traditional practices and enhances productivity and operations to a great extent.

4. **Digital skills** form the basis and the stepping-stone for wide scale adoption of digital technologies. Effective use of digital technologies requires information and communications technology (ICT) specialist skills, generic ICT skills and complementary skills such as information processing, self-direction, problem solving and communications.

5. **Digital ecosystem of disrupting technologies** act as a catalyst for digital economy. Comprehensive ICT ecosystem enables ICT environment, fosters innovation within the sub-sectors and bring significant benefits to entrepreneurs, youth and SMEs.

6. **Finance and capital** are considered as main pillars in the framework of digitization. Funding is extremely crucial for the realization of any digital strategies and agendas.

7. There is a need to establish special economic zones to encourage economic activity. Special economic zones create a link to the world's intelligent cities, infuse technology across all sectors and drive innovation and productivity.

8. **Digital single markets** break down barriers to cross-border online activity. They improve access to digital goods and services and create an environment where digital networks and services can prosper and maximize the growth potential.

Through the sectoral benchmark study, each of the selected six sectors is analyzed in-depth, providing reasons for its selection, the impact it will have and best practices globally. Finally, key lessons are distilled from each sector.

Financial services sector

For example, the **financial services** sector comprises about 15% of the global GDP and around 12% of the Arab world GDP. Financial inclusion stimulated by financial technology or FinTech clearly illustrates the positive relationship between the finance sector and the economy. In this manner, FinTech is expected to contribute to the Arab region economic development. People could have smooth access to financial services and businesses could utilize the more accessible payment services. Governments as well could benefit from blockchain's transparency and security and their relation to cost savings. This can come from auditing and enforcing smart contracts and avoiding fees that are associated with other payment methods.

Manufacturing sector

Similarly, **manufacturing** comprises about 16% of the global GDP and about 11% of the Arab world GDP. The application of smart manufacturing is expected to create USD 1.2 to 3.7 trillion of value worldwide by 2025. This comes in many forms, such as

operational efficiency, predictive and preventative maintenance, supply chain management and inventories and logistics management. Digital technologies can bring dramatic changes to the world of manufacturing and offer opportunities to innovate and increase output. They can create new production technologies, new materials and new ways of storing, processing and sharing data. New manufacturing devices, such as 3D printers, speed up product development cycles and make new collaboration processes possible by supporting rapid prototyping and customization, with fewer errors, and enable a faster time to the market.

Health care sector

Healthcare comprises about 10.4% of the global GDP and is considered the third major contributor to the global GDP. The transition of the healthcare industry into digital healthcare system for management and analysis of patient health is expected to be the most vital driver of the market Global eHealth market is expected to reach USD 308.0 billion by 2022, according to a new report by Grand View Research Incorporated. The Arab region healthcare digital transformation can create value for all stakeholders, whether governments, healthcare providers, professional, or patients. The primary benefits of digital transformation for the Arab citizen are likely to be improvements in healthcare access, quality and affordability. For industry players, digitization can add value through enhanced revenue generation, capital efficiency, cost optimization and productivity.

Educational sector

Besides, the role of the **education system** and educational technology in teaching is of utmost significance due to the presence of ICT in our daily lives. One cannot deny the importance of education for any community development and its considerable 5% contribution to the global GDP expenditure. Education technology is the systematic and organized process of applying

information and communication technology to improve the quality and efficiency of education. For instance, e-learning is one of the key aspects of e-education which is rapidly changing the education landscape. - E-Learning Market size valued at around USD 190 billion in 2018, will grow at a CAGR of 7% from 2019 to 2025[1]

E-commerce sector

Likewise, **e-commerce** is considered a crucial digital sector due to the perceived benefits it can add to the local firms on the country scale, and to the overall economy of the Arab region. The wholesale and retail sector is a major contributor to the overall global GDP with 5.5%, and 6% contribution to the Arab world GDP. One can simply say that e-commerce causes cost reduction and improved efficiency. If implemented properly, it will lead to lower prices for goods and services, causing Arab markets to be more competitive. E-commerce will allow procuring firms and individuals to purchase more widely and gain extra choices. It will allow selling firms to sell into new geographic markets as well as unreachable markets that would otherwise be uneconomic to serve.

Agricultural sector

Precision agriculture is a modern farm management concept that makes use of digital technologies to monitor and optimize agriculture production processes. Instead of applying the same amount of fertilizers over an entire agriculture field or feeding a large animal population with an equal amount of feed, precision agriculture helps to optimize fertilizers' use, harvest time and livestock feed after monitoring various field variations using new sensor technologies, satellite navigation and positioning technology, and Internet of Things (IoT). Agriculture accounts for nearly 6% of the total GDP of the Arab countries. In addition to that, global market size of precision agriculture is expected to garner USD 7.8 billion by 2022, registering a CAGR of 14.9% during the forecast period 2016-2022.

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[1]https://www.gminsights.com/industry-analysis/elearning-market-size

The vision structures

Our analysis of the Arab countries' current situation revealed that formulating and effectively implementing an Arab Digital Agenda, must take into account the heterogeneity among Arab countries in terms of income, competitiveness, infrastructure, innovation, e-government development and digital readiness.
We relied on the main published indices like:

- Global Competitive Index GCI
- The E-Government Development Index EGDI
- The Information and Communication
- Technology Development Index IDI
- The Telecommunication Infra-Structure Index TII

The vision stated for Arab digital economy is to transform the Arab world into a digitally-enabled economy and advance the region towards a sustainable, inclusive and secure digital future to enable an innovative, empowered and integrated Arab community.

The strategy is built on five dimensions based on the framework below:
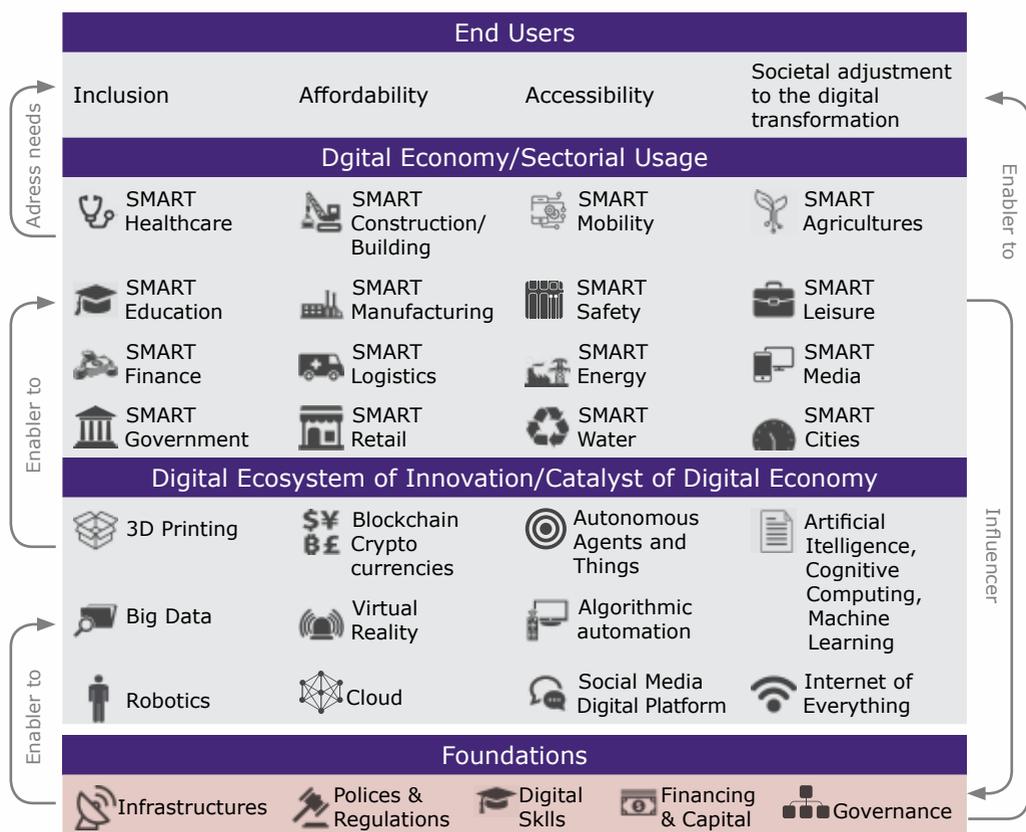
Figure 1 **Proposed Framework of Digital Economy**

The main dimensions of the vision

The first dimension of the strategy, digital foundation, provides the necessary foundations for a robust digital ecosystem and comprises five pillars: Infrastructure, policies and regulations, digital skills, funding and governance. Each of the pillars is critical

in developing the digital system at the international, regional, national or even organizational level. Any successful strategy has to address these five components.

The second dimension, digital innovation, addresses innovation as a catalyst for digitization. New disruptive technologies such as 3D printing, artificial intelligence (AI), big data and cloud computing are revolutionizing concepts and creating new sources of value for many industries. They can significantly alter the way businesses or entire industries operate.

The third dimension, digital government, addresses the needs of people through service provision, will improve the delivery of these public services. Digitization will improve efficiency and transparency within the government sector, thus down on bureaucracy. Similarly, public services will be moved closer to civil society and enterprises, which will not only facilitate the open government but also the decision-making process as a whole. Technology including smart and mobile-friendly devices, plays a crucial role in achieving these goals through the wider adoption of digital government services.

The fourth dimension is digital business which will benefit tremendously from the digital transformation. The latter will increase customer value proposition, improve cost efficiencies, and establish a wider customer base by entering new markets. Support should be extended to SMEs in their digitization efforts as they play a fundamental role in the digital economy.

The fifth dimension is the digital citizen. The digital ecosystem should be citizen-centric. Digital technologies enhance the quality of lives of citizens and civil society, including vulnerable and minority groups. Acquiring basic digital skills will empower citizens to seize opportunities presented by technology and digitization. By providing cheap, secure, accessible and affordable digital services to all people regardless of skills and financial abilities, will act as an enabler for greater participation and contribution to community development.

The report will also include a detailed implementation plan with projects' budgets, timelines and key performance indicators.

The implementation plan includes fifty programs. These programs are the primary path for digital transformation of the region. For each of the programs, a detailed description is elaborated based on multiple criteria such as the description of the program, objectives, main phases, prerequisites, required budget, stakeholders, etc.

In addition, a prioritization mechanism has been established to identify the higher priority projects. This mechanism is a matrix that evaluates each program based on its impact vs. its feasibility. The results have led to the choice of the ten highest priority programs to become pilot programs.

Then a governance model is established to define the roles and responsibilities of the Arab Commission for the Digital Economy (ACDE), its organizational structure, stakeholders mapping, etc.
There will be eight independent bodies that operate under the umbrella of ACDE:

- Arab Union for Precision Agriculture (AUPA)
- Knowledge for Arabs Center
- Arab Innovation and Technology Institute (AIT)
- Accessibility and communication Excellence Center
- Arab E-Health Organization (AeHO)
- Arab FinTech Agency
- Arab Union for Modern Manufacturing
- Modern Arab E-University (MAU)

The funding of the strategy and its programs is a crucial matter that needs to be analyzed carefully. As a result, the potential funding sources are identified **(29 sources of funds and 18 sources of sovereign funds),** taking into consideration their scope of funding, their latest funding seal or limit per year, etc.

In order to measure the strategy's impact and performance in the upcoming years, defined KPIs and standards have been formulated. Twenty-five KPIs are identified for each of the five dimensions of the strategy and for each of the clusters.

THE IMPORTANCE
of the digital economy and its pivotal role as a catalyst for real economic development

1. Digital Economy As A Lever of Growth

Digital transformation has vast effects on society at many levels. It allows the automation of business operations resulting in operational efficiencies, such as reduction of transaction costs, which ultimately impacts productivity. Furthermore, it offers new business opportunities, thus affecting employment and entrepreneurship. It also enhances the provision of public services, such as health and education, and improves the interaction between citizens and their governments. In addition, digital transformation affects human relationships and individual behavior, through facilitating communication and social inclusion.[2] Thus, enhancing digitization and creating digital markets can result in considerable economic and social benefits to societies and communities, through its potential to increase productivity, accelerate growth, facilitate job creation, and enhance the quality of life for society in general.

Information technologies have been a significant contributor to the growth of developed economies over the last decade. For example, in 2011, regardless of the poor global economic situation, digitization provided increased world economic output by about USD 193 billion and created six million jobs worldwide.[3] Digitization is 4.7 times more powerful than the average impact of broadband rollout in boosting economic growth, which is an average of 0.16% of per capita GDP. The economic effect of digitization is also accelerating as the degree of countries' digitization progresses.[4]

For instance, the digital economy in Asia Pacific will be worth USD 1.16 trillion by 2021 accounting for 60% of the GDP up from about 6% from last year, an IDC study has found. Commissioned by software giant Microsoft, the study, which polled 1,560 business decision makers across 15 Asia Pacific Accreditation Cooperation (APAC) economies, also found that digital products and services enabled by mobility, cloud, the Internet of things (IoT) and AI

would grow the region's GDP by 0.8% each year.[5] Similarly, Europe Digital Single Market creates opportunities for new startups and allows existing companies to reach a market of over 500 million people. Completing a Digital Single Market will contribute USD 465 billion (EUR 415 billion) per year to Europe's economy, create jobs and transform its public services.[6]

Nevertheless, there is another school of thought which argues that digital transformation could also result in potential negative effects, such as workforce disruption, the disappearance of companies, cybercrime and social anomie1. In addition, digitization may act as a potential source of socioeconomic inequality. Proponents of this school of thought argue that digitization has changed the structure and conditions of employment. Some jobs have disappeared or have become scarce. Moreover, they point out that the average worker today is poorer than 15 years ago despite the continuous leaps in productivity, wealth and profits3.

Accordingly, it would be quite relevant here to highlight possible socio-economic impacts of digitization, focusing on some key macroeconomic variables, including economic growth, employment and job creation, social welfare, competition, as well as variables related to various governmental aspects.

1.1 Impact on economic growth

Digitization, including computing, broadband and mobile telephone networks, helps in relaxing scalability constraints, thus allowing traditional sectors of the economy to grow more rapidly. Mature technologies contribute to improving productivity owing to the introduction of more efficient business processes supported by ICTs, marketing excess inventories and supply chain optimization. Moreover, digitization results in extending market coverage leading to revenue growth. It also affects the composition and operation of industrial value chains. In addition, digitization promotes the growth of some industries within the services sector (e.g. business process outsourcing, and software development.

[1]https://www.itu.int/en/Pages/default.aspx
[2]http://www3.weforum.org/docs/GITR/2013/GITR_Chapter1.2_2013.pdf
[3]https://rocasalvatella.com/app/uploads/2018/11/maqueta_competencias_espanol.pdf
[4]https://www.computerweekly.com/news/252435429/Digital-economy-to-make-up-60-of-

[5]APACs-GDP-by-2021
[6]https://ec.europa.eu/digital-single-market/en/policies/shaping-digital-single-market

The introduction of new applications and services, including for example Internet information searches, distance education, e-commerce and social networks, boosts economic growth. These technologies help businesses in lowering costs, and hence raise efficiency and labor productivity in almost all economic sectors. This is because better information facilitates better use of existing capacity, optimizes inventory and supply chain management, cuts downtime of capital equipment, and reduces risk. Furthermore, the Internet contributes to making workers more productive, as it helps in handing off routine and repetitive tasks to technology, and hence workers can focus on activities with higher value.[7] Additionally, the developments in big data analysis, robotics, and machine learning have significant implications for productivity improvement.

Empirically, studies that only concentrated on the penetration of broadband technology showed a gain in per capita GDP of just 0.16 to 0.25 %. However, other recent studies find that an increase in digitization of 10 percentage points generates a percent gain in per capita GDP of 0.5 % in digitally-constrained economies, 0.51% in emerging economies, 0.58 % in transitional economies and 0.62 % in advanced stages of digitization.[8]

Digitally-constrained economies get the least benefit, basically because they still need to establish an ICT ecosystem that can derive the benefits of digitization. Also, a study by Sabbagh et al. (2013)2 shows that an increase of 10% in a country's digitization score increases GDP per capita growth by 0.75% on average. Moreover, Katz and Callorda (2017)[9] indicated that 1% increase in a digital ecosystem development index, which corresponds primarily to the first and second waves of digitization, yields 0.13% increase in per capita GDP growth. In addition, it is concluded that as the digitization level of a country advances, the higher is its growth.

[7]http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Re-placement-PUBLIC.pdf
[8]http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.913.2649&rep=rep1&type=pdf
[9]http://www.teleadvs.com/wp-content/uploads/Katz_Callorda_Estimacion_del_impacto_socioeconomico_del_crecimiento_del_ecosistema_digital_en_America_Latina_v2.pdf

1.2 Impact on employment and job creation

The first wave of digitization had a significant impact on employment, since it increased the demand for labor. In addition, it resulted in huge job creation due to the construction and deployment of telecommunications networks. On the other hand, certain industries while undertaking digitization of their production, were prone to reduce their workforce.

During the second wave of digitization, many jobs were created as a result of increased demand for labor in specific jobs linked to the development of digital services or the emergence of collaborative business models. However, many jobs disappeared as a result of automation, and the labor market witnessed labor force polarization because of the "hollowing out" of middle-skill jobs. The impact of the third wave of digitization on employment is, however, debatable. Studies in this area are divided into two groups: the first foresees a dramatic disappearance of jobs as a result of automation, while the second argues that negative disruption effects are overstated.

In general, digitization creates new jobs, while other jobs become redundant.[10] It transforms existing jobs, since new skills are required to accomplish new tasks. This implies that the current work force has to be either retrained or replaced by workers who already have the new skills.[11] Studies indicate that the fourth industrial revolution will have a huge impact on the labor market. They also argue that this impact will differ by sector and that the rising new jobs will take many forms.[12] "A recent report from McKinsey Global Institute (MGI) says that digital economy has the potential to unlock productivity and would create 60-65 million new jobs by 2025.[13]

[10]http://aei.pitt.edu/88531/1/EESC_Digitalisation.pdf
[11]http://reports.weforum.org/digital-transformation/understanding-the-impact-of-digiti-zation-on-society/?doing_wp_cron=1535365028.0432989597320556640625
[12]https://www.etui.org/content/download/22130/184851/file/ver+2+web+version+Work-ing+Paper+2016+02-EN+digitalisation.pdf
[13]https://www.thehindubusinessline.com/news/digital-economy-will-create-over-60-m-jobs-by-2025/article26695072.ece

Full incorporation and application of digitization has a larger effect on employment compared to mere broadband penetration, because it results in creating more jobs in the digital sector, such as software development, business process outsourcing, equipment manufacturing, and parts supplies. According to Sabbagh et al. (2013)[2], 10 points increase in the digitization score leads to a 1.02% decrease in the unemployment rate. On the other hand, the same magnitude of increase in broadband penetration, results in a drop of only 0.22% in the unemployment rate. Thus, digitization effect on reducing unemployment is considered 4.6 times greater than that of the widespread adoption of broadband.

In addition to creating direct jobs, the number of jobs enabled by digital technologies is fairly large. These technologies reduce transaction costs and increases opportunities for individuals who face obstacles in finding jobs or productive inputs. This supports inclusion for women, people in remote areas, and persons with disabilities. Impact outsourcing helps in bringing Internet-based jobs to poor and vulnerable people[6].

Furthermore, digitization and the emergence of the on-demand economy allow new forms of employment to exist, such as online or distance work. Hence, they strongly affect how work is organized, as well as employer-employee relationship. Digitization and the on-demand economy make work less bound to space and time

Digitization and the on-demand economy make work less bound to space and time, e.g. more autonomy and better monitoring of work outcomes.[14]

It is worth noting that digitization has more significant employment effects in emerging markets compared to developed ones, due to three main reasons. Firstly, the digitization gain in the advanced economies is less than it is in some emerging regions. Secondly, some of the emerging countries have very large populations (e.g. China and India), which implies that a minor decrease in the unemployment rate results in a large number of jobs. Finally, off shoring grows along with digitization. As companies in digitally advanced countries improve their productivity thanks to digitization, they transfer jobs to digitally emerging countries 2.

Nonetheless, digitization could lead to an increase in unemployment, as automation replaces many human beings, and many workers could lose their jobs, especially low- and middle-skill jobs. In addition, automation of many tasks through Internet could lead to greater inequality rather than greater efficiency, if the workers do not have the skills that technology augments[6]. Thus, it is quite necessary to devote adequate efforts to re-skilling and up-skilling the existing labor force, in addition to including STEM+IE (i.e. innovation and entrepreneurship) in the formal education system to minimize the impact on the workforce. Moreover, digitization could threaten maintaining a healthy work-life balance, due to the absence of adequate negotiations between employers and employees.[12]

In sum, digitization has four main areas of impact on the labor market, namely:

- Job creation: new sectors, new products and new services.

- Job change: digitization, human/intelligent machine interface, new forms of management.

- Job destruction: automation, robotization.

- Job shift: digital platforms, crowd sourcing and 'sharing' economy.

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[14]https://www.researchgate.net/publication/302973038_Perspectives_on_The_Rise_and_Fall_of_American_Growth

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These four areas of impact of digitization are buttressed by macroeconomic stakes deriving from advances in labor markets, wages, social inequality, quality of newly created, changed, or 'shifted' jobs, etc. 11.

New Jobs

Digitalization, Machine learning, Smart Machines, robotics, New forms of management

Creating Jobs Opportunities

New sectors, New prodcuts, New Service

Changing Employment Pattern

Digital platforms, Sharing economy

Functions Elimination

Automation, Use of robotics
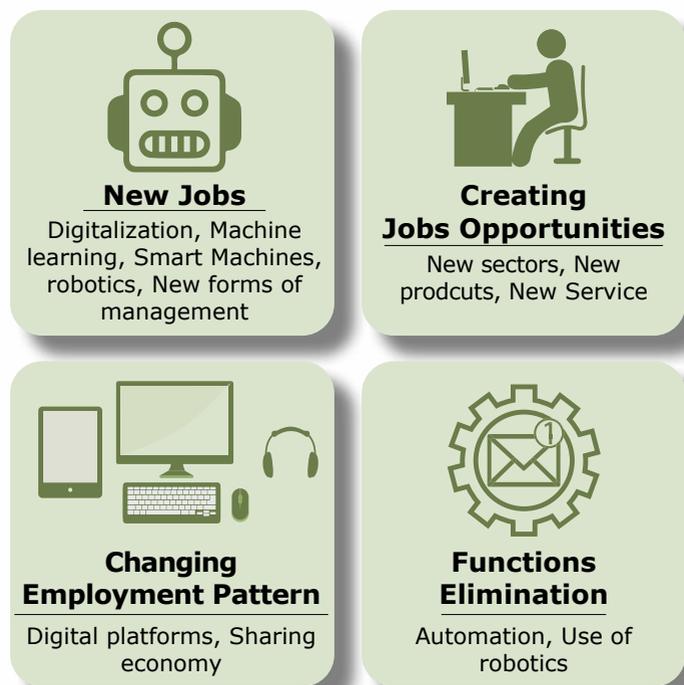
1.3 Impact on social welfare

Another important impact of digitization that is not adequately studied, is its impact on social welfare. In fact, there is no universal agreement on the way social welfare can be measured.[15] Studies often use inequality in societies as a measure for the degree of social welfare. However, in emerging countries that need to reduce poverty, there will always remain a complex correlation between economic growth and social inequality[7]. Also, other studies have used the United Nations Development Programme's (UNDP's) Human Development Index (HDI) as a proxy for equality of access to basic services, in order to assess the social impact of digitization. Social security professionals and experts of the International Social Security Association (ISSA) are committed to sustaining and further extending social security protection in line with the objectives of the United Nations Sustainable Development Goals for 2030. Accordingly, ISSA prepared a report, which spotlights ten of the most important global challenges that confront social security systems.[16]

This report was based on research and consultation of more than 280 government departments and social security institutions around the world. These challenges include; closing the coverage gap, inequalities across the life course, population ageing, employment of young workers, labor markets and the digital economy health and long-term care, new risks, shocks and extreme events, protection of migrant workers, the technological transition, and finally higher public expectations.

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[15]Cornachione, M., Panday, P. & Parrishet, B. (2008). A wellbeing index based on an enabling environment. International Journal of Social Economy, 35(3), pp.174-187.
[16]https://www.issa.int/en/ten-global-challenges-for-social-security

Several studies showed that the increase in the level of digitization boosts social well-being[17]. For example, a study estimated that a 10-point increase in the digitization score leads to an increase of approximately 0.13 points in the HDI. It was found that the digitization impact is greatest in constrained and emerging economies. Meanwhile, in more developed economies where basic human needs are more easily met, digitization plays a less pronounced role in expanding access to education, sanitation, water, and healthcare.[18] In addition, it was found that Internet adoption, introduction of broadband and using personal computers have yielded significant increase in household income. While these results apply to developed countries, they are not true for less developed ones. Although digitization has a considerable impact on social well-being, people living in less developed countries have other priorities as they struggle for daily survival[7].

However, digitization also generates a number of negative effects. It leads to degradation of human relationships as a result of intense digital consumption. It lessens the ability of children and adolescents to conduct knowledge gathering activities, such as reading. Moreover, limited local Internet content in developing regions, with the dependence on one language, makes the Internet a vehicle for cultural uprooting. The development of local digital content entails vast opportunities to satisfy the needs of a country's citizens that would only adopt broadband if they were to find a product that is culturally relevant to their needs[1].

1.4 Impact on competition

Automation and Internet-based services cause a drop of marginal transaction costs to zero. This could have two opposite consequences on the market structure. On one hand, low marginal costs imply large economies of scale, which support natural monopolies. This requires some regulation from the government to protect consumer interests. Moreover, large economies of scale, which the Internet delivers, along with business environment that hinders competition could result in excessive concentration of market power and rise of monopolies, restraining future innovation[6].

On the other hand, the characteristics of Internet-based services could encourage competition. For example, price comparison websites result in reducing prices for consumers. However, evidence shows that price dispersion on the Internet persists, partly due to the ability of companies to price discriminate based on search history, geographical location, or other information about the buyers. Furthermore, the Internet makes market entry easier, since the Internet firms can start and scale up rapidly with a relatively small number of staff and low capital investment. In addition, cloud computing lowers startup costs and permits firms to expand capacity, when there is additional need. This in turn reduces the risk for investors[6].

Even though Internet firms seem to compete with their equivalents, many of them, if not all, also compete with offline firms. For example, search engines and social media sites compete with traditional media for advertising revenue, e-commerce firms compete with brick-and mortar firms, and instant messaging apps compete with telecoms. This online-offline competition ultimately triggers innovations that benefit consumers, mainly when offline markets are distorted6.

In general, it can be said that digitization can substantially enhance competition, facilitate market entry, open up potential markets that firms can serve, and create new ones[9]. A recent trend is that online and offline firms will tend to complement each other in what is called O2O (Offline to Online or Online to Offline; it is applicable).[19] The recent surge of Amazon market value started from its offline outlets, and its founder became one of the richest persons in the world and is expected to be the first to reach the USD 2 trillion market cap.[20]

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[17]Kavetsos, G. & Koutroumpis, P. (2011).Technological affluence and subjective well-being. Journal of Economic Psychology, 32(5), pp. 742-753.
[18]http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan050670.pdf.

[19]https://www.bigcommerce.com/ecommerce-answers/o2o-commerce/
[20]https://www.thestreet.com/investing/amazon-apple-two-trillion-market-cap-14704068

1.5 Impact on some governmental aspects

Digital technologies help in better informing citizens of government's activities and hence open new paths for participatory democracy and improve public sector efficiency. This is usually accompanied by a stronger demand for e-government services[7].

Digital identification facilitates conquering barriers to participation. Several countries started using general-purpose digital identity (ID) schemes or specific systems for elections to manage post conflict transfers. Moreover, digital technologies allow the poor to vote by providing them with robust identification and restraining fraud and bullying through better monitoring. Mobile phones enable citizens to report instances of violence and voter intimidation, thus improving electoral participation. Social media, in turn, may overcome the traditional barriers to citizen collective action. Many empirical studies showed that cell phones and the use of Twitter and Facebook supported protests during the Arab Spring in the Egypt, antiwar demonstrations in the United States, and citizen mobilization across Africa[6].

Yet, before adopting such technologies, countries have to stimulate the demand for e-government services, through encouraging the adoption of connected digital appli¬cations by individuals, businesses, and government agencies. Developing mar¬kets in the early stages of digitization should focus on boosting demand for basic telecommunications services such as fixed, mobile, and broadband across both public and private sectors. As countries move to more mature stages, governments should focus on boost¬ing service adoption. Governments can also stimulate demand by ensuring that all public services—such as paying taxes, renewing drivers' licenses, and enrolling in school—can be performed using broadband networks.[21]

Governments, mainly those in digitally-advanced countries, take advantage of data analytics and digital platforms for faster, integrated, and more informed policy making. The Internet further raises government efficiency and productivity through automation and data-driven management. This happens because the Internet lowers the cost of communication and coordination dramatically. However, there is a need for efficient and effective identity management (analogue and digital) for better policy making, foresight and forecasting, as well as public service delivery. If one does not know identities, increased administrative burdens are faced by businesses and individuals to prove who they are.

Nearly all countries try to automate tax and customs administration, as well as budget preparation, execution, and accounting. Results have been mixed, though. E-filing reduces tax compliance costs, and one-stop computerized service centers and online portals have improved service efficiency. Digital technologies improve management within governments by monitoring the performance of workers. Studies report that generally, technology-based monitoring has positive effects on worker absenteeism, along with other institutional reforms. Finally, it is true that digital technologies help overcome information barriers that hinder service delivery. Yet, if governments stay unaccountable, this would result in more control, rather than greater empowerment and inclusion[6].

In sum, it can be concluded that digitization has significant positive socio-economic effects that usually outweigh its negative consequences. In addition, the impact of digitization varies greatly by country and by sector. Developed economies benefit from higher economic growth, but likely lag behind emerging economies in job creation. This is mainly due to the different economic structures of developed and emerging economies[2,7].

1.6 Impact on Sustainable Development Goals (SDGs)

In the year 2000, when the international development community came together at the United Nations (UN) to approve the Millennium Development Goals (MDGs), the digital revolution was

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[21]https://www.strategyand.pwc.com/media/uploads/Strategyand_Maximizing-the-Im-pact-of-Digitization.pdf.

just beginning. At that time, there were fewer than 1 billion mobile phones in use worldwide and only 400 million Internet users. In the intervening years to 2015, when the MDGs were reviewed, both indicators have grown by more than sevenfold. Thus, Target 18 - to make available the benefits of new technologies, including ICTs (information and communication technologies) - was one where progress was easy to demonstrate. But with the new generation of SDGs, adopted by the UN in 2015, the bar has been raised. As part of a broader Goal 9, on infrastructure, industrialization, and innovation, the SDGs commit to "significantly increase access to ICTs and strive to provide universal and affordable access to the Internet in LDCs [least developed countries] by 2020." Given that many developed countries are already close to saturation in terms of mobile penetration, it is logical to focus on Internet access, and specifically on the needs of the LDCs.[22]

The Sustainable Development Goals (SDGs)

"Technology has great potential to help deliver the SDGs, but it can also be at the root of exclusion and inequality. We need to harness the benefits of advanced technologies for all".

These were the words of the UN Secretary-General, Antonio Guterres, at the closing of the 2018 High-Level Political Forum on Sustainable Development. The benefits of digital technology for the SDGs is relatively well-integrated into the 2030 agenda, not only through Goal 9 (industry, innovation, and infrastructure), but also through the Technology Facilitation Mechanism and its Science Technology and Innovation (STI) Forum. By now, there is a well-established understanding that digital technology can help drive

progress for all goals, and that ICT is considered a powerful enabler for each of the 17 goals, and an essential catalyst in driving rapid transformation of nearly every aspect of our lives.[23] [See Table (1) and Figure (1)].

Table 1 **The ICT and The SDGs[24]**

SDG	ICT role in achieving the SDGs
No Poverty	There are still more than 2 billion "unbanked" people in the world. Now, thanks to digital financial services, many are participating in the digital economy for the first time; and access to financial services has proven to be a pivotal step in helping people lead out of poverty. In addition, timely and accurate information services will help ensure equal rights to economic resources and market insights that can benefit all.
Zero Hunger	To feed a growing population, agriculture is increasingly knowledge-intensive. ICTs help farmers improve crop yields and business productivity through better access to market information, weather forecasts, training programmes, and other online content tailored to their needs.

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[22]http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Re-placement-PUBLIC.pdf.

[24]https://www.itu.int/en/sustainable-world/Pages/default.aspx.

Good Health and Well-being	ICTs have the potential to deliver benefits across the global healthcare ecosystem. Patients can contact health care services remotely regardless of their proximity to a healthcare centre. Health care workers can, for example, learn and prepare for disease outbreaks, identify patient symptoms, follow established treatment protocols, perform remote diagnostics, access expert support and so on. Big Data analytics can help produce snapshots, analyze trends, and make projections about disease outbreaks, health service usage, and patient knowledge, attitudes, and practices.
Quality Education	ICTs are powering a revolution in digital learning, which has become one of the world's fastest-growing industries. Mobile devices now allow students to access learning assets anytime, anywhere. Teachers are now using mobile devices for everything from literacy and numerical training to interactive tutoring. Indeed, mobile learning has the ability to help break down economic barriers, divides between rural and urban, as well as the gender divide.
Industry, Innovation and Infra-structure	Without the digital infrastructure that powers our wireless world and forms the backbone of our digital economy, the world would not be able to deliver the ICT applications that enable scalable solutions to the SDGs. ITU believes broadband must be considered essential infrastructure for the 21st-century due to its capacity to power industry and innovation. And ITU's role in the adopting of globally harmonized spectrum and standards is essential to facilitate the development of transformative digital infrastructure, such as 5G systems, that will drive scalable solutions to all 17 SDGs.

Reduced Inequalities	ICTs have the potential to help reduce inequality both within and between countries by enabling access to information and knowledge to disadvantaged segments of society – including those living with disabilities, as well as women and girls. However, by the end of 2016, more than half of the world's population – 3.9 billion people – were not yet using the Internet and access was uneven between genders and geographically. Reducing inequalities cannot be achieved without addressing these underlying issues.
Sustainable Cities and Communi-ties	With more than half the world's population already living in urban environments, ICTs will be essential in offering innovative approaches to managing cities more effectively and holistically – through applications such as smart buildings, smart water management, intelligent transport systems, and new efficiencies in energy consumption and waste management. Using ICTs to make cities more eco-friendly and sustainable is vital – not just for the well-being of urban inhabitants, but also for the sustainability of the planet.
Responsible Consump-tion and Production	ICTs and responsible consumption and production are linked in two ways: increased dematerialization and virtualization as well as innovative ICT applications enabling sustainable production and consumption. Cloud computing, smart grids, smart metering, and reduced energy consumption of ICTs all have a positive impact on reducing our consumption. However, ICTs themselves require energy consumption. Therefore, effective policies are needed to ensure the negative impacts of ICTs, such as e-waste, are minimized.

Climate Action	ICTs, including satellite monitoring, play a crucial role in earth monitoring, sharing climate and weather information, forecasting, and early warning systems. ICTs therefore enable both the global monitoring of climate change as well as strengthen resilience by helping mitigate the effects of climate change through forecasting and early warning systems.
Life Below Water	ICTs can play a significant role in the conservation and sustainable use of the oceans – notably through improved monitoring and reporting which leads to increased accountability. Satellite-based monitoring delivers timely and accurate data on a global basis, while local sensors deliver on the spot updates in real-time. Big data can be used to analyze short and long-term trends in terms of biodiversity, pollution, weather patterns and ecosystem evolution, and to plan mitigation activities.
Life on Land	ICTs can play a significant role in the conservation and sustainable use of terrestrial ecosystems and the prevention of the loss of biodiversity – notably through improved monitoring and reporting which leads to increased accountability. Satellite-based monitoring delivers timely and accurate data on a global basis, while local sensors can deliver on the spot updates in real-time. Big data can be used to analyze short and long-term trends in terms of biodiversity, pollution, weather patterns and ecosystem evolution, and to plan mitigation activities.

Peace, Justice and Strong Institutions	ICTs can play an important role in crisis management, humanitarian aid and peacebuilding, and have proved to be a powerful aid in areas such as electoral monitoring. The growing use of open data by governments increases transparency, empowers citizens, and helps to drive economic growth. ICTs are also essential in terms of record-keeping and tracking government data and local demographics. When natural or man-made disasters occur, ICTs are crucial in obtaining, communicating and transmitting accurate and timely crisis information, allowing appropriate responses to be made. In the future, big data analysis and data mining should allow better use to be made of the vast amount of data that is already openly accessible online.
Partner-ships for the Goals	ICTs are specifically mentioned as a means of implementation under SDG17, highlighting the cross-cutting transformative potential of ICTs. Indeed, ICTs are crucial in achieving all of the SDGs, since ICTs are catalysts that accelerate all three pillars of sustainable development – economic growth, social inclusion and environmental sustainability – as well as providing an innovative and effective means of implementation in today's inter-connected world. Paragraph 15 of the 2030 Agenda for Sustainable Development highlights that"(t)he spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies…".

1.7 Impact of the digital strategy

The Impact of the strategy is assessed at the end of the study through a proposed economic model. The model assesses the impact of digitization on both the GDP per capita growth and the unemployment rate. The Arab countries are divided into two groups according to their digital performance and based on the latest Networked Readiness Index (NRI) developed by the World Economic Forum. Then, the effect of digitization is measured according to each group's digital performance.

The dataset that fed the proposed model was selected from different international data sources and published indices with the aim of incorporating the five proposed dimensions of the digital strategy and cover the components of the adopted framework of digitization. In this regard, seven variables were selected from the NRI and used in the economic model to reflect the proposed dimensions of the digital strategy. For example, the business usage index (6th pillar of the NRI) was used to proxy the digital business foundation and the government usage index (8th pillar of the NRI) was used to proxy the digital government dimension.

VISION AND FRAMEWORK
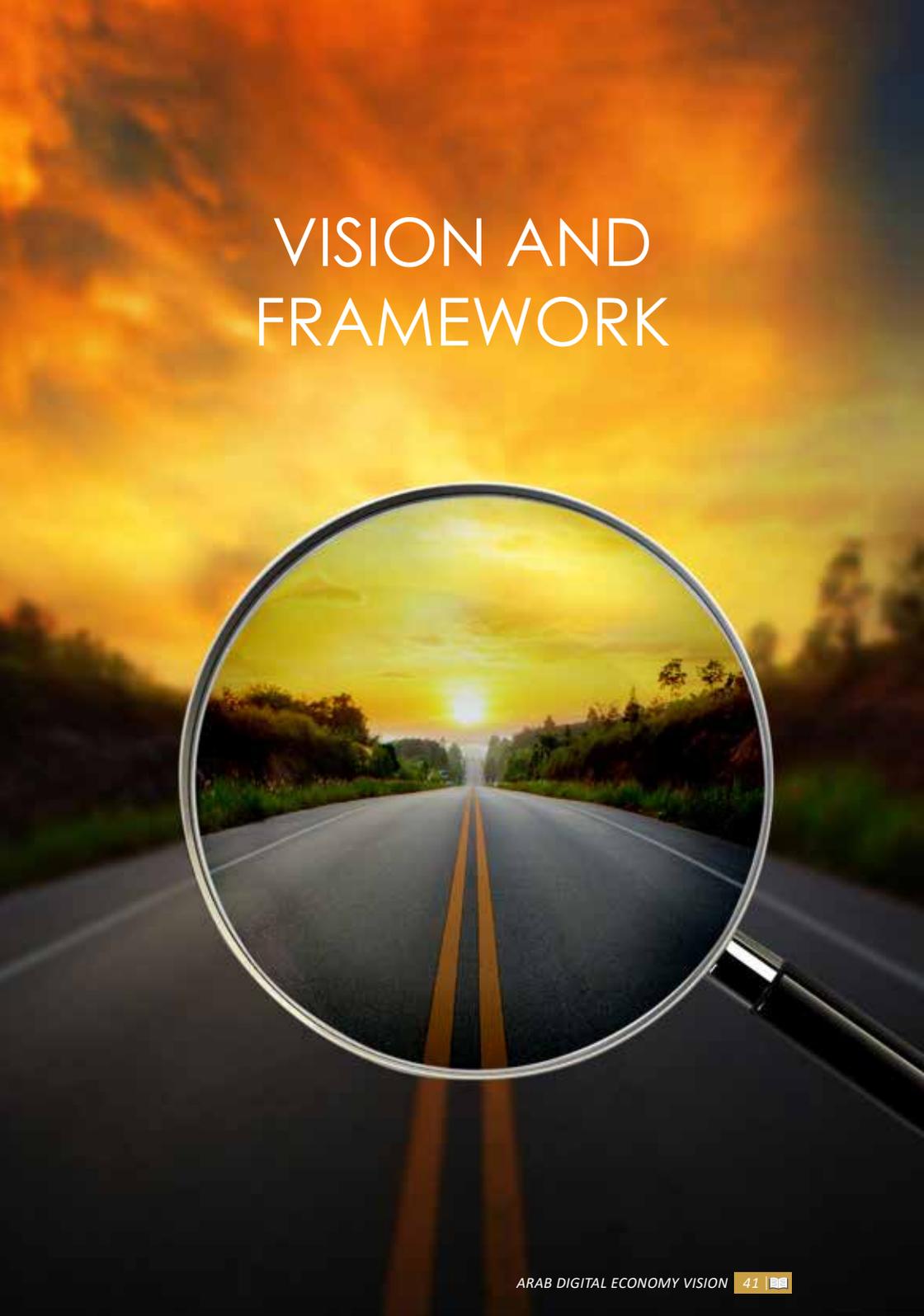
2   Vision and Framework

2.1   Vision Statement

Transform the Arab world into a digitally-enabled economy and advance the region towards a sustainable, inclusive and secure digital future to enable an innovative, empowered and integrated Arab community.

2.2   The Framework

Generally speaking, a digital economy requires a suitable environment to flourish and attain its development goals. This environment consists of an infrastructure that individuals, businesses and governments need for a reliable and widespread access to digital networks and services. The aim is to benefit from digital opportunities and regulations that create a lively business climate and enhance firms' competence and innovation in digital technologies and hyper connected world. Skills are also created that allow workers, entrepreneurs, and public servants to effectively benefit from digital opportunities, in addition to institutions that are accountable to citizens who are empowered through the efficient use of technology[6].

Digital technologies add two further dimensions to the foundations of economic development. Firstly, they raise the opportunity cost of not undertaking the necessary reforms. Secondly, they are perceived as an enabler, and perhaps an accelerator, towards development by raising the quality of services.

The framework of digitization is divided into three main components. First, foundations and pillars that are required to activate the process of digital transformation and ensure its effectiveness. Second, complements that support the success of

the digitization process. Their sustainability helps in reaching the required social and economic impact, which is the third component of this framework[6, 25, 26, 27] (see Figure 2).
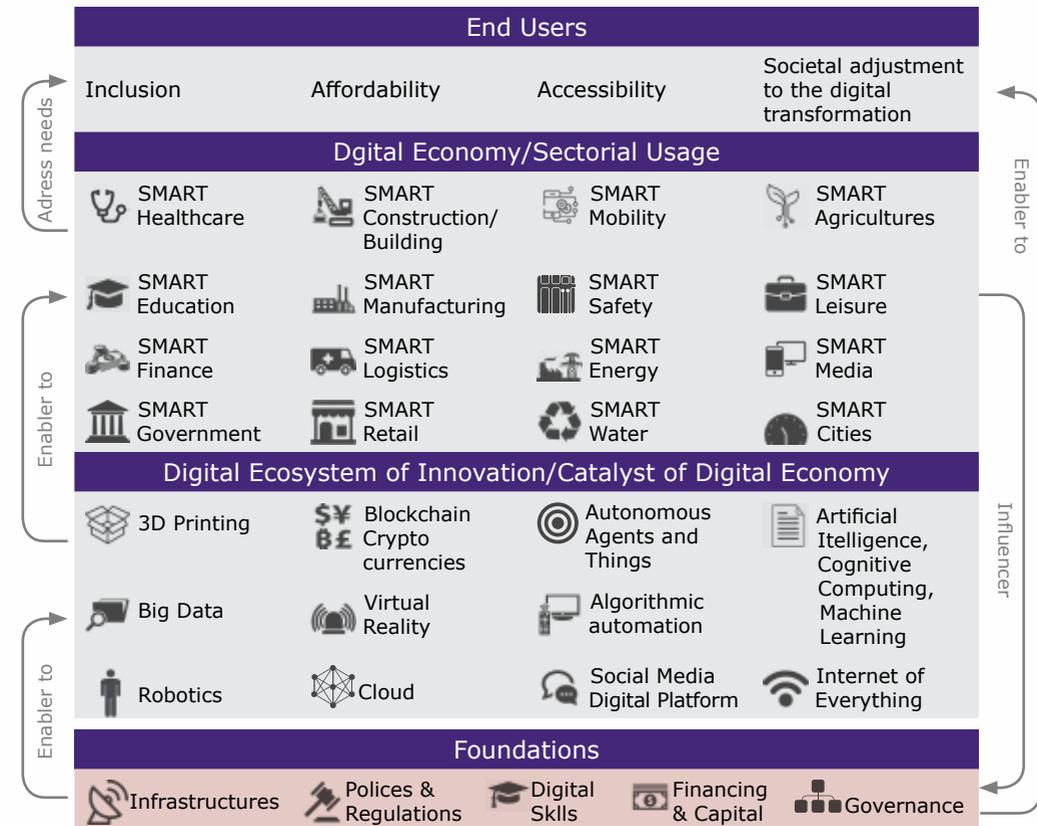
Figure 3   Proposed Framework of Digital Economy

[25]http://www3.weforum.org/docs/GITR2016/GITR_2016_full%20report_final.pdf.
[26]http://dx.doi.org/10.1787/9789264276284-en.
[27]https://www.dinl.nl/wp-content/uploads/2016/11/17112016-Dutch-Digital-Infrastructure-Report-2016.pdf.

2.2.1 Foundations

- **Digital infrastructure:** This includes efficient, reliable and widely accessible broadband communication networks and services, data, software, and hardware. Individuals, businesses and governments need reliable and widespread access to digital networks and services to benefit from digital opportunities. This requires adequate investment in digital infrastructures and competition in the provision of high-speed networks and services. There is also the need for organizational change, including investments in data and other knowledge-based capital to realize the full potential of the digital transformation.

- **Policies and Regulations:** This is a mandatory pillar that supports the development of the digital economy. It includes updates and creates new policy frameworks to promote investment, competition and innovation. It also protects consumer interests and expectations by using new digital solutions.

- **Digital skills:** Access to digital networks provides the technical foundation for the digital transformation of the economy and society, but does not by itself necessarily guarantee effective use. This effective use of digital technologies requires a wide range of skills, including ICT specialist skills, generic ICT skills, STEM+IE (i.e. innovation and entrepreneurship), as well as complementary skills, such as information processing, self-direction, problem solving and communications. These skills interact with the available technology allowing routine tasks to be automated. Workers with the right abilities leverage technology to become more productive. Education systems should have a role in shaping these skills in early stages. Notably, the pace of change is quick, and the types of skills in demand change rapidly. Thus, workers need to upgrade their skills frequently throughout their careers. On the other hand, technology can play a role in shaping three types of skills needed in the modern economy, which include a) cognitive and foundational skills (e.g. literacy, numeracy, and higher-order cognitive skills), b) social and behavioral skills,

and c) technical and technological skills developed through postsecondary schooling or training or acquired on the job, as well as skills related to specific occupations (for example, engineer, IT specialist).

- **Financing and capital:** For digital transformation to occur, budgets need to be assigned based on outcome measurement, performance-based budgeting or results-based budgeting. Thus, governments and businesses need to work on assigning the appropriate budgets to apply digital technologies and reap their gains.

- **Governance:** There are two types of necessary institutions in the process of digital transformation.

  ► Formal institutions, which include laws, rules, and regulations, that facilitate technology penetration and development of business activities. This is through regulations that ensure easy entry and exit of firms and facilitate competition to lower prices and increase coverage and quality, besides an open trade regime that exposes companies to foreign competition and investment. Digitization ready legislations, similar to the Danish approach, further facilitate but do not hinder innovation and use of technology, but rather protect rights and privacy etc. Technology interacts with such rules to create new ideas, such as new methods of producing goods and services. Technology is traded across markets and borders, while most rules are established locally. When it encounters rules that do not match, technology fails to deliver the expected benefits. Barriers to competition, for example, lessen the need of firms to reach for the technological frontier and sometimes prevent new businesses with new technologies and lower prices from entering the market and competing with existing firms.

  ► Informal Institutions, which are socially-shared rules, usually unwritten, that are created, communicated and enforced outside the official channels. In this context, they may include the level of innovation and conditions that allow the digital transformation   level of trust in the digital economy, as well as digital security and awareness to flourish.

2.2.2 End users

- **Inclusion:** By reducing the cost of acquiring information, making more information transparently available, providing secure systems, and encouraging legal frameworks, digital technologies can make new transactions possible and people could easily access services that previously were out of reach. Digital and financial inclusion can be promoted by improving digital literacy.

- **Affordability:** Governments and businesses need to provide digital goods and services at affordable prices to citizens.

- **Accessibility:** Making the digital technologies universally accessible should be a global priority. Individuals, businesses (including small and medium-sized enterprises (SMEs)) and governments need reliable and widespread access to digital networks and services to benefit from digital opportunities. Through inclusion, efficiency, and innovation, access provides opportunities that were previously unreachable by the poor and disadvantaged.

- **Societal adjustment to the digital transformation:** Society is quite affected by the digital transformation in several ways. On the one hand, automation may reduce employment in some occupations while job platforms may increase non-standard jobs i.e. short-term, part-time or low-paid jobs, and widen the gender wage gap. On the other hand, e-services, particularly e-health, may help society to address the challenges of the aging population and increasing social expenditures.

2.2.3 Technologies and Digital Concepts as catalysts of digital economy

The digital economy is based on a set of emerging technologies that disrupt the traditional business model and introduce new innovative alternatives. Below is a description of eight examples of these emerging innovations such as:

- **Distributed ledger technologies / blockchain**

  Distributed ledger technology (DLT), also commonly referred to as blockchain technology, is a new technology of storage and transmission of information, transparent, secure, and functioning without a central control body. By extension, a blockchain is a database that contains the history of all the transactions between its users since its creation. This database is secure and distributed meaning that it is shared by its different users, without intermediaries, which allows everyone to check the validity of the chain. Blockchain by its functionalities ensure the delivery of Trust, Transparency and Immutability as key benefits.

- **Big data analytics**

  The digitization of day-to-day activities has dramatically increased the amount of data available, creating extremely large and complex data sets commonly referred to as big data. By big data is meant all the digital data produced by the use of new technologies for personal or professional purposes. This overlaps with corporate data (e-mails, documents, databases, business process histories etc.) as well as data from sensors, content published on the web (images, videos, sounds, texts), e-commerce transactions, exchanges on social networks, data transmitted by connected objects (electronic tags, smart meters, smartphones ...), geolocated data, etc.

• Internet of things

The IoT characterizes connected physical objects that have their own digital identity and are capable of communicating with each other. This network creates a kind of bridge between the physical world and the virtual world.

From a technical point of view, the IoT consists of the direct and standardized digital identification (IP address, SMTP protocols, http) of a physical object using a wireless communication system that can be a chip Radio-Frequency Identification (RFID), Bluetooth or Wi-Fi. The IoT can provide rich information regarding individuals' behaviors. Thus, the resulting data can be used for increased tailoring of products, risk profiling and pricing.

An example of the IoT applications can be Smart Cities. As the Internet of Things is growing and rapidly spreading everywhere today, from industrial applications to emergency services, public transportation, public safety, city lighting and other smart city applications. Due to IoT technology advancements, municipalities are becoming more and more connected in an effort to increase the efficiency of infrastructure installations, improve reliability and responsiveness of emergency services, cut costs and more. In fact, "smart cities" could be considered a collection of industries that includes city lighting, city transit, waste water management, emergency services, traffic management and more.

A "smart city" is an urban area that uses different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services. The Internet of things (IoT) has given rise to the smart home and

smart office, with automated, Internet-controlled devices like thermostats, security systems and connected home speakers. Now, urban areas around the world are investing in IoT to create smart cities, which are designed to improve efficiency and quality of life through data and technology.

The smart city concept integrates information and communication technology (ICT), and various physical devices connected to the network (the Internet of things or IoT) to optimize the efficiency of city operations and services and connect to citizens.

• Cloud computing

Cloud computing is a revolutionizing concept that allows the storage of data or software on remote-located servers that is usually stored on a user's computer, or even on servers installed in a local area network. This virtualization of resources allows the company to access its data without having to manage an IT infrastructure, which is often complex and includes a cost to the company. Also, Cloud computing knows a new shift toward Hybrid and Multi-Cloud and not restricted to remote server storage.

Cloud computing is considered a major evolution of computing that allows access to data and software from anywhere in a secure way. Cloud-based services provide cost-efficient and relatively easily scalable on-demand processing and storage capacity for data. Cloud technology has greatly increased the capacity of financial institutions to collect and analyze data, thereby facilitating the growth in data analytics and their various applications.

- **Artificial intelligence**

  AI is the scientific field that deals with the research, design and implementation of intelligent machines. It combines the computing science with applied mathematics. It focuses on machine learning patterns by using a range of different characteristics of human intelligence such as recognition, understanding, learning, problem solving, reasoning and decision making.

  Machines are trained with historical data to recognize patterns and classify new data. Through advanced algorithms a machine can learn patterns with new experiences to improve its performance. However, the machine is not learning entirely on its own; rather, the learning process requires a significant level of human input to make sure the data is interpreted correctly.

- **Biometric technologies**

  Biometric technology is the science that deals with the analysis of the physical or behavioral characteristics specific to each individual, allowing the authentication of his or her identity. Biometrics means "measurement of the human body". There are two categories of biometric technologies: physiological measures and behavioral measures. The examples of biometric techniques that are now used for verification include fingerprint scanning, voice authentication, face recognition, iris scanning, and gait recognition.

- **Augmented/virtual reality**

  Augmented and virtual realities provide new ways for consumers to perceive or interact with their environment. The difference between the two is that augmented reality provides an enhanced view of the actual physical world in which individuals find themselves, whereas virtual reality creates a simulated world.[28]

- **Open application programming interface (APIs)**

  An open API is commonly defined as an API that uses a common or universal language or structure to allow interface or integration between different applications. In general, an API allows developers to use a specific software product in various ways, for example, fitting it into third-party projects.

  The open APIs allow the creation of a robust ecosystem. APIs are enabling financial firms to offer new products to customers by using other firms as a distribution channel. Open APIs are creating ease of integration, ease of connectivity, and ease of distribution.[29]

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[28]https://www.oecd.org/finance/private-pensions/Financial-markets-insurance-pensions-digitalisation-and-finance.pdf
[29]https://www.capgemini.com/wp-content/uploads/2018/02/world-fintech-report-wf-tr-2018.pdf

STRATEGY INPUT

This chapter describes the main inputs used to develop the strategy.

The chapter is divided into three sections as follows:

- **Sectoral benchmarks**

- **International benchmarks**

- **Arab countries current situation**

3.1 Sectoral benchmarks

In the following part, an introduction for the sectoral benchmarks is presented and selection criteria of a set of sectors (healthcare, manufacturing, education, and financial services) are provided, based on a selection methodology that will be discussed.

For each of the selected sectors, a certain scheme was followed:

1. Reasons: Why the benchmarked sector is selected

2. Impact: Some key facts about the sector and how digitization influences it

3. Best Practices: Examples of the best practices in the sector

4. Key lessons learnt

Sector	Contribution in the Global GDP	Contribution in the Arab World GDP	Digital Readiness	Employment Rate Per Sector
Financial Services	15%	12%		6%
Construction	6%	6%		3%
ICT	6%	3%		2%
Manufacturing	16%	11%		9%
Mining & Quarrying	5%	6%		1%
Health	10%	7%		13%
Hospitality	3%	3%		10%
Education	5%	5%		3%
Arts & Entertainment	2%	1%		1%
Wholesale & Retail	6%	6%		14%
Utilities	2%	3%		2%
Ag, forestry & fishing	4%	5%		24%
Other	19%	31%		34%

Figure 4 **Economy Sectors, Digital Readiness and Employment Rate**

Selection criteria for benchmarked sectors

A detailed study is conducted in order to select priority sectors for digitization in the Arab countries. The study resulted in selecting the following sectors for the initial/pilot transformation: Healthcare, manufacturing, financial services, and education. Of course, one cannot neglect some other sectors such as agriculture, which, as indicated above, plays an important role in the economies of most of the countries in the Arab region. However, the agriculture sector does not have the potential or the ability to be digitized through its value chains and have a quick short-term impact and a strategic long-term impact.

The main criteria of the sectoral selection were based on the following reasons:

a. Their large contribution to the global GDP, with around 47% of the overall sectoral contribution.

b. The large contribution to the Arab countries' GDP, with around 38% of the overall sectoral contribution to the Arab world GDP.

c. How digitization enhanced the outputs of each of the selected sectors.

d. The potential and ability (or even the existing infrastructure) of these sectors to be digitized through their value chains and have a quick short-term impact and a strategic long-term impact.

e. The existing positive impact in terms of programs and initiatives that relates to digitization in each of these sectors value chain.

Financial services

The financial services sector is the second major contributor to the global GDP, comprising about 15% and around 12% of the Arab world GDP. The continuing developments in telecommunications and computing technology - whether on the global scale or the Arab world scale - have been a vital force in the transformation of finance. They have greatly improved quality and processing speed and helped to lower information costs and other costs of transaction. These developments have had implications for both providers and users of financial products and services.

The financial services sector is the highest-spending industry in means of investment of information and communications technology. It was the first to digitize key transaction processes like electronic transfer of funds, securities trading and clearing, and interbank settlement. Lately, there is an effort to digitize the front office, starting from traditional retail and call center activities to fully automated online processes by which virtually every aspect of retail and home banking is fully digitized. Also, the emergence of smart ATMs and online banking solutions has further enhanced convenience and service delivery efficiency.

But then comes the question, what is the ultimate goal of transforming such a sector?

Financial inclusion stimulated by financial technology or FinTech, clearly illustrates the positive feedback between finance and the economy. It is the bridge between economic opportunity and outcome. If people in the Arab countries gain new access to financial services through FinTech, they will gain opportunities to expand business such as e-commerce and e-learning, which are currently hampered by constrained access to payment services. In this manner, FinTech is expected to contribute to the Arab region economic development. Governments could also benefit from blockchain's transparency and security, and their relation to cost savings, which can come from auditing and enforcing smart contracts and avoiding fees that can be associated with other payment methods.

Digitizing the financial sector in the Arab region has great potential for the following reasons:

- FinTechs are not only good in developing new technologies, but they are good at fixing business problems thus creating a better citizen experience.

- FinTechs make financial services and financial technology accessible for the "underbanked" in the Arab countries, especially in countries like Yemen, Libya and Palestinian Territories which will help make small businesses more sustainable.

- The transparent and real-time operation of financial services innovations, such as blockchain and digital currencies, are generating new value streams, not just in financial services but across the economy.

- Digitized financial services unleash a new era of competition, innovation and job-creating productivity in many different economies and markets across the Arab region.

- Arab governments, authorities, and businesses receive structured access to almost unlimited data. This is not about old-style data mining, but deep learning that permits previously unimagined insights and information that in turn allows more individualized products and services, and more efficient markets and systems.

- Modernized financial services are allowing people to conduct transactions through their mobile phones or tablets (digital wallets), improving efficiency and customer experience.

- Innovative financial services such as robot-advice (which is already implemented in some banks in different Arab countries) have the potential to extend financial advice beyond high-net-worth individuals (HNWIs) and more sophisticated investors, to a wider cross-section of the community.

- All transactions will be safe and transparent. This will assist governments in achieving financial inclusion to ensure social fairness and justice, deliver support for those in need, collect required taxes systematically, and expose all economic deviations.

Best practices in FinTech

- **Innovation hubs and regulatory frameworks** are emerging as key components of governments' efforts to support the development of FinTech and help new businesses understand how existing regulation applies to their ideas.

- **Innovation hubs** are emerging as key components of governments' efforts to support the development of FinTech and help new businesses understand how existing regulation applies to their ideas. FinTech ecosystems have stimulated technological innovation, made financial markets and systems more efficient, and improved the overall customer experience. Components that contribute heavily to the success of this ecosystem, include market, capital, government, regulation, talent and infrastructure.[30]

- **New York FinTech Innovation Lab** is a concrete example of a lab that fosters innovation in the financial sector. The lab is a mentoring program, designed to help FinTech entrepreneurs engage with finance leaders. Companies coming out of the lab have raised tens of millions of dollars in financing, with some companies achieving substantial valuations.

- Access to funding at all stages is critical for FinTech's growth and development. For this purpose, a wide range of government FinTech-specific initiatives have been developed to help FinTech startups gain access to business loans and attract local and foreign investments. UK Angel CoFund and FinTech Steering Group serve as key examples of the implementation of such

programs.[31] In addition to that, numerous tax initiatives have been announced for the creation of a conducive business environment.

Lessons learnt from financial services benchmark study

1. **Using digital finance services to improve financial inclusion**
   Financial inclusion means the opportunity for low-income groups to have affordable access to basic financial services. Inclusive financial systems are important because they contribute towards alleviating poverty and promoting a country's broader economic development. The focus on financial inclusion has sharpened and intensified in recent years following the G20s adoption of financial inclusion as one of its main policy goals.

   Digital financial services (DFS) provide an accessible and affordable entry point into financial systems for many unbanked and under-banked people and have consequently been the focus of those developing inclusive financial systems. DFS refers to the broad range of technologies available to deliver financial services from a broad range of providers to a broad range of recipients.

2. **Building consumer trust**
   In order to build consumer trust in DFS, there needs to be clear and transparent new products (newly introduced technologies) disclosure. The products need to be kept simple and relevant to users' needs and there must be consumer education on how to use new products as and when consumers are using the products.

3. **Developing enabling legal and regulatory frameworks**
   Financial regulators in the Arab countries must be firmly involved in both their traditional policy objectives of promoting

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[30]https://assets.kpmg.com/content/dam/kpmg/uk/pdf/2017/10/value-of-fintech.pdf

[31]https://www.ey.com/Publication/vwLUAssets/EY-UK-FinTech-On-the-cutting-edge/%-24FILE/EY-UK-FinTech-On-the-cutting-edge.pdf

safe and efficient financial systems and promoting financial inclusion. In particular, regulators must develop enabling legal and regulatory frameworks, which support the use of DFS for financial inclusion. They must include new participants who introduce innovative methods using DFS to reach the unbanked and under-banked countries like Syria, Yemen, and Iraq.

4. **Strengthening financial literacy and citizen/consumer protection frameworks**
   Citizen protection frameworks can be strengthened and supported by ensuring that roll-outs of new DFS are accompanied by sound financial literacy programs. Financial literacy programs should be designed around educating the customers at the point when they are first using the product or service. In order to build citizen trust and retain it even in case of negative experiences, education should focus on the cost of using the service and identifying for the citizen available compensation mechanisms.

Manufacturing

Digital technologies can bring dramatic changes to the world of manufacturing and offer opportunities to innovate and increase output (European Commission, 2015). They create new production technologies, new materials and new ways of storing, processing and sharing data. New manufacturing devices, such as 3D printers, speed up product development cycles and make new collaboration processes possible. By supporting rapid prototyping and customization, with fewer errors, they enable faster access to the market. Finally, digitization affects the way companies operate in a competitive environment.

Manufacturing comprises about 16% of the global GDP. It is the first and most important major contributor to the global GDP and is a massive contributor (about 11%) to Arab GDP. The digitization of manufacturing enhances the methodology of how products are designed, fabricated, used, operated, and serviced post-sale as it enhances the operations, processes, and energy footprint of factories and the management of manufacturing supply chains.

The application of smart manufacturing is expected to create USD 1.2 to USD 3.7 trillion of value worldwide by 2025. This comes in many forms, such as:

a. Operational efficiency
b. Predictive and preventative maintenance
c. Supply chain management
d. Inventories and logistics management

Below are the reasons why digitizing manufacturing is relevant - and even likely to be revolutionary - for the Arab economies:

1. It eases current challenges and obstacles facing the Arab manufacturers: The smart manufacturing vision provides recommendations on how Arab manufacturers can ease challenges. The digitization of the whole product lifecycle will allow manufacturers to use data from production, service, and social media which will lead to faster product improvements. Smart items will bring stronger integration between top floors and shop floors and thus more intelligence and flexibility to production. With these technologies, manufacturers can react faster to demand changes and implement new configurations easier or even re-plan production much faster.

2. It leads to an innovation economy: Digital chains will not only improve efficiency but also speed up innovations as new business models can be implemented much faster.

3. It puts the Arab citizen/consumer in the center of all activities: Today's consumers demand individual shaping in the provision of products and services. At the present time changes in the Arab consumer's behavior and demand is becoming quick and diversified as never before. Smart items, products and machines will enable Arab manufacturers to get down to lot size one and produce customized products without extra cost.

4. It puts workers in the center of production: As manufacturing facilities are becoming smarter, the work in production lines will be enriched and humanized. Simple manual tasks will disappear. Workers will become coordinators who ensure a smooth production and only intervene when a machine calls for action. Flexibility will be a key success factor. Workers will be assigned where help is needed. This will be demanding in terms of managing complexity, problem-solving and self-organization. At the same time, the work force will become more flexible.

5. It will enable sustainable prosperity: Old models of industrialization will run out. Economies and with them societies, will increasingly recognize the risks of globalization, job losses and resource shortages. Generating profit and realizing growth have to be put into a more long-term perspective, for example by finding ways to cope with constraints on energy, resources, environment, and social and economic impacts. Digitized manufacturing can help find solutions to these challenges. If it is smart and innovative, production can reduce energy consumption, help manufacturers in all the Arab countries to sustain their business with existing and new business models and use new technologies to produce more efficiently and sustainably.

Best practices in digital manufacturing

The majority of governments have made industry 4.0 a priority in order to increase productivity and competitiveness of the work-force. Government efforts are not only limited to providing support to the manufacturer but also to encourage wider adoption of technologies.

- A network of test labs has been developed for the integration of enterprises, industry bodies, government, academic and labor organizations. The concrete example of this test lab program can be found in the report "Industry 4.0 Test labs in Australia Preparing for the Future" where government plans to create a test lab which will act as a bridge between research and industry partners.

- A network consisting of ten field labs has been established as part of Dutch smart industry initiative in order to provide practical environments for the purpose of designing, testing and deployment of technological solutions. Similarly, Sweden's "produktion2030" main activities are based on setting up a Ph.D. school in order to provide production developing courses at master's level. In Germany, a network of competence centers has been set up in order to raise awareness, provide training for business leaders and offer hands on approaches for testing digital transformation in allocated demonstration factories. Some of these initiatives have attracted significant amounts of investments. In Italy, Under the Piano Nazionale "Industria 4.0" initiative, an investment of **USD 200 million** (EUR 200 million) has been made for the establishment of I4.0 competence centers and an additional **USD 268 million** (EUR 240 million) will be allocated for the strengthening of technological clusters "Fabbrica Intelligente" and "Agrifood".

- The European Commission launched on 19 April 2016 the first industry-related initiative in which building on and complementing the various national initiatives for digitizing industry, such as Industrie 4.0, Smart Industry and l'industrie du futur, the Commission will be enforced along five main pillars. These include use of policy instruments, financial support, coordination and legislative powers to trigger further public and private investments in all industrial sectors and create the conditions for the digital industrial revolution.

Lessons learnt from the manufacturing benchmark study

1. **Use industry 4.0 to accelerate operational improvements**
   Industry 4.0 comprises multiple digital technologies that are reshaping production and facilitating the digitization of core processes. Arab governments should implement these technologies to accelerate the business impact of operational improvement programs, such as lean management. In fact, frontrunners do not typically regard digitized manufacturing as a new production paradigm, but rather as a lever to maximize and accelerate the benefits of other programs. Through our

benchmark study, we found out that implementers most commonly make processes more efficient and then deploy digitized technologies or industry 4.0 within these processes to maximize performance and sustain it at a high level.

2. **Integrate new and existing capabilities and technologies**
To implement digitization in the manufacturing sector effectively, Arab governments must develop a new, nontraditional set of capabilities and integrate them with their existing ones. But adding capabilities can pose challenges. To integrate new and traditional capabilities, stakeholders often need to first change the mindset of the citizens and workers so that they are more receptive to pursuing new technologies and opportunities.

3. **Manage information architecture as a critical enabler**
To capture the benefits of digital technologies, stakeholders must manage their information architecture effectively. There are many examples that demonstrate the critical role played by information architecture in enabling the successful digitization adoption of manufacturing, such as integrating legacy systems, migration to the cloud, and building cyber-resilience.

4. **Thoughtfully design the transformation roadmap**
Implementers must recognize that an Industry 4.0 transformation is a long journey that requires a systematic approach. First, implementers need to understand the value of making the change, while assessing the current state of systems and operations. On that basis, implementers define a fixed transformation roadmap and vision, in which they have to take into consideration the need to improve existing processes and expand capabilities along the value chain.

5. **Approach digitized manufacturing as a change management project**
The adoption of Industry 4.0 requires a sophisticated approach to change management, involving many functions at a site, and an implementation approach across multiple plants.

https://www.maximizemarketresearch.com/market-report/global-ehealth-market/3243/

Healthcare

Healthcare represents about 10.4% of the global GDP and is the third major contributor to it. **Global eHealth Market** is expected to reach US$ 161.30 Billion by 2024 from US$ 31.52 Billion in 2016 at CAGR of 12.68%. The healthcare digital transformation in the Arab region will create value for all stakeholders, whether governments, healthcare providers, professionals, or patients. For the Arab governments and society, the primary benefits of digital transformation are likely to be improvements in healthcare access, quality and affordability. For industry players, digitization can add value through enhanced revenue generation, capital efficiency, cost optimization and productivity.

The question is why to implement e-health in the Arab countries?

The advantages of the e-health services could be summed up as:
- Improved quality of care
- Better planning and resource allocation
- Cost efficiency - more efficient health landscape
- Enhancing the evidence base for health service delivery and policy making
- Real-time monitoring
- Providing better, tailored and personalized services

Table 2	Implementing e-health systems through the established strategy in the Arab countries: Examples of potential areas for saving costs and increasing efficiency

Patient issues	Opportunities for reducing costs and increasing efficiency
Patient registration	- One-time registration - Information available on subsequent visits - Serves multiple purposes (e.g. vital statistics registries in addition to care)

Creation of persistent record	• Improved speed and efficiency of care delivered • Information base developed for a wide variety of direct care and administrative uses • Data is entered once
Payment for services	• Streamlined automatic billing, payment system • Documentation of billing, payment actions
Remote diagnostics	• Reduction of clinic visits • Saves time for patient • Improved patient triage • More efficient use of time of skilled health workers
Referrals	• Efficient access to closest available resources
Scheduling follow-ups	• Automatic messaging to public and providers
Disease surveillance	• Enables real-time surveillance, resource allocation
Public information	More targeted distribution of information
24x7 call centers	Decreased need for in-person clinic visits
Administration issues	
Performance review	• Easier and more timely aggregation of data by factors
Staff communications	• Voice and data communications increase efficiency
Staff management	• Ability to mine data to monitor staff performance through various filters, including at the individual or aggregate level • Ability to supervise staff in real-time
Staff training	• Combination of physical and e-training may provide efficiencies over the current traditional models
Payments	• Operations and record keeping efficiency • Fraud protection
Supply chain management	• Avoiding stockouts • Fraud protection, e.g. fake medicines

Best practices in e-health

• In countries such as Japan and China surgical robots, AIs and machine learning techniques are assisting clinicians in a wide range of medical diagnosis.

• In Denmark, the "Once Only" practice used in MedCom program was efficiently implemented to exchange data between different actors in the healthcare system such as lab test results, blood group, health records, etc. Any doctor can quickly asses a new patient without having to repeat all previous tests. This can be crucial in an emergency or when someone needs to be treated abroad.

• Numerous e-health initiatives by governments are focused towards extending support to health care startups. Numerous best practices and initiatives were applied to these thematic areas: Electronic health record (EHR), telehealth, m-health, e-learning in health, big data analytics in health and legal framework. EHR system allows for the diagnosis and the treatment of patients through provision of fast, extensive and timely information at the point of care.

• UK "united4health" project is aimed at providing innovative health care services for the remote monitoring of patients with chronic diseases. "Patient@Home" program is focused on providing in-home treatment for the optimization of data systems.

- Cardiology centers in Georgia have reduced the need for continuous monitoring of ECG through the use of heart-monitoring device to record abnormal heartbeats and hypertensions remotely, which are then sent to the mobile phone via Bluetooth technology.

- Health analytics have made it possible to draw insights, make recommendations and provide assistance in complex decision-making process. Big data has opened new research domains for the treatment of Alzheimer disease and dementia. Predictive analytics have allowed health practitioners to detect patient deterioration and disease in early stages.

- Robust legal framework plays a key role in the successful delivery of quality health services and generates patient trust in e-health.

Lessons learnt from the healthcare benchmark study

1. **Focus on training prior to implementation**
   The introduction of the EHR or any other digitized technology into the healthcare sector will be met with resistance from clinicians because it disrupts their workflow, and the benefits of the technology will not be clear to the users. Arab governments can work so long and hard with EHR vendors on implementation and training, but gaps would remain.

   As a result, before implementing any new technology, stakeholders should allow those who will be using the tool to become accustomed to using it.) In addition, they need to provide hands-on training, clarify the purpose of the technology, and highlight the benefits it will yield for the citizen.

2. **Embed the new technology into the sector's culture**
   Governments and ministries of health in the Arab region can design a digital transformation effort to the tee, but if the sector and its components do not possess a culture of innovation, the effort will be worthless.

The healthcare industry as a whole is relatively resistant to change because clinicians tend to subscribe to evidence-based reasoning. If they cannot see exactly how a new tool or process will help them take better care of patients, they might not believe it is worth implementing. This mindset has been a fundamental obstacle in the digital transformation in healthcare.

3. **Ensure the technology fulfills its promise**
   When embarking on digital transformation, make sure the new technology fulfills its full potential. If not, consider supplementing the technology with a tool to help users navigate it more effectively. For physicians, this is the critical difference that ensures technology will never be an obstacle to quality care.

4. **Make sure support is continually available**
   A digital initiative may have a specific start date, but the end date is not as clear. It takes time for users to acclimate to a new technology system. Therefore, learning should extend beyond the implementation period.

   In healthcare, clinicians who struggle to use an EHR or a specific technology not only feel overwhelmed and stressed, but they can also contribute to coding and billing errors, resulting in lower revenues and a worse patient experience.
   By offering continual support, one can quell resistance among users and empower clinicians to perform at an optimal level.

Education

The role of educational technology in teaching and education system is of utmost significance due to the advent of information and communication technology (ICT) in our daily lives. One cannot deny the importance of education in the development of communities, but education also plays an important role in the economy with a considerable 5% contribution to the global GDP expenditure, as well as a 5% contribution to the Arab world GDP. Education technology is the systematic and organized process of

applying information and communication technology to improve the quality and efficiency of education. E-learning is one of the key aspects of e-education which is rapidly changing the education landscape. The research firm Global Industry Analyst projected that e-learning industry would reach USD 107 billion in 2015, and it did.

The role of ICT in education can be summarized in the following points:

1. Develop a variety of educational services.

2. Promote equal opportunities in the Arab region to obtain education and information.

3. Develop a common system of collecting and disseminating educational information.

4. Promote technology literacy and support distance learning in remote areas in some Arab countries.

5. Help in improving innovative teaching skills and enhancing the classroom teaching experience.

6. Act as an assisting tool for teaching and learning itself.

7. Help in building some medium between teachers and students for better communication. ICT can fill the gap between teachers and students and play an important role in student evaluation in the Arab countries.

Best practices in e-education

- Due to technological innovation, the education sector is experiencing rapid transformation. Integration of online technologies into the education sector not only provides opportunities to learn anywhere but also offers a great deal of flexibility to non-traditional learners.

- The development of comprehensive national frameworks acts as a blueprint for institutional actions and will enable the integration of new modes of learning and teaching into educational programs.

- Acquiring digital skills for teaching and learning is fundamental for the adoption of these technologies. UNESCO, in partnership with Cisco, Intel, International Society for Technology in Education (ISTE) and Microsoft, has developed an ICT competency framework for teachers detailing the competencies that teachers need in order to integrate ICT into their practice and professional development.

- E-Campus is a five-year program, funded by the Norwegian ministry of education, that focuses on making technology available for the Norwegian higher education sector to make their teaching and research better, more effective and more available across organizational and geographical barriers. The Swiss Virtual Campus (SVC) program is an eight-year targeted initiative to promote e-learning in Swiss higher education institutions.

- The European Association of Distance Teaching Universities (EADTU), in collaboration with the European Association for Quality Assurance in Higher Education (ENQA) and the European Foundation for Quality in E-Learning (EFQUEL), are undertaking a project to support supporting quality in e-learning which seeks to promote excellence in the use of ICT in higher education.

- The use of IoT in education makes the learning experience more engaging and authentic. Educational institutions are working in collaboration with cultural organizations, governments and businesses to link people, process, data, and things to maximize the relevance of education and to provide skills to the next generation within the Internet of Everything (IoE) framework.

Lessons learnt from the education benchmark study

1. **Improving access and equity to narrow the digital divide**
   To narrow the digital divide, ICT in education policy should complement other government initiatives, such as public education in ICT, donation of computers and provision of free Internet access.

2. **Creating ICT vision and strategy in educational entities**
   The vision and strategy for ICT in schools should not be created by a single person or through a top-down process starting from ministry of education. Sometimes schools do not have their own ICT vision and plan as the ICT infrastructure and training are generally directed and given by the ministry. The school-level vision and plan (if available) are usually established by individual school principals. The school board takes all decisions on the purchase of ICT tools, a procedure that is usually met with some resistance from the teachers as they do not always share the same vision as the principal or the ministry nor do they feel a sense of ownership of the plan.

3. **Educational entities should be given some autonomy to select ICT resources that are most suitable to the needs of instructors and students**
   Every school or entity is different from the other and each one should be given autonomy to select ICT resources that are most suitable to the needs of teachers and students. ICTs should not be put into place just for sake of using newer or latest technologies. Entities should be provided with basic technology infrastructure and given the autonomy to decide on the kind of ICT resources and tools that they should acquire, based on their vision and analysis of their students learning needs.

4. **Translate ICT policy into a set of educational entity-level regulations and procedures**
   Translate ICT in education policy and laws into a set of school-level regulations and procedures to provide a clear blueprint for the schools on the use of ICT. These policies and procedures should be in line with existing laws governing ICT at the national level.

5. **Education curriculum reform to integrate ICTs into content**
   There has been a number of changes in ICT education due to the introduction of ICT-related educational reform. In several Asian countries, a new ICT curriculum has been made compulsory from primary thorough secondary school. ICT has been integrated in the curriculum as a tool for developing decision making, critical thinking and communication skills.

6. **Ensure sustainability**
   Empower educational entities to look for their own funds and identify expertise to promote sustainability. Prepare and disseminate guidelines on how to secure funds. The preparation of guidelines ensures that entities with adequate financial means can proceed on their own initiative, while complying with existing rules and regulations.

Wholesale and retail - commercial sector

E-commerce is considered a crucial digital sector due to the perceived benefits it can add to the local firms on the country scale, and the overall economy of the Arab region. It is important to note that the wholesale and retail sector has a major contribution to the overall global GDP with 5.5%, and 6% contribution to the Arab world GDP.

One can simply say that e-commerce causes cost reduction and improved efficiency. If implemented properly, it will lead to lower prices for goods and services, causing Arab markets to be more competitive. It will lead to improved efficiency, particularly in procurement by automating processes and improving the management of the procurement function.

E-commerce will allow procuring firms and individuals to purchase more widely and gain extra choices. It will allow selling firms to sell into new geographic markets and into unreachable markets that would otherwise be uneconomic to serve.

Investments in digital commerce and e-trade will have a huge positive impact domestically and in the region. Domestic investments in e-commerce will enable national IT firms to gain technical and commercial expertise that will differentiate them in export markets for IT services. The improved efficiency and reduced costs from e-commerce will lead to a small increment of growth in the economy and this will lead to some additional employment, first in the IT sector, but subsequently in other sectors of the economy. By its nature an e-commerce strategy is wide ranging, covering many areas of the economy. It has components in technology, the law, transportation, logistics and postal services, utilities, education, customs, financial services and taxation, and the creative industries such as those associated with developing catalogues for goods or services. E-commerce services are potentially used by all sectors of the economy.

E-commerce can be a pillar of the Arab region economy. One can summarize some of its advantages in the following:

- **Regional marketplace:** By enabling the Arab countries e-commerce, businesses will have access to citizens, not only on the regional level, but also on the global scale all around the world, just like the case of EU.

- **Operational cost saving:** The commercial processes associated costs will be significantly decreased, especially on the long term as the costs of creating, processing, distributing, storing and retrieving paper-based information will be decreased.

- **Mass customization:** For economies of scale, e-commerce has revolutionized the way consumers buy goods and services. The processing allows for products and services to be customized to the citizen's requirements.

- **24/7 access:** E-commerce enables citizens to shop or conduct other transactions 24hours a day, all year round from almost any location in any Arab country, which will make a significant increase in accessibility for the laggard countries.

- **Improved delivery processes:** This can range from the immediate delivery of digitized or electronic goods to the on-line tracking of the progress of packages being delivered.

- **An environment of competition:** E-commerce will eliminate monopolistic markets.

- **Connects citizens:** Enables citizens in the Arab countries, both in urban and rural areas to access products, services and information.

- **Facilitates delivery of public services**
  Implementing e-commerce systems through the established strategy in the Arab countries can be crucial and beneficial, as it will have the following impact:

1. E-commerce platforms will increase the number of Arab retailers that sell online within countries of the Arab region and worldwide.

2. E-commerce will help stimulate wholesale and retail business startups.

3. It will improve citizens' access to goods and services, and as result, will reduce the cost of goods and services for Arab citizens.

4. The available range of goods and services will be extended for citizens, especially for those in remote and rural areas.

5. It will extend the volume and profitability of domestic retail business across the Arab region.

6. There will be an increase in the number of businesses that use e-commerce for business to business (B2B) trading within the Arab region and worldwide.

7. The efficiency of operating supply chains will be increased in Arab countries.

8. If the Arabs e-commerce platforms are compatible with those in the EU and other global platforms, this would extend the reach of Arab countries in existing international markets and reach new international markets.

9. The efficiency of the procurement of goods and services will be increased for public and private sectors.

Best practices

We categorized the best practices into supporting e-commerce, improving information and transparency, promoting interoperability, enhancing customer protection and innovating delivery.

- "Choice in ecommerce" is an initiative by Berlin against online trade sales and ban to ensure that e-commerce remains free and fair for all types of sales and retail businesses. Since SMEs are a key pillar for e-commerce, several best practices are targeted towards creating conducive a environment for SMEs. Programs such as "eStep SMEs" and "Mittelstand-Digital" provide modular solutions for SMEs to incorporate e-business standards into their value chain as well as to provide software-based solutions for seamless and simple export process.

- "Log4green" is a program initiated by the EU which aims to strengthen the logistic research network at regional level by providing a set of technological approaches and developing educational programs in the logistics and transport sector. "European e-business support network for SMEs (eBSN)" program creates a network for e-commerce stakeholders in public authorities and research institutions.

- "E-freight integrated project" offers a platform which acts as a testbed for the design, development, deployment and maintenance of e-freight solutions in real business cases and pilots. Similarly, "IPC e-commerce Interconnect program" fosters cross-border cooperation between national postal providers through the facilitation of tracing and tracking of process for e-commerce stakeholders.

- "A Pan-European network of e-commerce trustmark" initiative aims to improve the international credibility and overcome language barriers of national trustmark by establishing harmonized certification criteria for all national trustmarks across the European region. In addition to that, "European consumer centers network" offers free consumer and support advice to EU residents who are purchasing goods and services from a trader based in another country. Qatar's "Qbuy" platform supports merchants and SMEs in accessing knowledge/learning resources and provides online tools on-demand support and funding.

- "Citylog" initiative by EU aims to increase the sustainability and efficiency of the urban delivery of goods through an integrated management and innovative vehicle and transport solutions. "Rural transport program (RTP)" initiated by the Irish government provides infrastructure and services that allow rural businesses and citizens to engage in "Click and Collect": Collect deliveries at social facilities.

Key lessons learnt from wholesale and retail – commercial sector benchmark study

1. Modernization of customs procedure, system is the most important step to hear the voices of the business community: It is important because e-commerce is not only a technical but also a cultural matter for the business community.

2. It is essential to obtain support from international organizations in relation to e-trade or e-commerce standard/technology

3. Effectively use service providers: There is a wide variety of programs and services to assist companies with e-commerce. Services available include e-commerce and entrepreneurship training programs; website design and hosting; software systems for integrating e-commerce with accounting, shipping, and inventory management as well as business analytics software to provide data and statistical analysis on the company's e-commerce activity. These services can be valuable in identifying niches, reaching customers in the market, and developing an efficient production and distribution system for serving customers.

4. Creating an online platform is the beginning, not the end of an e-commerce strategy: Nearly all of the businesses studied struggled with website optimization. Strategies for optimizing a website are different from those needed to create an initial site and make it fully e-commerce capable. Many of the case study businesses did not initially plan or budget for the expenses associated with optimization.

5. Integrate e-commerce into overall business operations: E-commerce is broadly defined as "using online resources and tools to do business more efficiently and productively".[33] As such, e-commerce holds the promise and challenge of affecting every aspect of a business operation from product design and production to distribution and service delivery.

   Businesses using or considering e-commerce should investigate the potential roles of the Internet in all aspects of their business. Businesses may benefit by using the information provided through e-commerce (e.g., customer characteristics, location, and order size and regularity) to enhance efficiencies in other areas of operation.

6. Strong leadership is a critical factor in the successful implementation of e-commerce or trade. Close inter-ministerial cooperation among regulatory parties is necessary.

Precision Agriculture

Precision agriculture or precision farming is a modern-farm management concept that makes use of digital technologies to monitor and optimize agriculture production processes. Instead of applying the same amount of fertilizers over an entire agriculture field or feeding a large animal population with an equal amount of feed, precision agriculture helps to optimize fertilizers' use, harvest time and livestock feed after monitoring various field variations using new sensor technologies, satellite navigation and positioning technology, as well as the Internet of Things (IoT).

According to the World Bank, agriculture is one of the key sectors in the world economy, contributing 4% of the global GDP and accounting for nearly 5% of the total GDP of the Arab countries.[34] In addition to that, the global market size of precision agriculture is expected to garner USD 7.8 billion by 2022, registering a CAGR of 14.9% during the forecast period 2016-2022.[35] The key factors contributing to this astronomical rise in market are the growing adoption of smartphone use, aggrandized use of cloud technologies, booming population and rapid technological advancements.

Precision farming promises an increase in the quality and quantity of agriculture produce while minimizing the use of agriculture inputs (fertilizers, water, pesticides, energy etc.). The main aim is to save cost and reduce environmental impact while producing more and better food. Moreover, the technology enables farmers to manage their resources as well as access real time information through their smartphones, thereby offering greater mobility and ease of operation.

[33]Montgomery, 2007

[34]http://wdi.worldbank.org/table/4.2
[35] https://www.alliedmarketresearch.com/precision-agriculture-market

Some key drivers have resulted in the need to shift from traditional agricultural practices to a more modern and sophisticated approach.

These drivers of change include:

- Increase in population has increased demand for food.

- Climate change has negatively impacted the crop yield.

- Increase in cost of agriculture inputs and labor has made farming more expensive.

- Depletion of natural resources.

These drivers of change have created significant opportunities for a successful precision agriculture ecosystem. These opportunities include:

- **Sustainable use of resources:** Improving the sustainability of land and water through technologies that reduce chemical use, improves land mapping and enhances water management.

- **Improve productivity:** This applies to productivity on the farm in terms of yields as well as increased asset management.

- **Attract new investments:** Given the diverse landscape and dry climate condition of most Arab countries, researchers will be able to test out new agriculture technologies in challenging and harsh environments.

- **Increase Revenues:** Connected value chain will increase the confidence in food safety and traceability thus creating increased value in marketplace.

- **Job creation:** New jobs will be created since entrepreneurs and new players will join relatively new smart agriculture industry.

Impact of precision agriculture

Precision agriculture will form a crucial part of the digital strategy for the Arab countries as it will have environmental, social, technical and economic impact.

- Accurately applying chemicals and fertilizers only where needed will reduce the potential for ground and surface water pollution.

- Increased efficiency through accurate machinery guidance systems can deliver quantifiable return to farmers. Accurate auto steer systems can save farmers 5-15% of the input costs (fuel, pesticide, fertilizer)

- Precision agriculture practices contribute positively towards greenhouse gases emission mitigation caused by excessive use of fertilizers and pesticides.

- Significant improvements in profitability by reducing the over-application and under-application of inputs.

- Precision agriculture will affect job opportunities (providing consulting services, supporting services, specialized tools, etc.) and agriculture structures, especially the allocation of farm sizes in rural areas.

- Significant increase in farm profitability due to increase in yield and input cost reduction.

Best practice:

- UK "Agricultural Engineering Precision Innovation Centre (Agri-EPI Centre)" was established by the UK government to help provide engineering and precision agriculture solutions for the Agri-Food industry. By bringing together leading organizations in all sections of the supply chain, it will become a world-leading center for excellence in engineering and precision agriculture

to benefit the livestock, arable, aquaculture and horticulture sectors. It delivers research, development, demonstration and training services. "Farm 491" is another initiative launched by UK that provides high-spec facilities to foster entrepreneurship, ideas generation, and collaboration. It includes 491 hectares of farmland for research and testing.

- In the US, "the yield lab" is an accelerator program that offers support, mentorship and funding for early stage agriculture technology companies. Similarly, "Farm 2050" brings together entrepreneurs, researchers and industry to connect technology with industry.

- "Agro Internet of Things" aims to boost the adoption of smart farming in Greece. By extending the existing network of IoT stations to fully cover the cultivated land and data collected from the farms, it will expand Greek agriculture digital innovation hub to a national level.

- In Canada "Agri-Innovation Program" aims to accelerate the commercialization, adoption and demonstration of innovative products, technologies, processes or services that increase agriculture sector competitiveness and sustainability. Crop specific programs such as advancing agriculture and grape industry development, aim at supporting productivity through the adoption of latest technologies focused on resource management.

- Several of the EU-funded projects such as "ECHORD plus plus", "SWEEPER" and "VINEROBOT" focus on the development of advanced robotic solutions that will be directly deployed in the field and greenhouses to make the evaluation and crop picking more efficient and less labor intensive. "IoF2020" project has developed solutions to better integrate IoT technologies into agriculture processes. Meanwhile the project "FOODIE" is an ICT platform that makes use of cloud-based infrastructure to store farm data as well as inform and assist farmers in the decision-making process.

Key Lessons Learnt

- **Focus:** A clear vision must guide the Arab countries' pursuits in the precision agriculture sector. It is important to work together across the value chain with key stakeholders to draw priorities and devise regulatory frameworks that enable this focus.

- **Leadership:** Strong leadership is required from industry along with the active participation of government, researchers, entrepreneurs and financiers. This is crucial for digitizing the agriculture sector.

- **Provide grants and tax incentives:** Attract and direct investments through tax incentives for investors and farmers in rural areas and early stage agri-startups. Apply funding to support ideation through the commercialization and implementation phases.

- **Partner with industry to drive real results:** Industry leadership as well as consultations are crucial to the strategy and the adoption of digital technologies within the agriculture sector. Investors within the industry need to understand the value proposition for precision agriculture.

- **Create mutual beneficial alliances with other countries:** Collaborate with countries which are considered global leaders to develop together innovative solutions for precision farming and attract international investments. For instance, India is working on numerous research projects to drive innovation within the agricultural sector. In addition, there is a need to invest in bringing already developed precision agriculture solutions from overseas and adapt them to the local environment. i.e. Canada's approach

- **Attract and develop talent:** Build the right skill set among the youth by including business and entrepreneurial skills as well as strong focus on technology in the agriculture courses at university. Moreover, set up training centers in rural areas

in order to provide training to farmers on how to use latest technologies within agriculture. This will also create awareness among them about the significant benefits in terms of profitability and productivity brought by precision agriculture.

3.1.2 **The Sectoral benchmarks and the strategy framework**

Through the sectoral benchmark study, we conducted in-depth analysis in each of the selected sectors, discussing the reasons why we selected each one, the impact it will have, best practices globally, and finally the key lessons learnt. In the table below, we link the key lessons learnt with the strategy framework.

Table 3   Lessons Learnt from Sectoral Benchmark and Link to Strategy

Relevance to Strategy	Lessons Learnt
Digital Foundation	• Thoughtfully design the transformation roadmap. Implementers must recognize that a digital transformation in any sector is a long journey that requires a systematic approach. • Regulators in the Arab countries must be involved in both their traditional policy objectives of promoting safe and efficient digital systems and promoting digitization into sectors. • **Focus on human capital qualifications and training prior to implementation** • Embed the new technology into the organization's culture.
Digital Government	• **Create ICT vision and strategy for all governmental and private entities.** • Educational entities should be given some autonomy to select ICT resources that are most suitable to the needs of instructors and students. • **Education curriculum reform to integrate ICTs in content in order to eliminate digital and technological illiteracy.** • **Modernization of customs procedure and cross-border trade in order to achieve related trade agreements between Arab Countries** • Provide continual support. A digital initiative may have a specific start date, but the end date may not be as clear. It takes time for users to acclimate to a new technology system. Therefore, learning should extend beyond the implementation period
Digital Business	• Use digital finance services to improve financial inclusion. • **Using digital finance services and FinTechs to attract SMEs and reach out to different social classes to enhance financial inclusion.**

Digital Business	• Effectively use service providers: There is a wide variety of programs and services to assist companies with e-commerce. Services available include e-commerce and entrepreneurship training programs; website design and hosting; software systems for integrating e-commerce with accounting, shipping, and inventory management; and business analytics software to provide data and statistical analysis on the company's e-commerce activity. These services can be valuable in identifying niches, reaching customers in the market, and developing an efficient production and distribution system for serving customers. • Integrate e-commerce into overall business operations: E-commerce holds the promise and challenge of affecting every aspect of a business operation from product design and production to distribution and service delivery. • Use industry 4.0 to accelerate operational improvements.
Digital Citizen	• **Develop financial literacy and citizen/consumer protection frameworks in order to achieve financial inclusion.**

Digital Innovation	• Manage information architecture as a critical enabler. • **Integrate new and existing capabilities and technologies by transforming old models to modern and digitized ones.**

3.2 International benchmarks

- **Selection criteria for benchmarked countries**
The selection of benchmark countries was based on two factors: state and rate of digital evolution. These two factors make up the digital evolution index (DEI).36 DEI is a data-driven holistic evaluation of the progress of the digital economy across 60 countries, combining more than 100 different indicators across four key drivers:

- **Supply conditions:** Internet access and infrastructure

- **Demand conditions:** Consumer demand for digital technologies

- **Institutional environment:** Government policies, laws and resources

- **Innovation and change:** Investments in R&D and digital startups, etc.

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[36]The Fletcher School at Tufts University and Mastercard published the Digital Evolution Index (DEI) in 2017.

The DEI framework segments the 60 countries into stand outs, stall outs, break outs and watch outs.

Stand out countries are both highly digitally advanced and show high momentum of digital evolution. Stall out countries show a high state of digital advancement while exhibiting slowing pace. Break out countries are low-scoring in their current states of digitization but are evolving fast and have the potential to become the stand out countries of the future. Finally, watch out countries face critical challenges with their low state of digital advancement and low pace of digitization
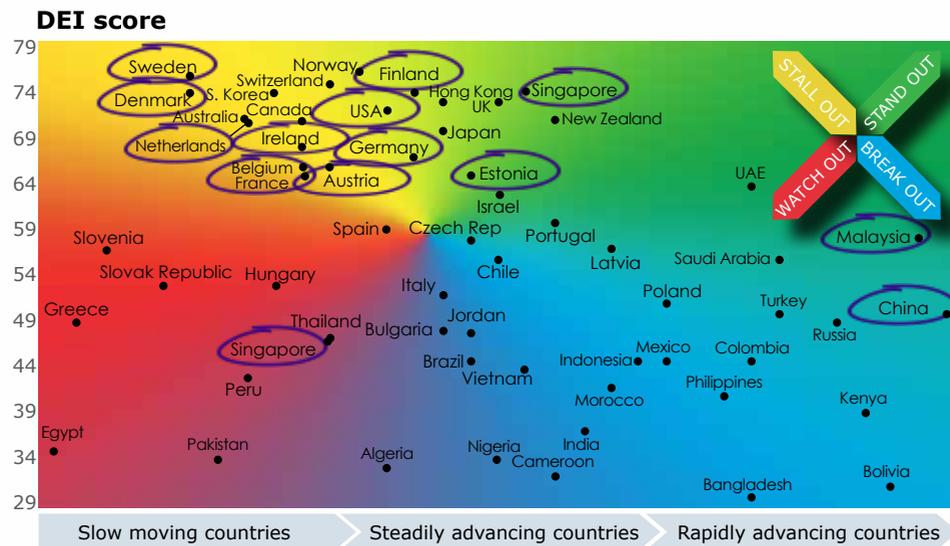
Source: Digital Evolution Index 2017,
The Fletcher School at Tuffs University and MasterCard

Figure 5 **Digital Evolution Index (DEI) and Selected Benchmarks**

Covering case studies from each of the first three segments was important for the diversity and inclusivity of the learnt lessons that would help in setting the strategy. The best practices in each of the countries are reflected in the proposed programs and initiatives. The chosen case studies are as follows:

- EU: The choice of the EU benchmark is to reflect a regional strategy incorporating a set of heterogeneous countries, demonstrating how each country could benefit and help other countries in reaping the gains of digitization.

- China: The second largest economy in the world. The country is also leading the pack of the break out countries. China was chosen in light of its emphasis, in its five-year plan, on the creation of an Internet silk road between China and the Arab countries. Arab countries could reap great economic benefits from stronger collaboration with China, a market of great potential.

- USA: The largest economy of the world and its digital economy has been growing at triple the pace of the GDP.[37] USA falls in the stall out segment according to DEI.

- Singapore: One of the leading digital economies in the world and falls in the stand out segment

- Malaysia: Following the momentum of China in its digital evolution and has the potential to become one of the stand out countries of the future. Also, it is an Islamic country with a remarkable success story in terms of digital transformation. Reflections from such an experience will be quite beneficial for Arab countries in designing their digital strategies.

- South Africa: Despite its place in the watch out group, South Africa is an interesting case because it has fallen from a break out country in the previous DEI to a watch out country in the recent one.

[37]https://www.bloomberg.com/news/articles/2018-03-15/digital-economy-has-been-growing-at-triple-the-pace-of-u-s-gdp

Lessons learnt

Digital foundation: Responsible authorities, infrastructure, policies and regulations act as key pillars for achieving digital innovation

China: Developing a comprehensive broadband strategy has been at the core of China's digital infrastructure plan. "Broadband China"[38] strategy is based on the principles of combining effective planning and development of application services to trigger industrial innovation in different economic sectors. It will not only improve the broadband penetration rate through the adoption of disruptive 5G technologies in rural and urban areas but will also enhance the information security thus mitigating security threats significantly.

Also, the Belt and Road International Cooperation Forum in Beijing, proposed to promote the big data, cloud computing, smart city construction, connected to the twenty-first century digital silk road to further enrich the connotation of the initiative and to conclude that the One Belt One Road (OBOR) Initiative went Digital!

USA: A wide set of initiatives has been put forward by USA for the promotion and upgrading of the country's digital infrastructure. "Broadband USA"[39] program is one such example which expands broadband excess by holding regional workshops that bring local stakeholders together and provides solutions. guides and tools. It serves as a funding guide to support broadband planning, public access, digital literacy, adoption and deployment.

Singapore: Several government agencies in Singapore such as the Info-communications Media Development Authority of Singapore (IMDA) and the Government Technology Agency (GovTech) provide key platforms and solutions to aid Singapore in its quest towards achieving Smart Nations status and improve government potential

in the areas of ICT and engineering domain. Significant emphasis has been placed by these authorities on the creation of exciting growth opportunities while focusing on talent, research, innovation and enterprise.

Malaysia: Collaborative efforts between Malaysia Digital Economy Corporation and government have played a major role in the transformation of Malaysia's public sector. Their efforts are focused on driving the nation's digital economy through investment, creation of digital ecosystem and nurturing talents with advance ICT skills.

South Africa: South Africa is characterized by a strong regulatory environment and has laid down a set of policies and legislations which focus extensively on regulating the ICT sector. Public Service Corporate Governance of ICT Policy Framework was implemented in 2012 to promote the governance of ICT as an essential part of corporate governance and to overcome challenges presented by hyper connected digital world. South Africa Connect[40] is a national broadband policy and strategy developed to increase the digital connectivity of the government, business and citizens and to increase the access and affordability of broadband at all levels.

Additionally, several electronic communications and broadcasting organizational acts are passed to provide for the facilitation and regulation of the electronic communications and transactions, the development of national e-strategy for the country, and provide for human resource development in electronic transactions. Some of the examples include Electronic Communications and Transactions Act, 2002, Former States Broadcasting Reorganization Act, 1996, Broadband Infraco Act, No. 33 of 2007.

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[38]https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6623497
[39]https://broadbandusa.ntia.doc.gov.

[40]https://www.gov.za/welcome-official-south-african-government-online-site

Digital ecosystem of disruptive technologies acts as a catalyst for digital economy by creating ICT enabled environment

Malaysia: In Malaysia various strategies and frameworks have been established to consolidate the collective efforts of various stakeholders for the wide adoption of these technologies in different sectors and to transform Malaysia into a premier regional hub for IoT development and big data analytics solutions. Digital Malaysia 354[41]roadmap lays down an integrated approach and strategy to build comprehensive ICT ecosystem which enables ICT environment, fosters innovation within the sub-sectors and bring significant benefits to entrepreneurs, youth and SMEs. In order to create and sustain this digital ecosystem of innovation Malaysia Digital Economy Corporation (MDEC) has identified big data analytics (BDA), IoT, e-commerce, data centers and clouds as the key focus areas. Malaysia's National E-Commerce Strategic Roadmap includes six core areas that cover the end-to-end spectrum of e-commerce value chain and possess the potential to double e-commerce growth in the country. Similarly, Malaysia's IoT Strategic Roadmap[42] acts as a lever of economic growth through the proliferation and industrialization of IoT.

Sectoral innovation plays a crucial role in digital transformation by disrupting traditional business models and creating new ones

EU: EU has developed several action plans to drive sectoral innovation. For instance, FinTech action plan offers supportive measures to help introduce FinTech solutions and proactive measures to foster innovation, competitiveness and integrity within the European financial sector. FinTech facilitators or regulatory sandboxes provide general guidance to firms during the authorization process. This enables such firms to gain quicker access to the market and better understand the rules and supervisory expectations. In addition to that EU FinTech Lab is acting as a testbed for FinTech products and services including distributed ledger technologies, cloud technologies, machine learning and application programming interfaces.

Similarly, the EU plans to introduce technological innovation in the education sector in order to make better use of digital technologies for teaching and learning; improving the education through data analysis and foresight. We should keep in mind that Europe's Digital Education Action plan outlines key initiatives to achieve these objectives through the collective efforts of member states, stakeholders and society.

Innovation in the e-health sector delivers citizen-centric healthcare, facilitates socio-economic inclusion and equality and provides wider access to information and services. To deliver these promises is quite a challenge in itself. That is why the EU has devised an E-health Action Plan (2012-2020) to achieve wider interoperability of e-health services as well as support research and development in the e-health sector.

China: China has a vision to emerge as a world manufacturing power in the next three decades. The initiative Made in China 2025[43] is a ten-year action plan based on the concept of Germany's Industry 4.0 and aims to develop competency and boost cutting-edge innovation in manufacturing sector.

Digital government strategy is a key enabler for the development of the digital economy agenda

China: E-government in China started with a series of "informatization" plans. Golden Projects (GP) and Government Online Project (GOP) are the core of this plan. Golden projects comprise a fundamental plan to develop a national information infrastructure. The primary objective of the GOP is to encourage

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[41]https://www.patentagentip.com/malaysia_digital_roadmap.html
[42]http://www.mimos.my/iot/National_IoT_Strategic_Roadmap_Summary.pdf

[43]https://gbtimes.com/made-china-2025-plan-unveiled-boost-manufacturing

office automation via government websites in order to cut down on excessive bureaucracy. A total of 12 projects were undertaken under China's GPs with their scope varying from automating internal processes to creating interactive websites allowing online transactions. Similarly, the GOPs was based on the strategy to create a centrally accessible administrative framework assisting top government officials to depend more heavily on the Internet and other technologies to enhance productivity and transparency of the central and local governments in China.

USA: The US Digital Government Strategy[44] aims to accomplish three things:

• Enable the American people and an increasingly mobile workforce to access high-quality digital government information and services anywhere, anytime, on any device.

• Ensure that as the government adjusts to this new digital world, opportunities are seized to procure and manage devices, applications, and data in smart, secure and affordable ways.

• Unlock the power of government data to spur innovation across the American nation and improve the quality of services for the American people.

Singapore: Singapore aims to become a leading digital economy. In order to achieve this objective Smart Nation initiative[45] acts as a strategic roadmap for the country's digital transformation. Projects falling under the Smart Nation initiative were based on the principles of improving citizens' lives through smart mobility, national digital Identity and e-payment solutions. Thus, the government has released the digital economy framework for action to form a web of business and employees who fully harness and utilize the new digital technologies. Under this framework, three key priorities have been identified to accelerate digitization of industries and business, creating an ICT-enabled ecosystem and to trigger sectoral innovation.

Malaysia: The Malaysian government has developed a framework to map its path for the transformation of government sector into e-government. The framework was developed based on the vision of where the Malaysian public sector intends to be in the future, an assessment of the public sector's current business and ICT environment and also research and benchmarking on international best practices. The following is a set of identified and prioritized ICT initiatives based on strategic intent and directions:

• Enhancement of service delivery through online services and applications.

• Enhacement of capacity and capability by establishing ICT skills framework.

• Enhancement of performance measurement capability through realtime public sector service intelligence and self assesment tools.

• Connected government through knowledge management hubs and registries.

• Sustainable and resilient ICT through the implementation and deployment of government integrated telecommunication Network, data centres and mobile based solutions and applications.

South Africa: South Africa has launched its national e-strategy and the e-government strategy to lead the country's digital transformation efforts. E-government strategic framework involves the establishment of co-ordination mechanisms, upgrading of the government network and integration of different legacy systems. In contrast the national e-strategy aims to achieve key strategic objectives including the identification of ICT skills gap in the country, integration of technology within the government and business sectors, creation of policy and regulatory environment to support SMEs and to mitigate cybersecurity threats and challenges.

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[44]https://obamawhitehouse.archives.gov/participate/united-states-digital-service
[45]https://www.smartnation.sg

Digital skills form the basis and the stepping stone for wide scale adoption of digital technologies

EU: The EU has realized the strategic importance of digital skill for sustaining jobs, growth and competitiveness. In this regard it has developed the New Skills agenda to assist member states in their national reforms by improving the quality and relevance of skills formation. Moreover, under the Education and Training 2020 program concrete measures will be taken to bring digital skills and competences to all levels of education and training, supporting teachers and educators and promoting active involvement of business and other organizations. Digital Opportunity Traineeships is another EU-funded training initiative which aims to help companies fill vacancies with digitally-competent candidates. Digital Opportunity trainees strengthen their ICT-specific skills through work experience in fields such as cybersecurity, big data, quantum technology and machine learning. They also boost their digital skills in areas like web design, digital marketing, and software development.

USA: The US has always been at the forefront of digital skill development and has rolled out plans to achieve digital literacy. It has developed a Digital Literacy Portal[46] serving as a valuable resource by offering digital literacy training and services accessible to all age groups at all stages of learning. Similarly, Computer Science For All initiative aims to enhance ICT skills across the country by increasing access to K-12 computer science by training teachers, expanding access to high-quality instructional materials, and building effective regional partnerships.

Finance and capital are considered the main pillars in the framework of digitization

EU: In the EU, in order to achieve the goals of the EU digital agenda and the digital single market, various EU funding opportunities, in the fields of research, broadband technology, ICT and smart

specialization, have been created and made available. In the field of digital cultural heritage, a number of EU projects have also received funding. With the aim of digitalizing EU industry, the European Commission seeks, amongst other things, to invest USD$ 560 million (Euro 500 million) in a Pan-EU network of digital innovation hubs (centers of excellence in technology), where businesses can obtain advice and test digital innovations. In addition, the European Fund for Strategic Investments (EFSI) can finance digital projects and businesses in a number of areas.

Creation of a digital single market as a lever to break down barriers to cross-border online activity, allowing a free movement of goods, people and services

EU: In order to achieve the objectives of the Digital Single Market strategy, a legal framework, has been built and adopted. In addition, roles of different institutions and related authorities were defined, and different stakeholders were involved in the digital transformation process. These institutions and bodies include: Committee on industry, research and energy, communications networks and content and technology (CNECT). A set of legislations and policies have been adopted by the EU to promote the development and dissemination of the new information technologies, introducing a battery of rules to ensure that customers and businesses have fair and affordable access to networks and services, and to remove barriers to competition. Under the 2017 resolution on building blocks for a post-2020 EU cohesion policy, the Parliament points out that the digital agenda, including the provision of the necessary infrastructure and advanced technological solutions, must be a priority within the framework of the cohesion policy, particularly in the next EU funding period (starting in 2020). Various trans-border networks have been formed to promote inter-regional and inter-city cooperation to tackle ICT challenges at the European level. The communication opportunities provided by new ICTs are vital to maintaining these forms of cooperation. However, this can only be made possible if a solid framework is developed and a set of institutions ensure the implementation of such a framework. These institutions also act as important stakeholders in the digitization process.

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[46]https://digitalliteracy.gov/

Creation of special economic zone to encourage economic activity

Malaysia: Malaysia has emerged into a flourishing dynamic ICT hub, enabling it to host more than 900 multinationals, foreign-owned and home-grown Malaysian companies centered on multimedia and communications products, solutions, services and research and development. A comprehensive roadmap consisting of three phases has been developed for the transformation of Malaysia from a Global ICT HUB into a knowledge-based society, hence leading to the birth of Digital Malaysia.

International benchmarks and strategy framework

Many lessons were selected from the international benchmark and used as an input into the strategy. We have grouped the 25 lessons learnt from the above-mentioned countries into eight lessons according to their strategic relevance to our proposed framework and strategy.

| Table 4 | The Lessons Learnt from The International Benchmark and their Link to The Strategy |

Relevance to the Strategy	Lessons Learnt
Digital foundation	Responsible authorities, infrastructure, policies and regulations act as key pillars for achieving digital innovation.
Digital Ecosystem	Disruptive technologies act as a catalyst for digital economy by creating ICT-enabled environment.
Sectoral Innovation	Sectoral innovation plays a crucial role in digital transformation by disrupting traditional business models and creating new ones.
Digital Government	E-government strategy is a key enabler for the development of the digital economy agenda.
Digital Skills	Digital literacy forms the basis and the stepping stone for wide scale adoption of digital technologies.
Financing and Capital	For digital transformation to occur finance and budget need to be assigned based on measuring outcomes.
Digital Single Market	Creation of Digital Single Market as a lever to break down barriers to cross-border online activity, allowing a free movement of goods, people and services.
Creation of Economic Zones	Creation of special economic zone to encourage economic activity.

3.3 Arab countries current situation: Analysis

Arab countries national digital strategies: Opportunities and challenges

The Arab countries acknowledge the importance of developing national digital strategies (NDSs) to build an information society linked to socioeconomic development and attaining the SDGs. Hence, many Arab countries launched NDSs in the hope of making progress towards the use of digitization opportunities, boosting countries' competitiveness, economic growth and social well-being. However, disruptive technologies pose many opportunities and challenges that need to be addressed.

This section provides an overview of the current state of the national digital strategies in Arab countries. It also presents the Arab countries' priorities for developing the digital economy and society.

Arab countries: Available national digital strategies
Of the 22 Arab countries, only 14 have NDSs, plans or programs. Some NDSs are standalone strategies, while the remaining ones are a component of a broader national strategy (a national innovation strategy).

Table 5	Arab Countries' National Digital Strategies, Plans or Programs

Economy	National Digital Strategies[47]
Bahrain	√
Kuwait	√
Oman	√
Qatar	√
Saudi Arabia	√
UAE	√
Algeria	√
Djibouti	√
Egypt	√
Jordan	√
Lebanon	√
Morocco	√
Tunisia	√
Libya	√
Mauritania	X
Sudan	X
West Bank and Gaza	X
Comoros	X
Somalia	X
Iraq "conflict-affected"	X
Syria "conflict-affected"	X
Yemen "conflict-affected"	X

Notes: √ = available NDS - X= unavailable NDS.
Arab countries: Digital policy objectives

Policy objectives for the development of the digital economy and society which are largely pursued by NDSs are a high priority across all Arab countries. Priority policy objectives are highlighted below.

Promote the ICT sector
The first objective in all Arab national digital strategies is increasing support for the ICT sector, typically in the areas of research and development, promotion of standards, venture capital investments, foreign direct investment, and export of ICT goods and services. For example, Egypt's national digital strategy aims to attract investments to expand existing ICT companies and generate job opportunities.

Improve ICT infrastructure and broadband capacity
Improving ICT infrastructure and broadband capacity is achieved by developing national telecommunication infrastructure and services. The main objectives are to increase broadband capacity and speed, increase broadband coverage to better connect remote areas and improve the resilience of existing broadband infrastructure. Further objectives include expanding mobile broadband and allocating spectrum efficiently.

Strengthen e-government services
This includes enhanced access to public sector information and data (open government data), strengthen trust in the digital economy (digital identities, privacy and security).

[47]Source: Compiled by the author from the World Bank Doing Business 2019.

Arab countries employ web-based or mobile applications to strengthen government responsiveness and citizens' trust- such as the Handasah mobile application and the Rassed system in the UAE; the TALABI mobile application in Morocco; the Smart Traveler mobile customs application in Tunisia; and the Kollona Amn application in Saudi Arabia.

Promote ICT adoption in education,
health care and transport
Many Arab digital strategies aim to promote the adoption of digital technologies and the Internet in key sectors of society. For example, promoting ICT adoption in education ranks high among Arab digital strategies. The aim is to capitalize on the digital revolution to improve the effectiveness of the education system and ensure the development of basic and advanced ICT skills. Measures range from a focus on infrastructure (better connecting education institutions, for example) to promoting ICT-related curricula, teacher training and online learning environments (massive open online course, for example). E-health care measures focus on ensuring high-quality broadband connectivity across the health-care system.

Increase e-inclusion
The promotion of ICT adoption by households and individuals aims to advance social policy objectives. E-inclusion requires expanding broadband access to underserved areas, increasing the level of digital literacy and raising awareness about risks and opportunities online.

Enhance financial inclusion
Rapid technological changes are fostering financial inclusion (expansion of the number of low-income people accessing and using financial services). This plays an important role in alleviating poverty and promoting economic growth. In 2017, the Global Findex Survey found that the Arab countries have the lowest financial inclusion in the world.

Develop digital skills and jobs
All Arab digital strategies recognize that improving skills and competencies is a means to further e-inclusion. Developing skills and competencies is essential for the digital economy. Other measures include promoting a higher participation of young women and women returnees in the ICT workforce.

Advance cybersecurity measures
Public information on cyber-risk and measures to combat cybercrime appear frequently in Arab national digital economy strategies.

Arab countries: NDSs governance
The lead on strategy development is often taken by a ministry or body that is not dedicated to digital affairs, while only a minority of Arab countries so far is giving this responsibility to a ministry or entity that is dedicated to digital affairs. Almost all Arab countries engage multiple private stakeholders and public bodies to contribute input to developing their NDSs.

In most Arab countries, the implementation of the NDS is the responsibility of several ministries, bodies or institutions. In some countries, multiple stakeholders are involved in implementing it. Bodies responsible for monitoring the implementation of the NDS tend to be the same as those which lead the development and the coordination of the NDS.

Many Arab governments have set up measurable targets within a specific time frame to monitor the implementation of their NDSs. Targets were set up for measuring progress in broadband infrastructure development and performance, public sector services and performance, use of digital technologies and ICT skills development.

Arab countries performance on SDGs
The following two figures show the Arab countries performance on SDGs based on the SDG Index. The SDG Index is produced by the Sustainable Development Solutions Network (SDSN) and the Bertelsmann Stiftung and presents a revised and updated assessment of countries' distance to achieving the SDGs. The two figures present detailed SDG dashboards to help identify implementation priorities for the SDGs.

Figure 6: SDG Dashboard for the Middle East and North Africa

Goals (columns):
1 No Poverty · 2 Zero Hunger · 3 Good Health and well being · 4 Quality Education · 5 Gender Equality · 6 Clean water and sanitation · 7 Affordable and clean energy · 8 Decent work and economic growth · 9 Industry innovation and infrastructure · 10 Reduced inequalities · 11 Sustainable cities and communities · 12 Responsible consumption and production · 13 Cultivate action · 14 Life below water · 15 Life on land · 16 Peace, justice and strong institutions · 17 Partnership for the goal

Countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Palestine, Sudan, Syrian Arab Republic, Tunisia, UAE, Yemen

Legend:
- 🟩 SDG achieved
- 🟨 Challenges remain
- 🟧 Significant challenges remain
- 🟥 Major challenges remain
- ⬜ Data not available

Figure 6 SDG Dashboard for the Middle East and North Africa[48]

Figure 7: SDG Dashboard for Arab Countries

Goals (columns):
1 No Poverty · 2 Zero Hunger · 3 Good Health and well being · 4 Quality Education · 5 Gender Equality · 6 Clean water and sanitation · 7 Affordable and clean energy · 8 Decent work and economic growth · 9 Industry innovation and infrastructure · 10 Reduced inequalities · 11 Sustainable cities and communities · 12 Responsible consumption and production · 13 Cultivate action · 14 Life below water · 15 Life on land · 16 Peace, justice and strong institutions · 17 Partnership for the goal

Countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Palestine, Sudan, Syrian Arab Republic, Tunisia, UAE, Yemen

Legend:
- ⬆ On track or maintaining SDG achievement
- ↗ Moderately increasing
- → Stagnating
- ⬇ Decreasing
- •• Data not available

Figure 7 SDG Dashboard for Arab Countries

Developing The Arab Vision For The Digital Economy

Morocco Mauritania Algeria Tunisia Libya Egypt Sudan
Palestine Lebanon Syria Jordan Saudi Arabia Yemen Djibouti Somal Iraq
Iran Kuwait Bahrain UAE Qatar Comoros Oman Afghanistan

4   Strategy Development

4.0   Dimensions, themes and initiatives

In the previous section we conducted an in depth and comprehensive analysis of sectoral and international benchmark studies and identified the key lessons learnt. These lessons reaffirmed the importance of four strategy layers namely: Digital foundation, digital ecosystem of innovation, sectoral usage and end user. The lessons provided us with strategic insights that guided the framing of the digital economy strategy. They stressed the importance of building digital foundations through the development of infrastructure, defining the role of responsible authorities, and the alignment of national transformation plans with national and regional policies and regulations. In addition, they highlighted the fact that the integration of digital technologies within the sectors, creates an ICT-enabled environment which fosters innovation and leads to newer and disruptive business models. Furthermore, in order to create a truly inclusive and digital economy, it is essential to make digital technologies universally accessible and affordable to all citizens.

Based on our examination of the benchmarks, we have identified five strategy dimensions and associated key success factors for achieving sustainable, inclusive and secure digital future for the Arab countries.

From the four layers stated above, we have identified five dimensions to be considered in the agenda building exercise.
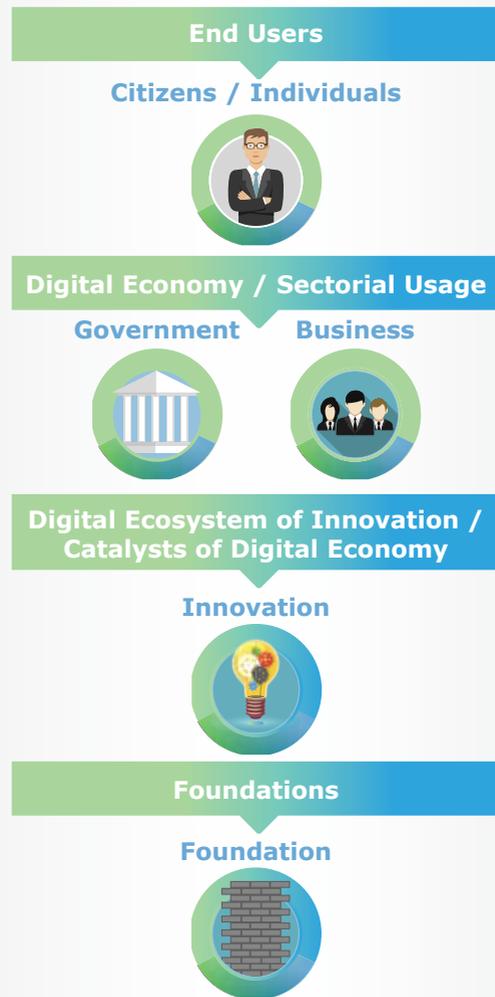
Figure 8 The Digital Strategy Five Dimensions

Five strategic directions are linked to the above five dimensions as indicated below:

- Increasing the digitization of the business/sectors and the contribution of digital economy to the GDP.

- Maximizing the inclusion, affordability and accessibility of the end users: This requires better harmonization of the cost and the performance of network in addition to better content development.

- Creating the right environment of innovation that allows the ITC companies/ startups to develop new technologies and applications in different sectors: This requires developing our own Silicon Valley for all the Arab countries, a hub of innovation and creation of values adapted to the Arab context as well as trust-worthy infrastructures and content services.

- Creating the right technical foundations for digital networks and services to flourish

- Bringing down legal barriers within Arab countries to maximize digital transactions: This is supported by the right regulatory conditions for innovation, investment, fair competition and a level playing field.
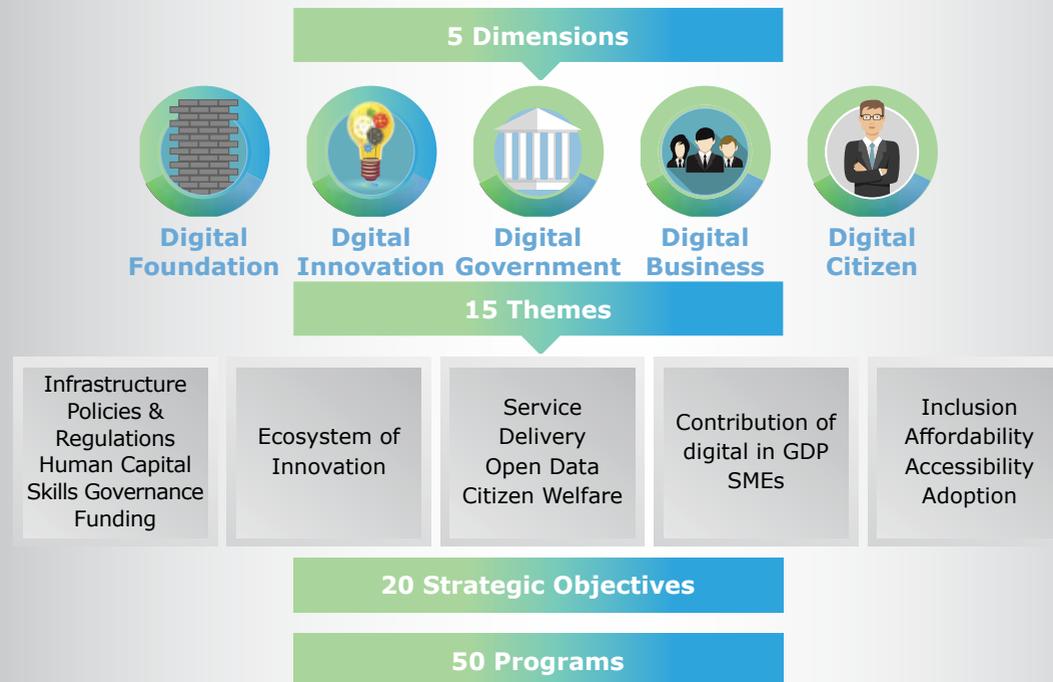
The defined strategy is summarized as below:

Table 6 The Five Dimensions, Strategic Objectives and Programs

Dimensions	Themes	Strategic Onbjectives	Programs
1. Digital Foundation	Infrastracture	1. Developing the Telecomunication Infastracture 2. Enhancing the Internet Ecosystem	1. National Broadband Plan 2. Arab Datacenter and Cloud service program. 3. Internet Exchange Points (IXPs) development program 4. Internet of Thngs and Machine to Machine Communication Program 5. Arab Cybersecurity Development
	Policies and Regulations	3. Implementing Regulations and Policies for Digital Economy	6. Digital Transformation Framework 7. Intellectual Property Protection 8. Data Protection Framework 9. Cybercrime Legislation
	Human Capital Skills	4. Enhance ICT Skills & Competences at different levels	10. Partnering with universities to develop relevent ICT curricula 11. ICT Vocational Training / ICT skill accelator 12. e-learning Program / Skills Citizen 13. ICT Training Programs for SMEs
	Funding	5. Ensuring fund availability	14. Attracting FDI in ICT: EU, World Bank 15. Crowdfunding Plateform 16. Network of Digital Angles
	Governance	6. Establishing Digital Governance Bodies	17. Develop a new organization for ARAB DIGITAL UNION 18. Partnership with specialized independent exiting Arab bodies and build new ones to implement the strategy
2. Digital Innovation	Ecosystem of Innovation	7. Creating Environment which fosters innovation within a community 8. Building Innovation Capacity 9. Promote the innovation	19. Arab Digital Innovation Agency 20. Develop a Registry of Experts and innovators 21. Arab Tech Universities Alliances 22. Create World Class Innovation Hubs 23. Recognise and Reward ICT Innovators 24. Arab Innovation Forum
3. Digital Governance	Service Delivery	10. Government Online Services 11. Increase inter-Government interaction	25. Promote eGov Initiatives (Guidance, Policy, recommendations...) 26. E-ID 27. e-Procurement Program 28. Develop Regional Single Window (Customs & Trade)
	Open Data	12. Build Public Data Content as Economic Growth driver	29. Open Data Program
	Citizen Welfare	13. Enhance citizen Education by ICT usage 14. Foster cross-border healthcare, health security, soliditary and equity	30. Arab-wide platform for digital higher education (e-university) 31. Platform Peer to Peer learning 32. Create Arab ICT Scholarship Program 33. Innovative Technologies for High-tech Classroom (ITHTC) 34. Plateform For Telemedecine Program

Dimensions	Themes	Strategic Onbjectives	Programs
4. Digital Business	Contribution of digital in GDP	15. Open Market for more additional economic growth 16. Increase the Digital employment	35. Develop e-Trade Platform Management 36. Create a Pan-Arab Cross-border Fintech Regulatory Sandbox 37. Smart Manufacturing Testbeds 38. Smart Factory 39. Smart Agri-food Accelerator 40. Arab Telework Platform
	SMEs	17. Increase the Adoption of ICT by SMEs	41. SMEs Go Digital Program 42. The 100,000 SMEs Online Program 43. Arab Open Solution Platform
5. Digital Citizen	Adoption / Inclusion / Accessibility	18. Ensure inclusive and equal access to digital technology 19. Enhancing Digital Literacy and Social Inclusion	44. Digital Content Program 45. New Generation of Telespace for Isolated Communities 46. Provide free access to wireless Internet 47. Basic level of ICT competence 48. Promote Daily lifestyle Apps Program
	Affordability	20. Enhance the Fixed broadband Internet tariffs	49. Social Coverage Incentives 50. Develop a legal framework to promote healthy ICT competition

Digital Foundations
I N F R A S T R U C T U R E

4.1 Digital foundation

4.1.1 Key success factors

Key success factor 1: Contribution to SDG and sustainability
Investment in infrastructure and human capital is a fundamental component of economic development, and it is a way to achieve the SDGs, especially SDG 9: "Build resilient infrastructure, promote sustainable industrialization and foster innovation". A regional successful partnership between the Arab countries to achieve similar goals is another way to achieve the SDGs, as according to SDG 17 "Revitalize the global partnership for sustainable development", a successful sustainable development agenda requires partnerships between governments, the private sector and civil society.

Key success factor 2: Continuous development of digital telecommunications networks
Digital economy cannot exist without the provision of advanced and complete digital telecommunication networks providing access capabilities to all the players in any country. The development of such networks, the main part of the infrastructure necessary to give access and communication to all stakeholders in any economy, is a continuous process to ensure the adoption of the latest technology in supporting the digital economy. Such a development will vary depending on the network status in each country. Goals and time plan of network development shall be carefully crafted in order to reach the desired targets.

Key success factor 3: Promotion of Internet services and communication platforms
Internet is an essential element for the digital economy to exist and thrive. International data access points, Internet exchange points and data centers must be deployed to serve all the projected needs in each country. The planning shall accommodate the utilization of any new technology related to Artificial Intelligence, Internet of Things, etc.

Utilization cybersecurity and data protection frameworks will ensure that the telecommunications and data infrastructure are continuously protected against all cyberattacks and crimes. Such safe environment is vital for a thriving digital economy.

Key success factor 4: Establish and maintain policies and regulations creating a stable and sustainable ecosystem for digital economy
Digital economy requires full support and political will at the highest level in any country. It requires policies that encourage private sector participation in developing the infrastructure and utilizing the latest technology to provide applications and services used in operating digital economies.

The states should establish regulatory bodies to monitor and facilitate the establishment of service providers essential for the digital economy. Regulators shall maintain a balanced, competitive and fair market protecting all players through establishing a sustainable healthy ecosystem.

As the Arab states stand at different positions in respect to the required laws to achieve the above goals, legislations are urgently needed to establish all the required regulators and the laws providing the framework and executive orders necessary to digitize the economy. Specialized plans will be required for each state to provide a complete set of the necessary transformation policies and regulations.

Key success factor 5: Strategic governance
Good governance is an enabler not a burden. Governance, if established correctly, ensures the strategic intentions of the Arab Governments are met through information management, projects, initiatives and digital operations. Correct governance provides a mechanism to align the programs and initiatives in support of the overall Strategy. In order to make governance effective and efficient, it should be encompassing, authoritative and transparent without creating a distraction or barrier of compliance activity.
Key success factor 6: Build for sustainability

Sustainability is one of the most critical goals of digital development, and yet, unfortunately, in the Arab world it is often not considered in the development of any long-term strategy. It is therefore critical that long term sustainability – in all its forms – physical, human and financial - becomes a guiding principle.

4.1.2 Strategic objectives

The strategic objectives of the programs under this dimension are:

Strategic objective 1: Developing the telecommunication infrastructure

A telecommunications infrastructure is required to provide broadband networks that will deliver the required speeds needed to support the functions and services of the digital economy. This strategic objective aims to develop the framework for national broadband plans to set the requirements in terms of speed, technology, and coverage together with a detailed time plan to ensure that the goal of digital transformation in each Arab state based on its current status, is reached. The plans shall be living documents that ensure the timely development and utilization of the best technology that fits each state. Data centers hosting protected data are an essential ingredient in an efficient Internet with fast response and small delays. Incentives for the private sector must be created to build such data centers. Clouds providing services for the government and businesses need such data centers.

Strategic objective 2: Enhancing the Internet ecosystem

The Internet is the basic building block in the infrastructure required for the success of the digital economy. Plans to improve the efficiency and reduce the cost of the Internet services need to be developed. Internet Exchange Points (IXPs) are required in each state. International data gateways (interfacing undersea cables) and policies encouraging the provision of large capacities in undersea international cables are required by each state to develop its Internet infrastructure. This Internet ecosystem will not survive without the proper cybersecurity protection.

Strategic objective 3: Implementing regulations and policies for digital economy

Policies that encourage the participation of the private sector shall be developed and implemented to drive the state towards the digitization of the economy. A policy framework for such a goal will require the formation of several regulatory bodies to cover all aspects of infrastructure development, e-government and e-commerce, competition and antitrust, and intellectual property rights and consumer protection. Legislation for data protection, electronic signature and cybersecurity are also required to establish a healthy and stable ecosystem for digital economy. These regulations and policies shall constitute the initial building block in the digital transformation.

Strategic objective 4: Enhance ICT skills and competencies at different levels

The objective here is to provide a vision for quality training to improve ICT competencies that today's Arabic teacher, worker, business and citizen need to face the challenge of the scarcity of knowledge and information in a fast-pace world. The objective is to establish training and interactive techniques for improving the quality of education and general ICT knowledge at all levels based on levels of adoption of ICTs. Development of ICT Skills is a key foundation in a digital transformation strategy. The core aim is to develop ICT training programs to enhance creativity, innovation and the development of talent as well as transferable coaching skills, based on ICT merged learning methodologies.

Strategic objective 5: Ensuring availability of funds

When it comes to finance, investment and building foundation in ICT may be costly for most of the Arab governments, especially when it comes to financial sustainability along the initiated programs. Thus, ensuring sustainable sources of funds is vital. Crowdfunding and FDI attraction are sustainable and innovative ways to fund projects and programs.

Strategic objective 6: Establishing digital governance

In order to ensure the feasibility and implementation of different ICT programs and initiatives, a central governing body must be established, that ensures strategies are getting implemented, audits and develops new ICT programs, assesses and evaluates the implementation of digital transformation in all sectors in all Arab countries and raises awareness among governments and citizens. Such a body has a vital role in developing governance systems for each project, in order to ensure alignment between the umbrella strategies, project strategy and directions, and the path to the required outcomes over the life of the project.

Digital Innovation

4.1 Digital innovation

4.1.1 Key success factors

Key success factor 1: Contribution to SDGs and sustainability
Bringing together technology and innovation to create synergies which will take them further and faster towards achieving the SDGs, especially SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation). Also, the Innovation can generate new opportunities of employment and growth and contribute to SDG 8 "Sustainable development Goals"

Key success factor 2: Innovation as enabler of sustainable economic growth and catalyst of entrepreneurship
Innovation is essential to address local and global problems, to enable innovators to create compet¬itive solutions and sustainable employment, to give entrepreneurs and companies the incentives to develop their own communities, and to ensure that the public sector has the means to accelerate its transformation.

Innovation should be used as catalyst to enhance entrepreneurship and establish a sustainable culture of innovation by taking concrete strategic action using ICT as an enabler.

Key success factor 3: Apply digital innovation framework to ensure suitability of the ecosystem
In 2017, ITU developed the Digital Innovation Framework (DIF), which enables countries to map key chal¬lenges and opportunities in their ICT innovation ecosystems and assists stakeholders through their innovation journey.

The DIF identifies six main stakeholder groups needed in digital transformation: entrepreneurs, the public sector, financiers, academics, the private sector and entrepreneurial support networks.

The DIF defines the seven critical pillars of an innovation ecosystem: vision and strategy, capital, market, infrastructure, talent, culture and policy. This framework was used to build the innovation programs to be applied at Arab level

The DIF can operate within the key building blocks: Guiding innovation dynamics, building innovation capacity and ensuring integration with the key sectors are the three building blocks required to set the strategy initiatives.

- Guiding innovation dynamics: The development of strong innovation ecosystems is a key component of regional development, as innovation – especially in ICTs – is a driver of economic competitiveness and growth in modern economies. To catalyze the entrepreneurial ecosystem, which consists of large firms, startups, universities and governments, the key is not only the roles these entities play, but also the interac¬tions between them. It requires a guiding innovation agency or organiza¬tion and flexible approaches that deliberately understand and set policies and programs fostering digital innovation and entrepreneurship.

- Building innovation capacity: This includes innovation hubs, tech parks, lab programs, and other similar arrangements. Cross-sector and cross-regional collaboration are key elements for building innovation capacity at the national and regional levels.

- Integration of ICT into key sectors: Within sectors, many SMEs and big firms need to integrate technology more closely into their operations to be competitive and sustainable.

4.1.2 Strategic objectives

The strategic objectives of the programs under this dimension are:

Strategic objective 7: Creating an ecosystem which fosters innovation within a community

A dynamic innovation environment requires coherent regulatory organizational settings which guide, facilitate and promote innovation culture, mindset, projects and programs. This strategic objective aims to develop the mechanisms (organization, regulatory frame work, alliances etc.) in charge to orchestrate the innovation dynamic and good interactions with different stakeholders.

Strategic objective 8: Building innovation capacity

Networks and innovation hubs, cross-sector and cross-regional collaboration are key elements for building innovation capacity at the national and regional levels. Cross-regional and cross-sector collaboration, and support for the establishment of innovation hubs and knowledge networks, are important. Experiments in building innovation capacity require cross-sectoral collaboration with higher education institutions and the private sector. Sharing the experience and best practices of universities in technology transfers can accelerate the delivery of innovation to markets. Arab countries need an ecosystem of universities, labs, companies, investors and regulators, all ready to collaborate and innovate.

Strategic objective 9: Promote innovation through collaboration with the private sector

Startups can scale organically through acquisitions or through collaboration. Collaboration with private sector allows a startup to profit from the resources of a large corporate partner. Corporate partners benefit from the startup's ideas/concepts, possibilities to test ideas quickly and outside complex structures, access to new technology, rapid prototyping, and entrepreneurial spirit and culture. Such a collaboration enables innovative ventures to be scaled, for the benefit of all concerned.

Digital Government

4.2 Digital government

4.2.1 Key success factors

Key success factor 1: Contribution to SDGs and sustainability
The e-government is a facilitation tool to help citizens best use and benefit from their civil rights towards the achievement of the SDGs, particularly SDG 8 (Decent Work and Economic Growth). It also helps in increasing accessibility of public services in a reliable and accountable way, which serves SDG 11 (Sustainable Cities and Communities).

Key success factor 2: Services harmonization towards a better citizen experience
Build a new relationship between society and government, focusing on the experience of the citizen as a user of public services through the adoption of ICTs in the government. Guide the digital transformation of public service in the Arab countries into an inclusive digital society where all citizens can benefit from the opportunities offered by digital technologies to improve their quality of life

Key success factor 3: Proactive governance
Reach the level of governance that reaches out to the public without waiting to react to formal requests; offer data disclosure (in open format), with the exception of data that the government is required to protect due to privacy or security and deliver online services to users. Governments should proactively seek feedback directly from citizens about the quality of services and make it mandatory for service providers to use smartphones and create dashboards for citizens to view real-time information on service delivery (this is what is normally referred to as proactive governance).

Key success factor 4: Government as a platform
Governments should use technologies (and data) to harness the creativity of people in groups and create collaborations to jointly address policy challenges.

Key success factor 5: Cross Border recognition
Cross border recognition has multiple advantages. Citizens and businesses can use their eIDs for the access of at least public online services and the completion of electronic transactions everywhere in the region. The range of accessible online services would increase massively. One of the major benefits for citizens and businesses would be simplification and the reduction of administrative burdens.

4.2.2 Strategic objectives

The strategic objectives of the programs under this dimension are:

Strategic objective 10: Government online services
Public administration units should deliver services digitally as the preferred option while still keeping other channels open for those who are disconnected by choice or necessity. In addition, public services should be delivered through a single contact point or a one-stop-shop and via different channels.

Modern and efficient public administration units need to ensure fast and high-quality services for citizens and a business-friendly environment. They need to transform their back offices, to rethink and redesign existing procedures and services, and open their data and services to other units, and, as far as possible, to businesses and civil society.

Strategic objective 11: Increase inter-government interactions
Public services should be designed to work seamlessly across governmental authorities and across organizations, relying on

the free movement of data and digital services. This can be done by creating and managing reliable, accessible and cost effective common central services centers that ensure the facilitation of common or interconnected processes. Governments should also simplify work processes to improve service to citizens. The individual e-government projects will be driving the migration of systems, data and processes to a common solution that better meets citizen needs.

Strategic objective 12: Build public data content as economic growth driver

Public data will drive growth, ingenuity, and innovation in the Arab countries' economies. Data is the new capital of the global economy in general as countries seek renewed and constant growth and stronger public services performance that is citizen centered. Open data is a crucial part of the burgeoning data landscape and a smart ecosystem. In this context, the main objective is to encourage and drive the uptake and use of open data and in doing so add value to the economy by increasing transparency, stimulating new business applications, building trust in Government and improving the lives of citizens by delivering better services.

This can be done by:

- Encouraging the release of all appropriate high value government data as open data by default.

- Building a value driven economy by making it publicly available and freely reusable.

- Engaging with decision makers, policy makers, and community representatives to promote and encourage use of open data.

Strategic objective 13: Enhance citizen education by ICT usage

With the goal of informing progress towards the SDGs, especially Goal 4 on education that aims to "ensure inclusive and quality education for all and to promote lifelong learning." Education advancement is a vital goal in the Arab countries. The trend that technology affects most spheres of people's lives impacts on Arab society's requirements for essential skills and knowledge. Effectively using technology in teaching and learning in an open distance-learning environment can enhance the quality of education and prepare students for their role as knowledge workers. E-education particularly offers opportunities to enhance students' engagement and to contribute to the establishment of a graduate identity. Introducing innovative teaching pedagogies to existing learning cultures may require a change from instructivism to constructivism. E-education offers opportunities for innovative spaces to expand teaching and learning in an open distance learning environment.

Strategic objective 14: Foster cross-border healthcare, health security, solidarity, universality and equity

Firm structural reforms are needed to ensure the sustainability of the health systems while securing access to services for all citizens. As part of these efforts, Arab countries must reduce any regulatory burden that might hinder the accessibility of cross-border health systems, while of course ensuring safety. E-health and wellbeing are areas with high growth potential and possibilities for innovation notably by unlocking effective health data exchange.

Digital Business

4.3 Digital business

4.3.1 Key success factors

Key success factor 1: Digital economy contribution to GDP
The new digital evolution will act as an engine of growth for the region's economy. It will aid in accelerating the digitization of many current existing industries and catalyzing productivity improvements and efficiency gains. The selection of the industries was based on two factors. Firstly, the significance of the sectors in the Arab region and secondly, the degree at which digital technologies have penetrated such sectors. The selected industries to utilize the new digital technologies are as follows:

- Agriculture: Agriculture plays an important role in the economies of most of the countries in the Arab region. The contribution of the agricultural sector to the overall economy differs significantly among countries in the region, ranging, for instance, from about 3.2% in Saudi Arabia to 13.4% in Egypt. However, many countries in the region, especially those around the Mediterranean Sea, are highly dependent on agriculture such as Egypt, Morocco, Sudan, Syria, Algeria and Mauritania (ecoMena).

- Manufacturing: Manufacturing is growing in the Arab world region. Two countries in specific have been focusing in manufacturing: UAE and Saudi Arabia. In UAE, the manufacturing sector is the second biggest contributor to the nation's economy and accounts for around 80% of Dubai's trade that does not involve oil. Saudi Arabia as well is on its way to become the region's biggest manufacturing hub. The Kingdom has invested USD 70 billion to build six cities equipped with the infrastructure requirements to attract and support the manufacturing companies (The manufacturer). The manufacturing sector also contributes significantly to the GDP of other Arab countries such as Egypt and Jordan (16.44% and 16.08% respectively).[49]

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[49] World Bank

- Financial: The financial services sector has some of the highest levels of digital potential. A more developed and technology-driven financial sector is essential to boosting sustainable economic growth in the region. Financial integration within the Arab region will also help boost the financial markets and increase their efficiency. While still relatively small when compared with the likes of the UK or the US, the region's FinTech sector is ready for exponential growth. FinTech startups have raised over USD 100 million in the Middle East and North Africa (MENA) region over the past decade. This number of startups launched, and amount of investments raised will be doubled by 2020.[50]

- E-commerce: E-commerce is one of the booming sectors in the region. The Middle East e-commerce market is expected to reach USD 69 billion by 2020.[51] Overall, there is a lot of promise for e-commerce in the Middle East.

Key success factor 2: Transforming business and supporting entrepreneurship
The greatest digital opportunity for the Arab countries lies in the transformation of existing businesses and enterprises. The digital revolution has altered the way of doing business leading to change in business models and increase in competition. Business leaders, specifically of SMEs, are still finding it hard to implement effective strategies to use the digital technologies as a source of innovation for their customers or users. Emerging digital technologies can be utilized by business leaders and entrepreneurs to identify new opportunities and also serve as a critical enabler for businesses in their transformation.

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[50] Fintechnews
[51] PayFort

4.3.2 **Strategic objectives**

The strategic Objectives of the programs under this dimension are:

Strategic objective 15: Open market for additional economic growth
Digitization acts as an economic accelerant that fuels the GDP and uplifts the economic growth. The growth of the digital economy has widespread impact on the whole economy of the Arab world and the chosen sectors in specific. Boosting digital adoption across these economic sectors will enhance productivity and efficiency and provide new options to overcome many sector-specific constraints.

Strategic objective 16: Increase digital employment
As a growth driver, digital transformation is changing the world of work and creating a revolution in how we work. Digitization can reshape the nature of jobs within the labor market and create more jobs. Digitization has provided an additional 6 million jobs in the world in 2011. Harnessing the power of digitization can offer great opportunities to skilled workers in the Arab job market, prepare people for employment success and fuel economic growth.

Strategic objective 17: Promotion of SMEs through adopting digital technology
SMEs are a key driver to the digital economy and digitization has become vital to them in terms of raising productivity and driving topline growth. Many SMEs are now looking to embrace opportunities in the digital economy and acquire digital capabilities in order evolve their business models, seize growth opportunities and better compete in the market. The strategy will support companies and SMEs to upskill their digital capabilities and use technology more intensively in their operations and workplace.

Digital Citizen

4.4 Digital citizen

4.4.1 Key success factors

Key success factor 1: Contribution to SDGs and sustainability (reduce inequality and ensure sustainability)
The enhancement of inclusion, accessibility and digital affordability in Arab countries will contribute to the achievement of the SDGs, especially SDG 10 (reduce inequality). Indeed, the fair access to networks and technologies will significantly trigger a reduction in the growing disparities within and among countries. Connectivity can be a channel for better lifestyle and sources of income. In addition, it will help to ensure their sustainability and contribute to SDG 11 (sustainable cities and communities).

Key success factor 2: Improve the quality of life
Improve the wellbeing of citizens and civil society: Everyone, including vulnerable and minority groups, will benefit from a higher standard of living. Basic digital skills will empower citizens to seize opportunities presented by technology and digitization. Digital services would be affordable, secure and accessible to all regardless of skills and economic means. Local digital content will be encouraged. Every citizen would have the opportunity to access and make use of ICT for their daily needs.

4.4.2 Strategic objectives

The strategic objectives of the programs under this dimension are:

Strategic objective 18: Ensure inclusive and equal access to digital technology
Ensure easy access to technology and connectivity and help citizens to learn how to get the best out of them. Relevant, alluring and engaging content drives people to make use of ICT. High

quality local content will draw more people online. The Internet offers the opportunity to overcome economic limitations; it reaches households with greater ease. The Internet also offers unprecedented opportunities to digitally preserve heritage.

Strategic objective 19: Enhancing digital literacy and social inclusion
Achieving widespread digital literacy is vital for inclusivity and social cohesion. For example, digitally- competent workers and digitally-competent citizens can be more successful in the job market and contribute more effectively within the community. Those without digital competences are in danger of falling behind.

Strategic objective 20: Enhance the fixed broadband Internet tariffs
Promote better speed and tariffs of Internet will contribute to an effective participation in the digital economy and deliver positive benefits for communities in the form of improved access to business and job opportunities, health, education and government services.

Towards The Implementation of The Arab Vision For The Digital Economy

To achieve the goals of the vision, we need to implement a set of programs that are outlined in the accompanying guidelines for this topic, titled "A Guide to Programs for the Arab Vision of the Digital Economy"

We will clarify here with this document the presumed roles assigned to the Arab Commission for Digital Economy, as it is the main initiative and the proposed realistic application tool to implement this strategy.

Given the nature of the main strategic programs, especially their integration and formation of a unified vision, the first necessarily initiative will be the formation of a capable or empowered body or organization by the Arab countries to supervise and council the implementation of its projects and programs.

ACDE is endowed with the necessary operational model, capabilities and regulatory framework to achieve and execute the strategy. The Commission ensures highest level representation of Arab countries as well as coordination and joint work with representatives of ministries, public authorities and organizations of Arab states.

ACDE's board of directors consists of representatives of the digital economy of the Arab countries. They meet twice a year. The Commission will be attached directly to the Arab League as an independent Arab institution and will function in accordance with the League's rules of corporate governance. The Commissioner-General is a high-level person with proven experience and success needed to lead digital change and transformation. He/she is contracted by the board for a period of four years during which he/she will have full administrative powers to run the Commission according to rules and statutes.

The following figure illustrates ACDE's business model and governance:
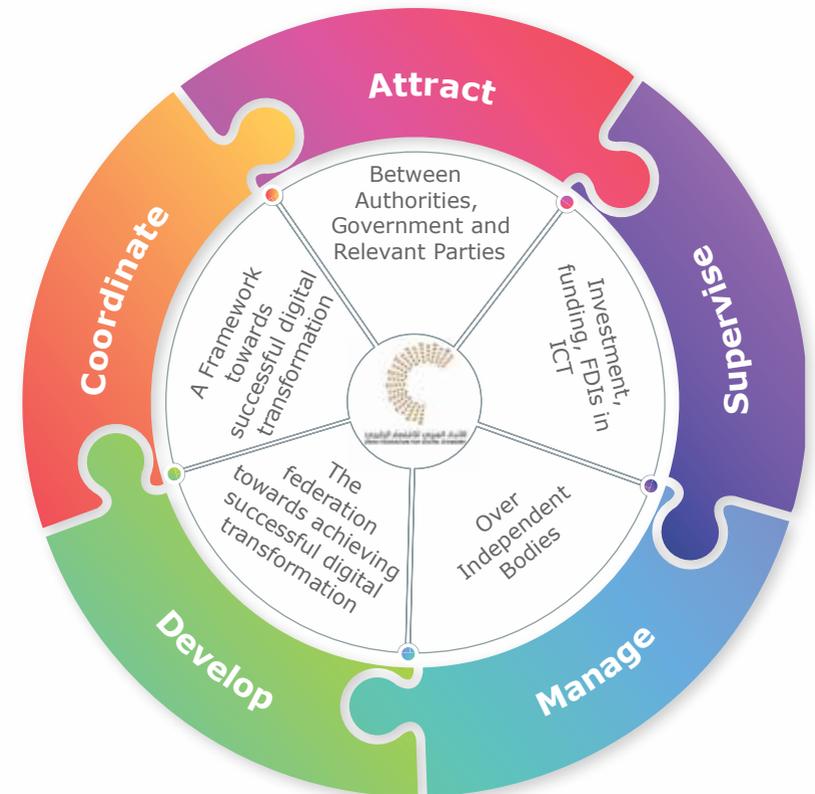
Figure 10 **ACDE Roles**

The organizational structure of the Commission is designed to fit with the ICT and digital economy ecosystem in the world and the Arab region. It is also designed to sustain the implementation of the strategy and systems built by the Commission. The structure is defined in accordance with the strategic vision and related programs as well as the operational model defined during the first five years, coordination with affiliated bodies and relevant Arab organizations and Arab governments, in addition to various funding entities and investors for the launch of programs and projects.

The coordination role stands on top of the responsibilities of the Commission to ensure continued momentum and support for the implementation of these ambitious plans and provide the best opportunities for the Arab digital transformation. The second role is to supervise a group of eight or more Arab organizations (shown in Figure 18 below within the organizational structure). These organizations have thematic or sectoral specialization and can supervise or carry out projects directly by owning and implementing a range of programs such as e-learning, health, and agricultural and financial services. Thirdly, the role of the Commission is general supervision and coordination without interference in the detailed management of the projects or program. Each project or program is subject to specific agreements that regulate work relationships.

The Commission is required to implement a series of programs as reflected in the master plan. As a result of the implementation of the annual programs and projects, the Commission assesses the situation annually and readjusts the plan to maintain full alignment with strategic vision. Then it repeats the administrative cycle referred to above (business and governance model for ACDE).

Suggested organizational structure

The following figure illustrates the organization structure to launch, manage and supervise the programs and ensure full coordination with Arab countries and with similar international bodies.
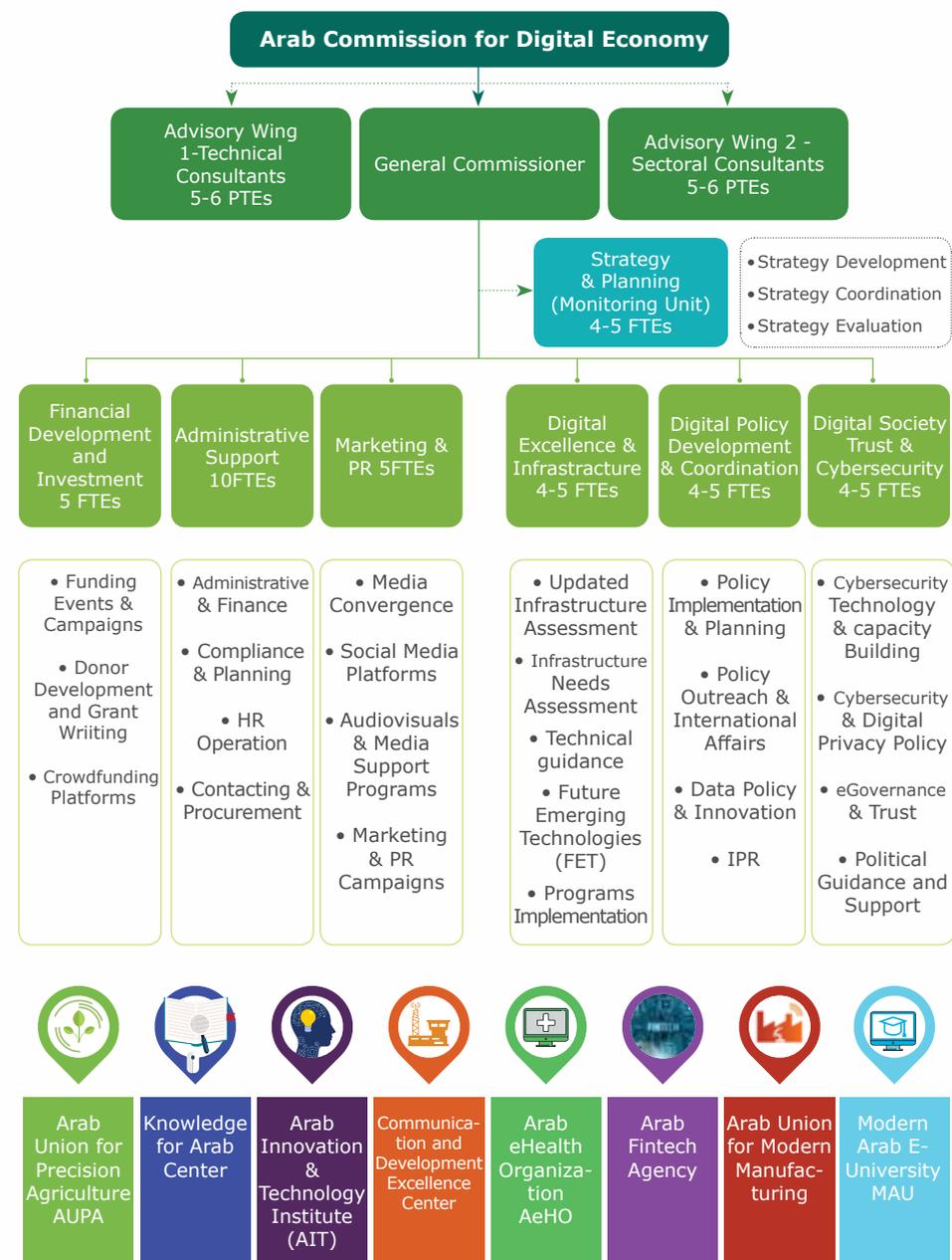
Figure (11-a) ACDE's Organizational Structure

In order to strengthen the position of ACDE, it is recommended that it reports directly to the secretary general of the League of Arab States through a commission attached to the secretary general office.

The diversity of situations across the Arab countries is huge. Cooperation between them is key for the enhancement of innovation, practices and resources. The overall governing entity should have a dedicated action plan to foster this cooperation.
The governing structure as described above (Figure 18) starts with ACDE at the top. Under ACDE, come a board of directors and two consulting wings.

Board of Directors: The board of directors' key purpose is to ensure that the Commission is on the right path, by collectively directing its affairs and assessing its overall direction and strategy. **Consulting Wings:** The first wing comprises a group of technical consultants and professionals who can provide technical supervision, direction and support to the board about ongoing projects. While the second wing is a group of sectoral consultants, such as an e-healthcare consultant, a FinTech consultant, etc.

Further down in the organizational structure, there are seven main departments:

1. Strategy and planning (separate department that audits strategy development and implementation and reports to the board of directors)

2. Financial development and Investments

3. Administrative support

4. Marketing and public relations

5. Digital excellence and infrastructure

6. Digital policy development and coordination

7. Digital society, trust, and cybersecurity

Strategy & Planning

- Strategy Development
- Strategic Coordination
- Strategy Evaluation
- Digital Economy Indicators and Index

Strategy & Planning

It is responsible to develop the digital transformation strategy, coordinate and align between different parties and countries and evaluate and montor over the achievement the strategy (50 programs) through monitoring over all the other departments

Strategy Development

- It is the process of researching and identifying strategic options, selecting the most promising and deciding how resources will be allocated across the organization to achieve objectives

Strategic Coordination

- Responsible for strategic alignment and coordination between different parties and authorities (such as governments, ministries, parties sector entities, etc.)

Strategy Evaluation

- It is the assessment process of the strategy and its goals, making sure that the strategy is going in the right path by assessing each department's performance

- Monitor each of the project's plan and process, measure their indicators and report them to the top management

Digital Economy Indicators and Index

- Publish Arab Strategic Economic Report through measuring general KPIs of Digital Economy

Financial Development and Investment

Financial Development and Investment

AFDE manages the budget of projects carried out by its departments, and its headquarters, in the Arab delegations or through Arab executive agencies.

Funding Events & Campaign

- Organize campaigns and events that highlights a specific goal that Arab countries want to reach in order to attract investments, funds, FDIs, etc.

Donor Development

- Develop a strategic pipeline of donor engagement

- Develop relationships and communication with funding sources such as the World Bank

Grant Writing

- Grant proposal writing and submissions to funding sources

Crowdfunding Platforms

- Raise funds from a large number of individuals or institutional investors through online web-based platforms

Financial Development and Investment branches:
- Funding Events & Campaign
- Donor Development
- Grant Writing
- Crowdfunding Platforms

Administrative support

Administrative support branches:
- Financial Affairs
- Contracting and Procurement
- Human Resources
- Legal Affairs
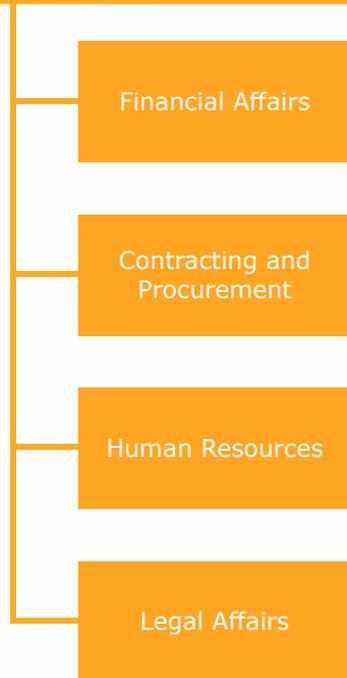
Administrative support

It is possible for work achieving high performance levels of performance of the federation employees and managing all the internal affairs related to the federation

Financial Affairs

- Management of office and assets strategy
- Plan, organize, audit and account for and control all the federation's finances
- Produce financial data and prepare monthly and annual reports

Contracting and Procurement

- Issue purchasing orders
- Manage suppliers and contractors
- Issue tenders and offers
- Manage contracting affairs
- Monitor payments

HR Operations

- Responsible of full and part time hiring
- Training and development
- Register and evaluate training and education institutes related to the AFDE
- Ensure the positive and energetic work environment in the AFDE

Legal Affairs

- Manage the legal aspects of contracting and procurement
- Document, archieve and revise agreements and contracts
- Legal coordination with affiliated and contracts
- Manage law cases
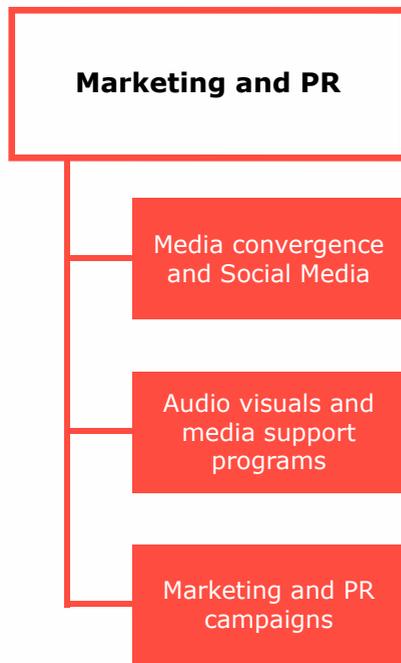
Marketing and PR

Marketing and PR

This department builds and maintains a positive public image for the federation. It creates media from press release to social media messages, that shape public opinion of the federation and increase awareness of its importance.

Media convergence and Social Media

- Media convergence and Social Media
- Audio visuals and media support programs
- Marketing and PR campaigns

Media convergence and Social Media

- Manage all media and advertsing affairs related to the AFDE, manage the media affairs that severe to achieve the AFDE goals on all social media platforms.
- Studying the federation's objectives, promotional policies and needs to build public relation s strategies that influence stakeholders

Audio visuals and media support programs

- Produce media programs in coordination with media networks and influencers on all media platforms, which serves the AFDE goals

Marketing and PR campaigns

- Manage all press conferences, events, participation and representation in international conferences and exhibitions and arrange events to attract sponsors for the programs
- Manage media content, productions, workshops, portable media campaigns
- Encourage innovation, creativity, enterpreneurship

Digital Excellence & Infrastructure

- Infrastructure
- Future & Emerging Technologies (FET)
- Technological Enterpreneurship
- Programs Implementation
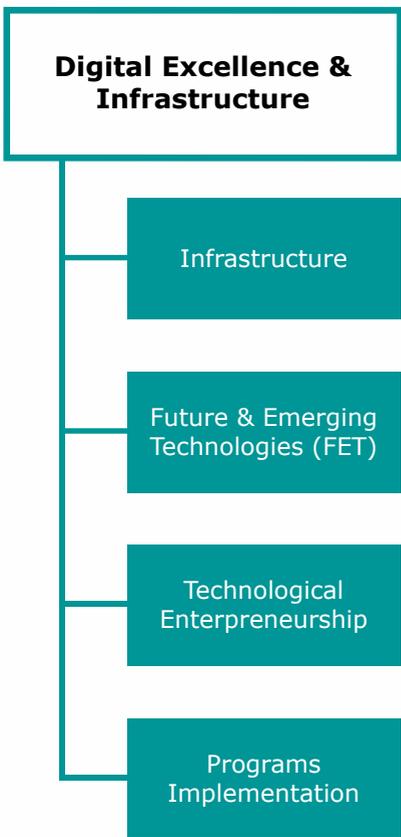
Digital Excellence & Infrastructure

To ensure leadership in future ICT Technologies and Infrastructures and to help transform the current situation to the desired situation through building infrastructure, mega projects, flagship and ensure the right implemntation of the programs.

Infrastructure

- Established cooperation agreements with relevant governmental bodies related to infrastructure
- Develop up-to-date (semi annual and annual) evaluation reports about current infrastructure in each country and areas of gaps
- Recommend areas of development in infrastructure
- Audit over the implementaion of any project related to the infrastructure

Future & Emerging Technologies (FET)

- Ultimate responsible for introducing new technologies like IoT and Machine to Machine Communication, through facilitating the adoption of new technologies for the governments, by providing guidance and supervision
- Monitoring the implementation of strategic projects related to FETs

Technological Enterpreneurship

- Investment in research, inventions and studies that help to introduce new technologies such as IoT, Big Data and Robotics

- Execute scientific initiatives that facilitate the challenges facing the Arab World. They are long-term initiatives that compiles pioneering research teams from different majors, aligned to one goal and an ambitious roadmap

Program Implementation

- Provide guidance, support and supervision over the implementation of the 50 projects in cooperation with the stakeholders

- Define objectives of each project and its KPIs

- Allocate resources and budget for each project in parallel with the Financing and Investment department

- Supervise over each project, provide reports to the Strategy and Planning department

Digital Policy Development and Coordination

- Policy implementaion and planning
- Policy outreach and international affairs
- Data policy and innovation
- IPR

Digital Policy Development and Coordination

It is responsible for the overall regulations and policy development in relation to the digital economy

Policy implementaion and planning

- Responsible for the interface with the other international institutions like the EU, about setting regulations and policies and develop mutual policy projects

Policy outreach and international affairs

- Regular IPR laws
- Regulate cybersecurity and data protection
- Regulate ePayments and Financial Technology laws

Data policy and innovation

- Work along the data-value chain to provide a legal and political framework that allows public authorities, companies and citizens to make the most of data in all sectors of the economy and many aspects of society

- Address the barriers that impede the creation of an Arab data economy, namely by enhancing access to and reuse of several types of data: public sector, publicly funded, research and private sector data.

- Direct the re-use of public sector information which advances the Federation's open data program

IPR

- Advise the Federation on policies and legislation to protect intellectual poverty

- Providing civil legal advice on intellectual property matters to the federation bureau and departments

- Registration of trademarks, patents, design and copyright licensing bodies

Digital Society, Trust and Cyberbullying

Cybersecurity Technology & Capacity

Cybersecurity & Digital Privacy Policy

eGovernment & Trust

Financial Development and Investment

It provides a strategic approach to the social dimensions of the AFDE, focusing on applications that combine digital policy, digital Research and Innovation and deployment and provide for leadershipin cyber security and digital privacy, legislation and innovation, in order to improve the life of ctizens, the opportunities for companies and the quality of public administrations in major areas of society and economy

Cybersecurity Technology & Capacity Building

- Ensure a future of strong digital resilence and privacy protection information security and digital provacy in the societal challenges

- Focus on innovative and next-generation systems and generic cyber security and privacy

Cybersecurity & Digital Privacy Policy

- Develop a Cyber Security Strategy, policies and regulations

- Ensure synergies with cyber security and privacy policy.

eGovernment & Trust

- Advance the quallity and innovation of public administrations and accelerate the large-scale public sector use of trusted identification and trust services in the e-Government programs and initiatives

- Enable better quality, more efficient and user-centric services across the services provided by the eGovernment programs and initiatives

Arab Union for Precision Agriculture AUPA

- AUPA is made to support farmers on the small scale and agriculture ministries on a larger scale in the Arab countries by providing customized information and services that increase productivity, profitability and environmental sustainability.

- Such union can offer many other benefits such as better working conditions for farmers, increased animals welfare and the potential to improve various aspects of environmental stewardship.

Knowledge for Arabs Center

- The Center is an excemptional partner in developing of new ideas and implementing ICT regional projects

- It manages specialzed programs with an aim of enhancing and improving basic ICT knowledge, culture and educational processes in all societal and professional spheres

- The Center provides ICT vocational training, cuztomized training programs for SMEs, basic ICT skills training etc.

Arab Innovation & Technology Institute (AIT)

- The AIT institute enables cross-border Arab collaboration by provding an innovation hub in each Arab state. It offers the benefits of regional ecosystems, partners' facilities, factories and classroom for joint programs and projects.

- The AIT focus on developing innovative products, service and training in a specific area to create a new innovative and creative generations.

Accessibility & Communication Excellence Center

- This center is responsible of establishing regional telecommunication strategies and plans in collaboration with Arab Government and ICT ministries. It is responsible for projects such as Arab Data centers and Cloud Services. National Broadband programs, IXPs Development, etc.

- It also coordinates with consulting entities to develop relevant project studies.

Arab eHealth Organization AeHO

- The eHealth Organization works with partners (such as ministries) at the regional and country level to promote and strengthen the use of ICT in health development from applications in the field to regional governance

- The Organization is developed because of the increasing importance of the digital health solutions and its potential to impact health in the Arab states. As a result, the organization will help to introduce and merge new technologies in the healthcare sector in the Arab states.

Arab Fintech Agency

- This Agency works within financial institutions in the Arab Region like Central Bank, Community Banks, Insurance Agencies, etc.

- The Agency aims to support and empower a healthy and successful financial system, where firms can thrive and consumers can place their trust in transparent and open markets, through introducing technologies

Arab Union for Modern Manufacturing

- The Union is responsible for the implementation of Smart Manufacturing and its practices to ensure an up-to-date skilled workforce. It introduces new technologies in the modern manufacturing and industry 4.0

- The union is comitted to providing the Arab communities with Workforce Development, Education and Training for the the workforce to make the Arab's Modern Manufacturing transition and implementation successful.

Modern Arabs E-University MAU

- MAU is a virtual univesity that operates solely by electronics means using the Internet and e-mail

- MAU collaborates with global educational institutions to offer quality, affordable and marketable courses and program through a quality and modernized learning techniques for undergraduates and postgraduates

- The university works regionally, cross-border and cross-culture

Figure (11-b) ACDE's stakeholders mapping

For more details and analysis of the work environment of the Arab Commission for the Digital Economy, the parties that will cooperate with it, the strategic partners and stakeholders, please refer to the book "A guide for Arab vision programs for the digital economy", where it is exposed in more detail to the mechanisms of work, financing and joint Arab cooperation.

Measuring the results of the Arab vision for the digital economy

5.1 KPIs and Arab Digital Index

We have 25 KPIs to measure the performance of each cluster towards successful digital transformation:

Dimension 1:
Digital Foundation

Table 10   KPIs of Digital Foundation

Dimension	Strategic Objectives	Domain	KPIs	Cluster 3			Cluster 2			Cluster 1			References/ Data Sets
				2023	2026	2029	2023	2026	2029	2023	2026	2029	
Digital Foundation	Developing Telecommunication Infrastructure	Fixed Broadband	% of households with Internet	24.20%	30%	50%	61.20%	75%	85%	91%	99%	99%	ITU
			Fixed Broadband penetration (Subs./100 pop)	2.2	5	10	9	18	25	11	20	30	ITU
		Mobile Broadband	Mobile Device Penetration (per 100 people)	71	80	95	99	99	99	100%	100%	100%	ITU
	Enhancing the Internet Ecosystem		3G/4G Penetration (%)	3.75%	10%	20%	63%	80%	90%	82%	90%	95%	Commission of Science and Technology for Development (CSTD)
		Speed	Broadband Av. Speed (Mbps)	1.82	2	4	1.82	2	4	1.82	2	4	ITU
			Average Download Speeds (Mbps)	1.05	2	3	1.05	2	3	1.05	2	3	ITU

Dimension 2: **Digital Innovation**

Table 11 KPIs of Digital Innovation

Dimension	Strategic Objectives	Domain	KPIs	Cluster 3			Cluster 2			Cluster 1			References/ Data Sets
				2023	2026	2029	2023	2026	2029	2023	2026	2029	
Digital Foundation	Building Innovation Capacity		Capacity for Innovation (1-7)	2.6	3.5	4.3	3.74	4.5	5.4	4.2	5.7	6.1	http://www3.wefofum.org/docs/GITR2016/WEF_GITT_Full_Report.pdf
	Creating ecosystem which fosters innovation within a community		Internet access at schools (1-7)	2.1	3	3.5	3.6	4.5	5.7	3.6	4.5	5.7	http://www3.wefofum.org/docs/GITR2016/WEF_GITT_Full_Report.pdf
	Promote the innovation through collaboration with the private sector		Firm-level technology absorption (1-7)	3.4	4	4.5	4.8	5.5	6	4.9	5.8	6.5	http://www3.wefofum.org/docs/GITR2016/WEF_GITT_Full_Report.pdf
			Knowledge-intensive jobs, % workforce	17.60%	20%	27%	24%	27%	30%	27.40%	30%	35%	http://www3.wefofum.org/docs/GITR2016/WEF_GITT_Full_Report.pdf
	Building Innovation Capacity		No. of publications (papers, researches, etc.)	0.70%	0.80%	1%	1.60%	2%	2.50%	2.40%	2.60%	3%	DESI

Dimension 3:
Digital Government

Table 12 KPIs of Digital Government

Dimension	Strategic Objectives	Domain	KPIs	Cluster 3			Cluster 2			Cluster 1			References/ Data Sets
				2023	2026	2029	2023	2026	2029	2023	2026	2029	
Digital Foundation	Increase inter-Government interactions		ICT use & gov't efficiency	3.1	3.5	4.2	3.68	4.6	5.9	5.2	5.9	6.2	The Global Information Technology Report 2016 (Networked Readiness Index) (GITR)
	Creating ecosystem which fosters innovation within a community	e-Government Development Index	Global Open Data Index (measures the openess of government data)	10%	11%	13%	18%	19%	20%	25%	27%	30%	http://index.okfn.org/dataset/
	Promote the innovation through collaboration with the private sector		Government Online Services Index, 0-1 (best)	0.05	0.2	0.3	0.56	0.74	0.8	0.75			BBVA, DIGiX: The Digitization Index
		Cybersecurity	Global Cyber Security Index (Score 0-1) ITU	0.16	0.15	0.3	0.47	0.65	0.73	0.54	0.6	0.75	ITU
	Building Innovation Capacity		Secure Internet Serves (per million pop.)	2.14	15	20	23	34	40	171	200	240	ITU

Dimension 4: **Digital Business**

Table 13 KPIs of Digital Business

Dimension	Strategic Objectives	Domain	KPIs	Cluster 3			Cluster 2			Cluster 1			References/Data Sets
				2023	2026	2029	2023	2026	2029	2023	2026	2029	
Digital Foundation	Open Market for more additional economic growth	e-Business	Business to Business Internet Use (min. 3.37, max. 6.36)	3.94	4.3	4.8	4.49	5.1	5.8	5.63	5.9	6.25	BBVA, DiGiX: The Digitization Index
	Increase the Digital employment		Business to Consumer Internet Use (min. 2.90, max. 6.30)	3.05	3.8	4	3.39	4.5	5.6	4.72	5.5	5.95	http://index.okfn.org/dataset/
	Promote of SMEs through adopting digital technology		No. of workers in ICT as a percentage of the total population	2.60%	2.80%	3.10%	3.10	3.50%	3.60%	3.80%	3.90%	4%	BBVA, DiGiX: The Digitization Index
			No. of Start ups related to technology / 1000 individuals	0.04	0.05	0.07	0.08	0.09	1.1	2.05	2.1	2.25	DESI
	Open Market for more additional economic growth		Contribution of eCommerce to the GDP in the cluster's	<0.1%	0.05%	1.50%	0.20%	0.80%	1.70%	0.40%	1%	2%	https://www.export.gov/article?id=United-Arab
			Contribution of eCommerce to the total trade	1%	1.20%	1.50%	1%	1.50%	2%	1%	2%	3%	

Dimension 5: **Digital Citizen**

Table 14 KPIs of Digital Citizen

Dimension	Strategic Objectives	Domain	KPIs	Cluster 3			Cluster 2			Cluster 1			References/Data Sets
				2023	2026	2029	2023	2026	2029	2023	2026	2029	
Digital Foundation	Enhance the Fixed broadband Internet tariffs	Basic Skills & Usage	No. of Internet Users	35%	40%	50%	57%	65%	75%	91%	92%	93%	ITU
	Ensure Inclusive and Equal Access to Digital Technology		Regular Internet Users (% of Internet users)	32.49%	50%	70%	51%	65%	80%	81%	90%	95%	ITU
	Enhancing Digital Literacy and Social Inclusion	Internet Users	E-Participation Index, 0-1 (best)	0.08	0.2	0.4	0.552	0.67	0.7	0.66	0.75	0.89	The Global Information Technology Report 2016 (Networked Readiness Index) (GITR)

Conclusion

Conclusion

Digitization is a technology/supply shock which affects the main economic aggregates, notably via enhancing competitive environment, productivity and employment effects, as well as through its interaction with institutions and governance. Understanding digital transformation and the channels through which it influences the economy is therefore critical to the construction of monetary policy.

All regions and countries around world have to deal with the thematic field of digitization in one way or another. Digitization is in fact a reality that presents both opportunities and challenges. Industrial nations in particular see digitization as a key driver of development. The fundamental themes of digitization are clear: it is all about education and qualifications, expansion of infrastructure, and the use and security of data. This wave of digitization is creating and giving rise to new solutions and new business models. New services are expected from digitization. Hence, digitization has the potential to become a turning point in addressing many issues in the Arab world including social welfare, job creation and employment, etc.

Governments of Arab countries face a major challenge in promoting acceptance of new technologies and digital adoption by populations and companies. With a well-defined strategy and action plans, Arab countries can undergo successful digital transformation. Some of the recommendations include energizing digital acceptance with holistic digital public policies, measuring the digital impact in economies and promoting digital telecommunications infrastructure, redefining traditional regulatory frameworks and institutions, fostering digital and banking penetration, and understanding the implications of each new business model.

In order to develop a reliable strategy for a successful digital transformation in the Arab countries, we have used three main inputs:

I. Sectoral benchmarks: We selected priority sectors for digitization. Prioritized sectors were chosen because of highest economic and employment impact if digitized, and also because of the easiness of digitization.

II. International benchmarks: We studied countries' success stories and best practices in digital transformation and analyzed them to come up with lessons learnt.

III. Current situation analysis: We provided an overview of the current state of national digital strategies in Arab countries. The analysis also identified the prioritized Arab countries based on their declared policy objectives for developing their digital economy and society. Our analysis of the Arab countries' current situation revealed that formulating and effectively implementing an "Arab Digital Agenda", must consider the heterogeneity among Arab countries in terms of income, competitiveness, infrastructure, innovation, e-government development and ease of doing business.

The strategy is built on five dimensions: Digital foundation, digital innovation, digital government, digital business and digital citizen. Twenty objectives, 15 themes and 50 programs have been developed for the five dimensions. The programs have been directed to selected Arab countries.

An assessment of the economic and social impact of digitization has been established in Arab countries, through estimating the relationship between the proposed dimensions of digitization on one hand, and GDP per capita growth rate and unemployment rate, on the other. The regression results showed that digitization does matter for all countries and for Arab countries. Below we provide the main findings of the model:

• Digitization is significantly positively related to economic growth and employment.

• The political and regulatory environments, as well as government usage are the most correlated dimensions of digitization to economic performance. In other words, countries with political and regulatory environments which facilitate ICT penetration and the development of business activities as well as governments that lead and succeed in developing and implementing strategies for ICT development, are expected to witness higher growth rates of GDP per capita.

• The digital business, followed by digital innovation dimension, has the highest association with lower unemployment.

• Digitization is related to the economic and social performance of Arab countries. However, the strength of this relation is lower in magnitude than that in the rest of the world.

• The economic and social impacts of digitization differ among Arab countries according to their level of digital performance.

• For Arab countries with low digital performance, digitization is less correlated with growth and some dimensions of digitization correspond to lower growth rates. However, the relationship between digitization and job creation is higher in magnitude, compared to the rest of the world.

• In digitally-advanced Arab countries, the relationship between digitization and unemployment is negative but lower in magnitude compared to the rest of the world. On the other hand, the relationship between digitization and growth does not differ from that of the rest of the world.

It is worth noting that although the magnitude of the gap between Arab countries and the rest of the world concerning the relationship between different aspects of digitization, on one hand, and growth and unemployment, on the other, is not sizeable, the direction of this gap, whether positive or negative, differs with respect to the level of digitization of the Arab countries.

As mentioned above, the Implementation plan includes 50 programs. These programs are the primary path for the digital transformation of the region. There is a defined dashboard/

platform for each program which covers the description, objectives of the program, main phases, prerequisites, required budget, stakeholders, etc.

Following that, a prioritization scheme has been established to identify high to low priority projects. The results of the matrices have led to the selection of ten highest priority programs to become pilot programs.

A governance model has been established to define the roles and responsibilities of the ACDE, the organizational structure, stakeholders' mapping, etc., noting that eight independent bodies would operate under the umbrella of the ACDE. These are: Arab Union for Precision Agriculture (AUPA), Knowledge for Arabs Center, Arab Innovation & Technology Institute (AIT), Accessibility and Communication Excellence Enter, Arab eHealth Organization (AeHO), Arab FinTech Agency, Arab Union for Modern Manufacturing and Modern Arabs E-University MAU.Also, Potential funding sources have been identified, taking into consideration their scope of funding and latest funding seal or limit per year.

Finally, in order to measure the strategy's impact and performance in the upcoming years, a list of defined KPIs and standards have been delineated for the upcoming years. Those KPIs are identified for each of the five dimensions of the strategy and for each of the clusters.

APPENDIX

Appendix

Appendix 1: The economic and social impact of the proposed digital strategy

Methodology and data

This part of the report tries to analyze the economic and social impact of the proposed digital agenda for the Arab countries, distinguishing between the different dimensions of the digitization process i.e. the 5Ds: digital foundation, digital innovation, digital business, digital government and digital citizen.

Assessing the impact of digitization could be tackled either from the macro or the micro (or sectoral) level. However, the report at hand is confined to analyzing the macroeconomic impact of digitization. The main reason behind this macro-level analysis is the difficulty of accessing, and sometimes the unavailability of, a comprehensive and lengthy micro or sectoral data set, especially for the Arab countries. It is worth noting, though, that the micro-level analysis usually provides more specific insights as to the importance and impact of different aspects of digitization.

It is argued that by 2020, the digital market will have added USD 95 billion[52] every year to the Middle East's annual GDP. Ultimately, a unified digital Middle East could contribute up to 3.8% annually to the GDP, or approximately USD 95 billion. Another study analyzed 150 countries using a classical production function model to assess economic impact, controlling for number of variables. Results showed that a 10% increase in digitization leads to an increase in GDP per capita by 0.60% worldwide, 0.50% in constrained countries, 0.51% in emerging countries, 0.59% in transitional countries, and 0.62% in advanced ones.[53] It was also found that a

10% increase in digitization reduces unemployment rate by 0.84% for the whole sample of countries.

Accordingly, the proposed econometric model estimates the relationship between digitization and two variables: a) GDP per capita growth; and b) unemployment rate.

The model takes the following form:

$y_{it} = \beta_0 + \beta_1 digitalization_{it} + \beta_2 digitalization_{it} * Arab\ country\ dummy_{it} + \beta_3 X_{it} + \varepsilon_{it}\ .. (1)$

where:

y: is the dependent variable representing each of the two outcomes (economic growth, and unemployment).

digitization: a variable that indicates some digital aspect proxying each dimension of the digitization process (5Ds).

Arab country dummy: is a dummy variable that takes the value of 1 for Arab countries and 0 otherwise.

X: is the vector of control variables which includes the main determinants for each outcome, based on what is standard in the literature.[54]

ε: is the error term, the subscripts i and t identify the country and the year, respectively.

The dataset covers about 144 countries, of which 16 are Arab countries over the period (2012-2016).[55] The Arab countries included in the sample are: Algeria, Bahrain, Egypt, Jordan, Kuwait,

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[52]Tarek Elmasry, Enrico Benni, Jigar Patel and Jan Peter aus dem Moore. (2016), "Digital Middle East: Transforming the region into a leading digital economy", Digital McKinsey.
[53]Karim Sabbagh , Bahjat El-Darwiche , Roman Friedrich and Milind Singh (2012),"Max-imizing the impact of digitization, PWC, pp. 8-17 , this report Previously published in "The Global Information Technology Report 2012: Living in a Hyperconnected World," World Economic Forum, 2012, and by Booz & Company in 2012.

[54]The choice of the control variables for each outcome (i.e. growth and unemployment) is based on theory and data availability.
[55]The main reason behind choosing this time period is data availability, especially for Arab countries, which are our main focus here. In addition, the WEF adopted a new methodology to construct the Networked Readiness Index (NRI) since 2012, which differs from the one used before 2012. Thus, for consistency purposes, we chose to start from 2012.

Libya, Lebanon, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab of Emirates, and Yemen. Other Arab countries are not included in the model due to the unavailability of data on digitization and/or macroeconomic variables.

Equation (1) is estimated several times, where we include one indicator accounting for each dimension of digitization, one at a time. Moreover, an interaction term between the indicator of digitization and the Arab country dummy is included. This is to assess whether the relation between digitization, accounted for by each dimension, on one hand, and growth and unemployment, on the other, differs in the Arab countries compared to the rest of the world.

Nevertheless, since the digital performance differs among the Arab countries themselves, we further divide the Arab countries in the sample into two groups: the first includes the Arab countries with high digital performance (Bahrain, Jordan, Oman, Kuwait, Qatar, and United Arab Emirates), and the second includes Arab countries with low digital performance (Algeria, Egypt, Lebanon, Libya, Mauritania, Morocco, Tunisia, Syria and Yemen). The rank of these countries in the latest Networked Readiness index (NRI) issued by the World Economic Forum (WEF) in 2016 is the criteria behind this classification. Accordingly, we construct two dummy variables for these two groups, and incorporate interaction terms between digitization dimension and these dummies. This allows us to test whether the relation between digitization in each dimension and growth or employment differs as the level of digital performance varies. Hence, the equation of the model takes the following form:

$y_{it} = \beta_0 + \beta_1 digitalization_{it} + \beta_2 digitalization_{it} * low\_Arab\ country\ dummy_{it} + \beta_3 digitalization_{it} * high\_Arab\ country\ dummy_{it} + \beta_4\ X_{it} + \varepsilon_{it} \ .... \ (2)$

where:

Low_Arab country dummy: is a dummy variable that takes the value of 1 if the Arab country has low digital performance and 0 otherwise.

High_Arab country dummy: is a dummy variable that takes the value of 1 if the Arab country has high digital performance and 0 otherwise.

Due to the short time span of the dataset, the above-mentioned equations (1) and (2) will be estimated using cross-sectional time-series Feasible Generalized Least Squares (FGLS) with heteroscedastic robust standard errors.

The dataset was built by screening different international data sources of ICT and selecting data, which covers the 5Ds of the proposed digital agenda, from the Networked Readiness Index (NRI) of the World Economic Forum (WEF). The main reason behind relying on the NRI is that it is considered the most comprehensive index for digitization that takes into account and incorporates indicators for almost all the components of the adopted framework of digitization.

The data for the dependent variables (GDP per capita growth rate and unemployment), as well as the control variables in each equation is derived from several databases, including the World Development Indicators (WDI) published by the World Bank and the UN statistics. For quality of government, we rely on the data of the World Governance Indicators (WGI) published by the World Bank.

For the growth equation, our empirical model builds on the neo-classical growth theory, where the real per capita GDP growth rate depends on the initial value of GDP per capita, to test for the convergence hypothesis, as well as a set of structural indicators and other factors influencing growth, including population growth, investment ratio to GDP, the ratio of government consumption to GDP, inflation, as well as a measure of openness to trade. In addition, the world governance indicator for rule of law is used as a control variable, to reflect the institutional environment in the country. As for the unemployment equation, previous literature shows that unemployment is determined by productivity, as well as sociological and political patterns of each country. Thus, we include the following variables as controls in our model: urbanization rate, per capita GDP, degree of exposure to international trade, Inflation rate and rule of law.

Concerning the variables reflecting the proposed dimensions of the digitization process, we employ seven variables: the Political & Regulatory Environment Index (1st pillar of the NRI) to proxy the policies and regulations theme of digital foundation, the Business and Innovation Environment Index (2nd pillar of the NRI) to proxy the innovation dimension, the Infrastructure Index (3rd pillar of the NRI) to proxy the infrastructure theme of digital foundation, the skills index (5th pillar of the NRI) to proxy the human capital skills theme of digital foundation, the Individual Usage Index (6th pillar of the NRI) to proxy the digital citizen dimension, the Business Usage Index (7th pillar of the NRI) to proxy the digital business dimension, and finally the Government Usage Index (8th pillar of the NRI) to proxy the digital government dimension.

It is worth noting that this exercise should be seen as a first attempt to assess whether and how differently the proposed digital dimensions in the Arab digital agenda are linked to the aggregate performance of both economic and social variables of the Arab countries of interest, in comparison to the rest of the world.

● **Regression results**
the detailed empirical results of the different models estimated are shown in the full report. In all models, most of the control variables included are significant and have the expected signs in accordance with theory and literature.

As for digitization variables, Table (14) reports the coefficients of these variables and their interaction terms with the dummy variable of Arab countries. Concerning GDP per capita growth, the results in Table (14) show that all dimensions of digitization are positively related to GDP per capita growth, except for the digital citizen dimension, proxied by individual usage. This may be attributed to the fact that digital consumer adoption is mainly devoted to high levels of smart phones penetration and social media adoption, especially in less developed countries. The effect of such phenomena is frequently argued to be minimal or destructive to growth, especially when being mainly used in nonproductive activities.

Moreover, the skills index, as one of the proposed digital foundation, reveals no significant correlation with growth. The most influential variable is the political and regulatory environment index, followed by the government usage index, whereas the least association is for the business usage index. An improvement in the political and regulatory environment index and the government usage index by one unit, is associated with an increase in the GDP per capita growth rate by about 0.9 and 0.77 percentage points, respectively. However, an improvement in the business usage index by one unit is coupled with an increase in the growth rate by about 0.25 percentage points. Adequate political and regulatory environments are believed to facilitate ICT penetration and the development of business activities which in turn enhances growth.

Furthermore, these positive relations are also significant for Arab countries, but are less in magnitude, since all the interaction terms between the digitization indices and the dummy of the Arab countries are significantly negative. In Arab countries, an improvement in any aspect of digitization by on unit is associated with higher growth, but by a factor that is expected to be less by around 0.2 percentage points compared to the effect of the same aspect of digitization on growth in the rest of the world.

Nevertheless, the negative association of individual usage with growth is more pronounced in Arab countries, the gap is estimated to be about 0.13 percentage points. MENA region ranks 2nd worldwide in number of YouTube video views. It has the fastest growing video consumers on FB. SMEs with online presence, on the other hand, are reported to be around only 15%. The skills index is negatively significant for Arab countries, compared to the rest of the world. An improvement in the skills index by one unit in Arab countries is associated with a decrease in the growth rate by about 0.19 percentage points. This signals deficiency in the capacity of the population to make effective use of ICTs.

As for unemployment, all the indices of digitization are associated with lower levels of unemployment, except for the political and

regulatory environment index, which is positively related to unemployment. This could be explained by the argument that regulations could be job killing,[56] especially in the short-run. The introduction of new technologies, accompanied by enhancements in the political and regulatory environments and the development of business activities, might change the mix of labor and capital, and that change could decrease the amount of labor required for a given unit of output. The most influential indices on unemployment are the business usage index followed by business and innovation environment index and government usage index, since an improvement in these indices by one unit is associated with a reduction in the unemployment rate by nearly 2.7, 1.7 and 1.6 percentage points, respectively. This could be attributed to the leading role of the business sector in creating new jobs due to digital transformation. Finally, the least related variable to unemployment is the skills index, as an improvement in this index by one unit is associated with a reduction in the unemployment rate by only 0.7 percentage points, keeping all other variables constant.

For the Arab countries, empirical results show that digitization is significantly related to unemployment, but with lower magnitude compared to the rest of the world. In other words, enhancement of any aspect of digitization is associated with a reduction in unemployment rate, but this relation is less tight for Arab countries by about 0.2-0.3 percentage points compared to the rest of the world. This is with the exception of skills and business usage indices where their relation to unemployment in Arab countries does not differ from that in the rest of the world. The coefficients of the interaction terms of these two variables with the dummy of Arab countries are statistically insignificant. On the other hand, the positive relation of the political and regulatory index and unemployment is stronger in Arab countries compared to the rest of the world. An improvement in the political and regulatory index is associated with a decrease in the unemployment rate by about 0.82 percentage points in Arab countries compared to 0.68 percentage points in the rest of the world, assuming all other variables are constant.

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[56]https://publicpolicy.wharton.upenn.edu/issue-brief/v1n3.php#ftn15

Table 15	Table (15): Impact of Digitization on Growth and Unemployment, with Arab Country Dummy Variables	
Variables	GDPPC Growth	Unemployment Rate
	(1)	(2)
Political and regulatory environment	0.901***	0.680***
Business and innovation environment	0.332***	-1.647***
Infrastructure	0.277***	-1.484***
Skills	0.0726	-0.724***
Individual usage	-0.228***	-1.604***
Business usage	0.254***	-2.782***
Government usage	0.766***	-1.634***
Political and regulatory environment *Arab country dummy	-0.160***	0.140**
Business and innovation environment *Arab country dummy	-0.216***	0.243***
Infrastructure *Arab country dummy	-0.150***	0.263***
Skills*Arab country dummy	-0.191***	0.0824
Individual usage *Arab country dummy	-0.129**	0.260***
Business usage *Arab country dummy	-0.206***	-0.110
Government usage *Arab country dummy	-0.206***	0.305***
Controls	Yes	Yes
Number of observations	537	660
Number of countries	142	144

Table (15) reports the coefficients of digitization indices and their interaction terms with the dummy variables for high and low digital performance Arab countries. For economic growth, the results show that most of the digitization dimensions are positively related to growth, except for the digital innovation, as well as skills dimensions which have no significant effect on growth. The digital citizen dimension is still associated with lower growth.

For Arab countries with low digital performance, political and regulatory environments, as well as the government usage are the only two aspects of digitization that are positively related to growth, but with a lower magnitude compared to the rest of the world. An improvement in these indices by one unit is associated with an increase in growth rates by about 0.8 and 0.7 percentage points respectively in the rest of the world, while Arab countries with low digital performance witness an increase of only 0.5 and 0.4 percentage points, respectively. However, other dimensions of digitization correlate with lower growth in these countries. Moreover, the individual usage index has a higher association with lower levels of growth in these countries by about 0.4 percentage points compared to the rest of the world.

As for Arab countries with high digital performance, the opposite is true. All digitization aspects are negatively related to unemployment, but with a lower magnitude, compared to their effects in the rest of the world, by about 0.3- 0.5 percentage points (except for business usage index, since the coefficient of its interaction term is insignificant). However, the positive correlation of the political and regulatory environment index with unemployment is higher by nearly 0.2 percentage points in these countries compared to the rest of the world.

As for Arab countries with high digital performance (mainly Gulf countries), the effect of digitization on growth does not differ from its effect in the rest of the world, since all the interaction terms with the high-performance Arab countries are statistically insignificant. This could be explained by the fact that Gulf countries are considered digitally advanced and have already achieved high growth rates. Thus, further digitization and growth in these countries would not differ from that in other countries of the world.

Concerning unemployment, again all digitization dimensions are associated with lower levels of unemployment, except for the political and regulatory environment. In Arab countries with low digital performance, digitization and unemployment relate more strongly compared to the rest of the world, except for the innovation, as well as the infrastructure dimensions, where their relationship with unemployment does not differ from that in the rest of the world. The negative relation of each aspect of digitization with unemployment is stronger by about 0.3- 0.5 percentage points in Arab countries with low digital performance compared to the rest of the world, holding all other variables constant. Moreover, the positive relation of political and regulatory environment and unemployment is lower in magnitude in these countries compared to the rest of the world by nearly 0.3 percentage points.

Table 16	Impact of Digitization on Growth and Unemployment, with Dummies for Low and High Digital performance of Arab countries

Variables	GDPPC Growth	Unemployment Rate
	(1)	(2)
Political and regulatory environment	0.832***	0.617***
Business and innovation environment	0.157	-1.867***
Infrastructure	0.263***	-1.455***
Skills	-0.0159	-0.844***
Individual usage	-0.249***	-1.580***
Business usage	0.206**	-2.825***
Government usage	0.707***	-1.700***
Political and regulatory environment*low Arab country dummy	-0.281***	-0.263*

Business and innovation environment *low Arab country dummy	-0.361***	-0.157
Infrastructure *low Arab country dummy	-0.331***	-0.185
Skills *low Arab country dummy	-0.332***	-0.285***
Individual Usage *low Arab country dummy	-0.406***	-0.246**
Business usage *low Arab country dummy	-0.385***	-0.532***
Government usage *low Arab country dummy	-0.266***	-0.264*
Political and regulatory environment *high Arab country dummy	0.0478	0.221***
Business and innovation environment *high Arab country dummy	0.0154	0.374***
Infrastructure *high Arab country dummy	0.0827	0.353***
Skills *high Arab country dummy	0.0126	0.284***
Individual usage *high Arab country dummy	0.0848	0.339***
Business usage *high Arab country dummy	0.0477	-0.0964
Government usage *high Arab country dummy	-0.0893	0.469***
Controls	Yes	Yes
Number of Observations	537	660
Number of Countries	142	144

*Note: *** p<0.01, ** p<0.05, * p<0.1*

- **Estimation of digitization impact**

  Enhancing digitization and creating digital markets can result in considerable economic and social benefits to societies and communities, through its potential to increase productivity, accelerate growth, facilitate job creation, and enhance the quality of life for society in general.


Macroeconomic Variables

Economic Growth | Job Creation

Promote Innovation & Competition | Social Welfare

Sectorial Impact

Education | Public Sector | Healthcare

Manufacturing | Trade | Financial
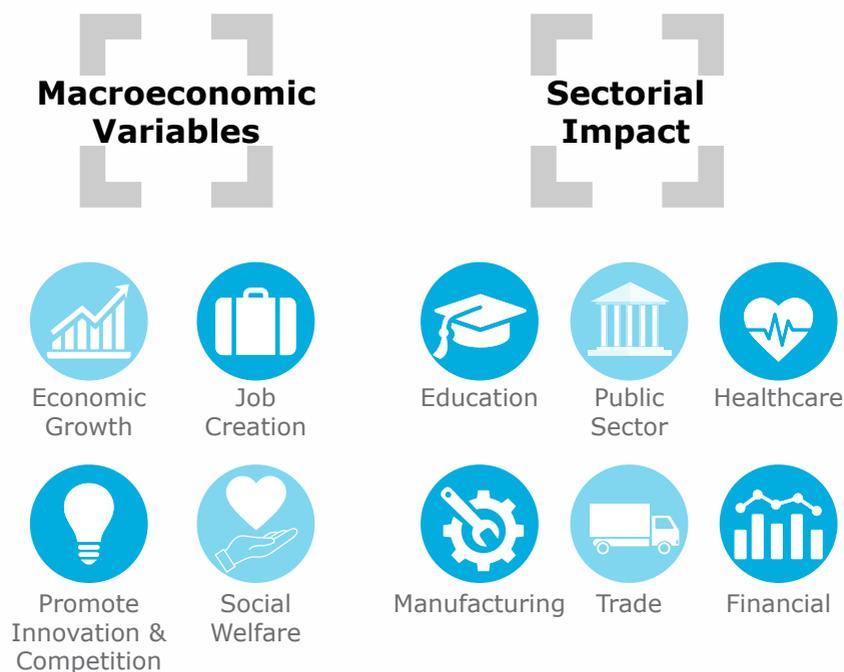
Figure 12 Macroeconomic and Sectoral Impact

One can easily make a rough estimation of the impact of digitization on the Arab region by comparing the gap between the before and after of digitization in the EU, China, Japan, etc. and consider this amount of change as the value by which the Arab economy will be affected by digitization.

The Arab world GDP is currently estimated at USD 2.6 trillion. The following represents the main sectors and their contribution to the GDP:

Sectors Contribution to Arab World GDP (%)

Wholesale & Retail
156

Manufacturing
286

Financial
312

**Agriculture**
130

Healthcare
182

Education
130
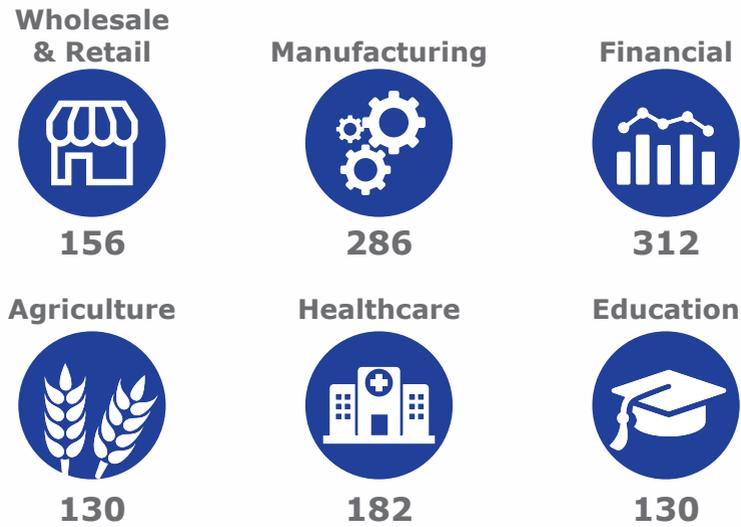
The digitization contribution on The six economic sectors in us dollars

Wholesale & Retail
156

Manufacturing
286

Financial
312

Agriculture
130

Healthcare
182

Education
130

Sectors Contribution to Arab World GDP (%)

12% Financial Services
11% Manufacturing
7% Healthcare
6% Wholesale & Retail
5% Agriculture
5% Education
Others 54%
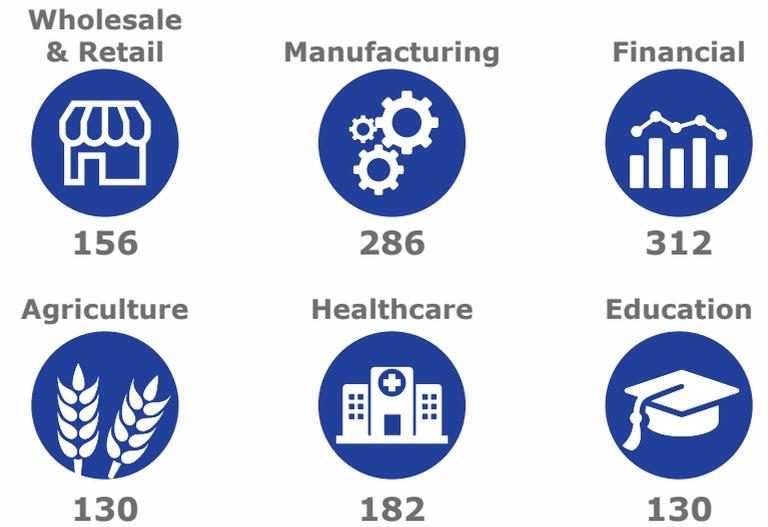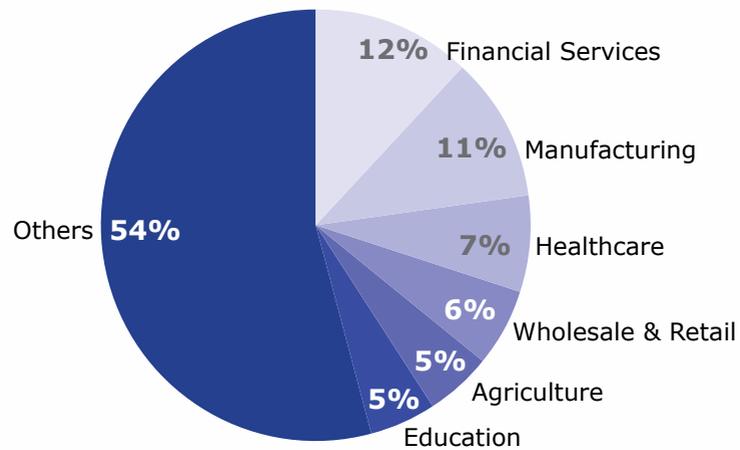
Figure 13 Sectoral Contribution to GDP

The effect of digitization on the local product upon reaching the stage of complete digital maturity in the Arab region

13%
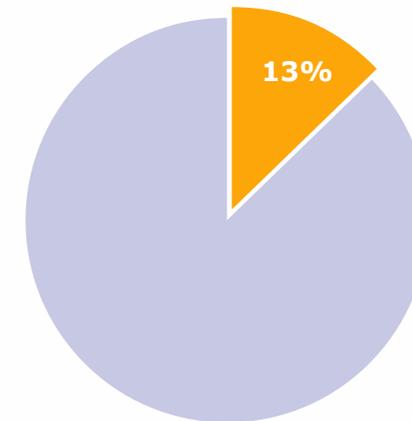
Figure 14 Sectoral growth per sector as a result of Digital Economy applications

List of Abbreviations and Acronyms:	
SDGs:	Sustainable Development Goals
ICT:	Information and Communication Technology
GDP:	Gross Domestic Product
OECD:	Organization for Economic Co-operation and Development
UNDP:	United Nations Development Programme
UNDESA:	United Nations Department of Economic and Social Affairs
EU:	European Union
USA:	United States of America
IoT:	Internet of Things
GCI:	Global Competitiveness Index
EGDI:	The E-Government Development Index
IDI:	The ICT Development Index
TII:	The Telecommunication Infrastructure Index
GCC:	Gulf Cooperation Council
SMEs:	Small and Medium-sized Enterprises
ACDE:	Arab Commission for the Digital Economy
AUPA:	Arab Union for Precision Agriculture
AIT:	Arab Innovation and Technology Institute
AeHO:	Arab E-Health Organization
MAU:	Modern Arab E-University
KPIs:	Key Performance Indicators
HDI:	Human Development Index
O2O:	Offline to Online or Online to Offline
ID:	Identification
LDCs:	Least Developed Countries
UN:	United Nations
NRI:	Networked Readiness Index
IT:	Information Technology

DLT:	Distributed Ledger Technology
IP:	Internet Protocol
SMTP:	Simple Mail Transfer Protocol
RFID:	Radio-Frequency Identification
API:	Application Programming Interface
HNWIs:	High-Net-Worth Individuals
UK:	United Kingdom
DFS:	Digital financial services
EHR:	Electronic Health Record
B2B:	Business to Business
B2C:	Business to Consumer
eBSN:	European e-business Support Network for SMEs
RTP:	Rural Transport Program
DEI:	Digital Evolution Index
R&D:	Research and Development
IMDA:	Info-communications Media Development Authority of Singapore
GovTech:	Government Technology Agency
MDEC:	Malaysia Digital Economy Corporation (MDEC)
BDA:	Big Data Analytics
GP:	Golden Projects
GOP:	Government Online Project
EFSI:	European Fund for Strategic Investments
CNECT:	Communications Networks and Content and Technology
NDS:	National Digital Strategies
SDSN:	Sustainable Development Solutions Network
GCI:	The Global Competitiveness Index
DiGiX:	The Digitization Index
BB:	Broadband
IXPs:	Internet Exchange Points
CERT:	Computer Emergency Response Team

UNHCR:	United Nations High Commissioner for Refugees
DIF:	Digital Innovation Framework
ADIA:	Arab Digital Innovation Agency
ATUA:	ArabTech Universities Alliance
AIH:	Arab Innovation Hub
REM:	Registered E-Mail
PSC:	Points of Single Contact
MENA:	Middle East and North Africa
AFEC:	Arab Federation of E-Commerce
AGTECH:	Agriculture Technology
WEF:	World Economic Forum
FGLS:	Generalized Least Squares
WDI:	World Development Indicators
WGI:	World Governance Indicators
USD:	United States Dollar
CAPEX:	Capital Expenditure
OPEX:	Operational Expenditure
UNESCO:	United Nations Educational, Scientific and Cultural Organization
E-Gov:	Electronic Government
WHO:	World Health Organization
ITU:	International Telecommunication Union
IT:	Information Technology
UNICEF:	United Nations Children's Fund
ADB:	African Development Bank
WTO:	World Trade Organization
UN ES-CWA:	United Nations Economic and Social Commission for Western Asia
UNCTAD:	United Nations Conference on Trade and Development
IMF:	International Monetary Fund

EBRD:	European Bank for Reconstruction and Development
IsDB:	Islamic Development Bank
AIIB:	Asian Infrastructure Investment Bank
KFAED:	Kuwait Fund for Arab Economic Development
OPEC:	Organization of Petroleum Exporting Countries
OFID:	The OPEC Fund for International Development
SFD:	Saudi Fund for Development
USAID:	United States Agency for International Development
DBSA:	Development Bank Southern Africa
IDRC:	International Development Research Centre
AFD:	French Development Agency
JICA:	Japan International Cooperation Agency
AECID:	Spanish Agency for International Cooperation and Development
IFAD:	International Fund for Agriculture Development
EIB:	European Investment Bank
ALECSO:	Arab League Educational, Cultural and Scientific Organization
AFESD:	Arab Fund for Economic and Social Development
AGFUND:	Arab Fund Program for Development

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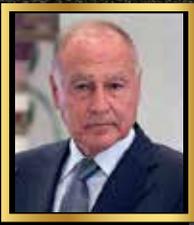
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Secretary General of the League of Arab States
Excerpts from the speech delivered during the inauguration of the Arab Digital Economy conference in
Abu Dhabi, December ۲۰۱۸.

The rapid and successive developments in information technology, that our world is witnessing today, will result in a new type of economy, which is widely referred to as the 'digital economy'.

The digital economy has come to play a significant role in achieving sustainable development goals through creating real investment opportunities in all fields and sectors, as well as in achieving digital inclusion, in a way that supports economies in keeping pace with global economic modernity.

Indeed, we are facing a comprehensive revolution driven by digital technologies, led by the development of artificial intelligence and big data. Some call it the Fourth Industrial Revolution; to show the intensity of its impact on various aspects of life. In fact, there is a wide international agreement on the fact that the impact of the Fourth Industrial Revolution will be more powerful than those in the past.

In today's fierce global competition game, our countries cannot afford getting out of this era empty-handed, or even retarded in late ranks. As creativity and innovation are the main drivers of this new revolution, our Arab world finds itself facing two options; whether to innovate or to extinct. Either we rush to prepare our educational systems and our employment markets to keep pace with these profound changes in the structure of the modern economy, or that we risk marginalization and slow down and pay the subsequent bill.

We cannot accept current performance, for example, that of our ecommerce market share which does not exceed ٪١ of the global marketplace. It is also no longer acceptable that the Arab citizen is not able to deal effectively with the financial technology applications that are invading the banking world at an unprecedented rate of acceleration.

It has become clearer, the increasing impact of synergy between technology applications in the field of communications and banking, as technological applications play a crucial role in achieving financial inclusion and digital inclusion in wider sense.

The time has come for Arab countries to take advantage of their abundant human capabilities, the very important geographical locations, and the sufficient financial and geological resources to achieve the desired renaissance, and place our countries in the levels they deserve among the developed countries.