

Technology adoption in the Islamic World



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CONTEXT

For all countries, but especially those diversifying away from oil-based economies, the acquisition of technological and digital know-how and infrastructure is the key to the creation and maintenance of future-proof sustainable economies. The challenges — and opportunities — are numerous, including in fast-moving fields such as blockchain technology; automated land, sea and air transport; cybersecurity; the development of smart cities; and the empowerment of remote communities through access to the digital highway.

**Young Female employee
using a Tablet at her
workspace.**
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Again, inequity exists across the region: While the Gulf states have some of the highest mobile internet speeds in the world, Palestine, Iraq and Algeria have some of the slowest. According to the World Bank, “while the region has several factors playing in its favor, including a young population and a growing entrepreneurial culture, now is the time to work collectively to accelerate digital transformation in the region, and to identify priority areas for public investments, analytical work and policy reforms to unlock private sector investments.”



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INTRODUCTION

Historically, since the early 19th century, the wider Middle East and North Africa region, and Muslim-majority states, such as Pakistan and Bangladesh, have been relatively poor in terms of technology adoption and innovation. Some of this can be traced to the actions of the various colonial powers and then the challenges of state building in the 1940s and 1950s.

However, while valid, this does not address how states now need to create an innovative economy to ease the transitions away from petrochemicals, to employ large (and young) populations and to adapt to the demands of climate change.

Innovation rates, as measured by criteria such as patents, remain very low¹ and the main alternative, foreign direct investment, has mostly gone into the petrochemical sector². This weakness has been compounded often by a very small and fragmented domestic set of enterprises³. In many states, the SME sector has been based on family firms⁴ and often with a focus on finding a way into the labor market that balances social restrictions and family demands⁵. Linked to these issues are the problems of an education system that does not support innovation or entrepreneurship⁶. In combination, this produces an SME sector with a focus on generating work rather than innovation.

A further issue is of poor connectivity in the wider region, at least up to 2015⁷, hampering both business and private use of the internet. This has radically improved over the past five years, but the global pandemic has exposed just how many families lack anything more than the most basic connectivity. Generally,

states with a high level of connectivity, and citizens used to digital approaches to work and leisure, have managed to offset some of the worst economic impacts of the pandemic as well as support the increased provision of online services, both by private companies and for key sectors such as health and education⁸.

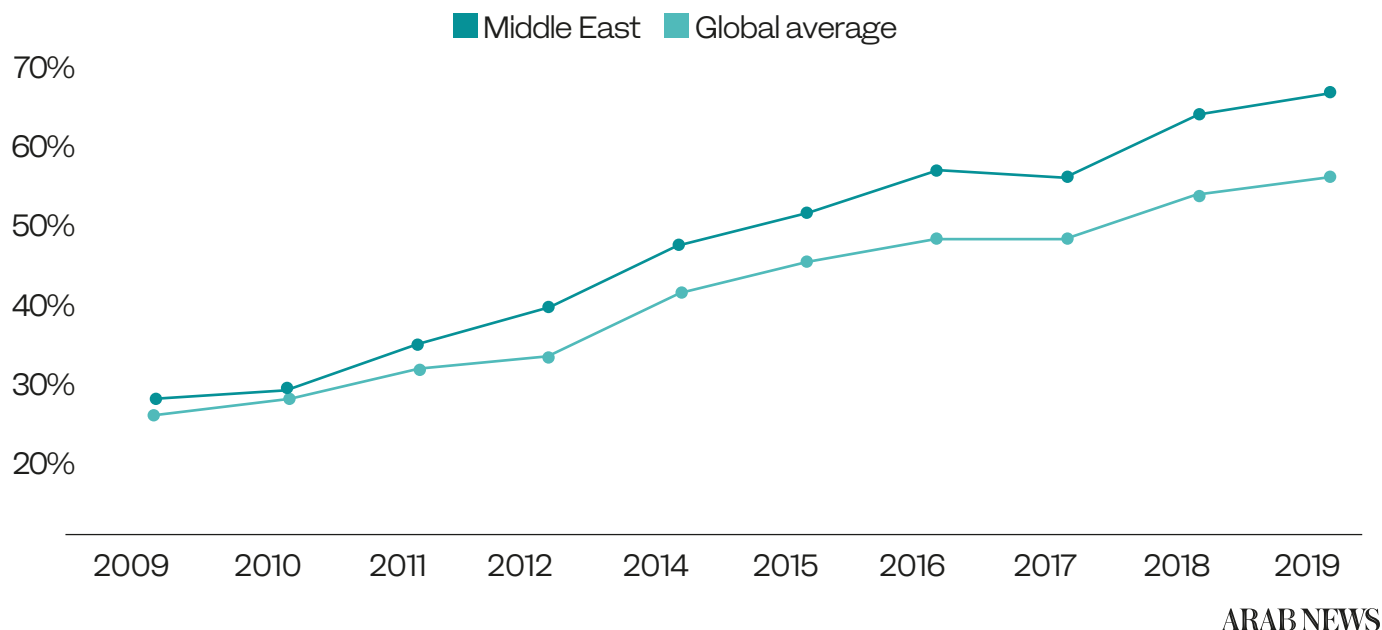
Increasingly, the themes of innovation, entrepreneurship and Internet connectivity are interlinked. Each depends on the other and, in combination, they can sustain the emergence of a modern economy.

At the moment, the richer Muslim-majority countries, mostly the GCC region, are grappling with the demands of transitioning from a historic dependence on petrochemical production to one where their wider domestic economies can sustain domestic wealth⁹. An important advantage is the possession of substantial sovereign wealth funds that can be used to make large investments and to make significant changes¹⁰.

The problem is that much of their social and political systems have come to rely on petrochemical production, making the transition a challenge. In addition, large though some of these funds are, they are finite, so major investment decisions need to be made wisely and with an awareness that the scope for future allocations will be circumscribed.

On the other hand, states such as Egypt face the challenge of making the transition without substantive reserves and also while needing to ensure adequate work for a large, and young, population. This makes investment choices critical in that, unlike, say, Saudi Arabia, they cannot really afford speculative projects that might produce a massive step change but are more likely to be useful stepping stones in terms of building an economy based on automation and digital technologies.

INTERNET PENETRATION 2009-2019¹⁵



INTERNET CONNECTIVITY

Up to 2015, internet connectivity across the MENA region was poor, hampered by a reliance on conventional telecommunications networks¹¹ and also with governments not convinced as to the value of improving digital access¹². Since then the region has invested heavily, aided by the improvement in wireless and mobile technology to become among the best connected regions in the world.

In particular, Saudi Arabia, Qatar, Kuwait, Oman and the UAE have seen significant changes and are estimated to have spent 11 percent of their gross domestic product annually (\$48 billion) in this respect¹³. This has paid off and the UAE, Qatar and Kuwait have internet penetration rates over 96 percent, with Qatar and Kuwait over 99 percent.

The non-oil producing states have struggled to match this, but have still made significant investments. Egypt achieved 48 percent penetration, Morocco 64 percent and Algeria 58 percent by 2020. Outside the usual MENA group, Iran has achieved an 80.5 percent internet penetration rate.

Overall, this investment has paid off and the Middle East has seen the largest global rise in internet penetration. In 2009, the region had a penetration rate of under 30 percent and by 2020 this had increased to over 70 percent¹⁴.

Figure 1: Internet Penetration 2009-2019¹⁵

While this is mostly good news, there are problems in terms of what connectivity actually means in practice. Mobile broadband subscriptions are below the global average (an average of 60 percent across MENA) as these are relatively expensive. Relative to income, the most affordable mobile-data baskets in the Arab states were available in Qatar, Kuwait, Algeria, the UAE and Saudi Arabia, all below 1 percent of gross national income per capita. By contrast, prices in Iraq were around 8 percent of GNI p.c. The least affordable country was Yemen, where a mobile-data basket cost around 26 percent¹⁶.

The practical implication of this is that 4G take-up is relatively limited, and in turn that hampers what can be done with the impressive connectivity rates.

GROWTH OF 4G NETWORK (MENA)¹⁷

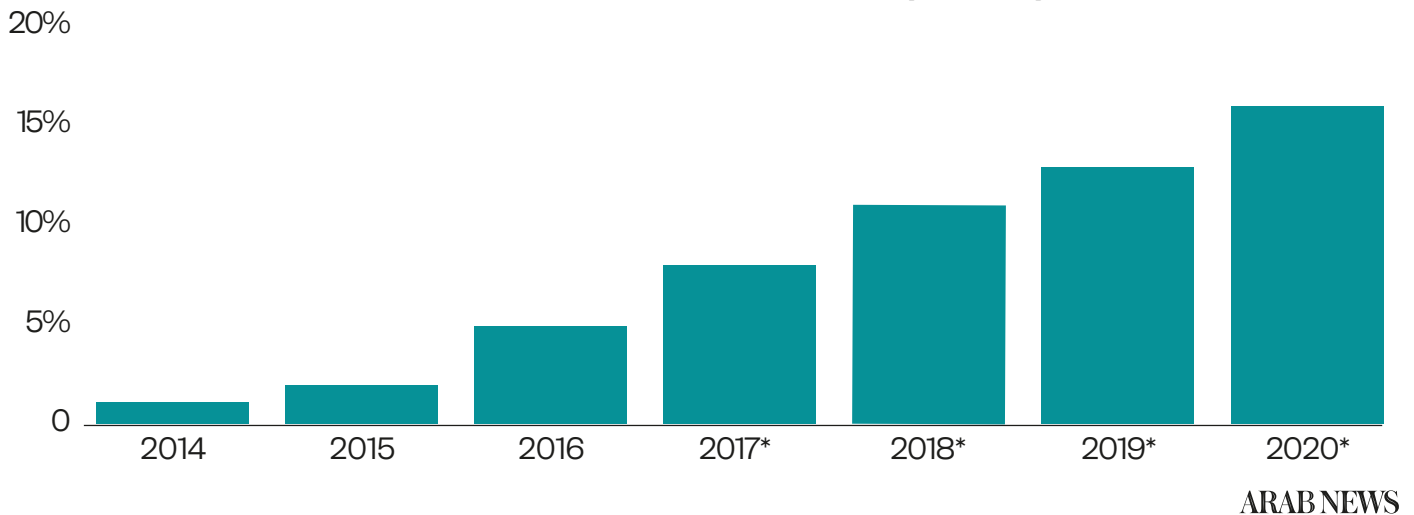
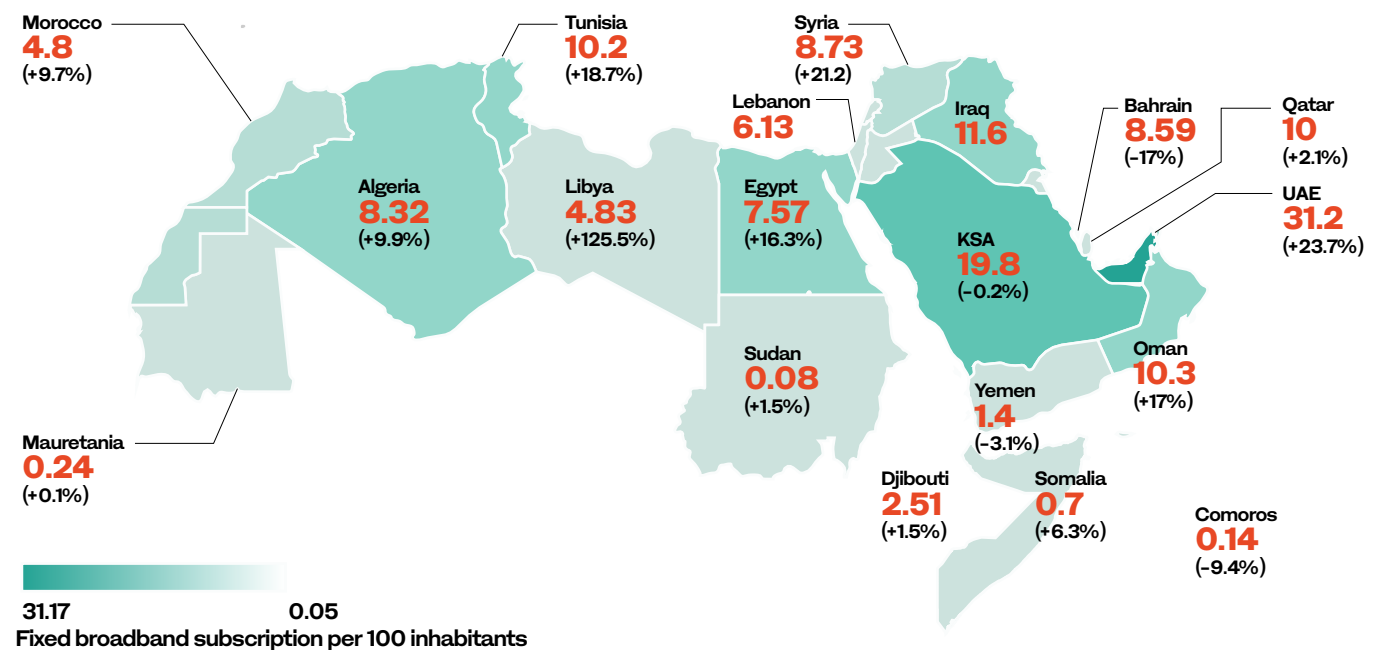


Figure 2: Growth of 4G network (MENA)¹⁷

The 4G problem is made worse as fixed broadband markets in MENA are largely underdeveloped. This clearly reflects populations that are relatively spread out and the problems of installing conventional telecommunications networks.

FIXED BROADBAND COVERAGE



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Figure 3: Fixed Broadband Coverage (MENA)¹⁸

In turn, if 4G is proving hard to access then adoption of 5G is also slowed and the MENA region may see only 8 percent of the population able to use it by 2025. As discussed below, this is particularly important given the ambitious plans of some

of the GCC states in terms of automation and digital access in their urban environments.

At the core of the 4G and 5G problems are weaknesses in the regulatory frameworks. While some states in the GCC group are making some progress, and Morocco has been noted for its innovative changes, something like 20 percent of the MENA region is hampered by poorly developed regulatory systems. This matters as it affects both the performance of the ICT sector and its contribution to the national economy as a whole.

Key issues in terms of effective frameworks include:

- Wider state investment in the infrastructure and adapting regulations as the technology changes; using the tax system to encourage capital investment;
- Easing market entry and for existing providers to develop their processes with the minimum of bureaucratic hindrance and reducing other red-tape costs.
- Specifically, in the mobile sector, an overarching national plan is essential to enable investment decisions, both by the state directly and by private firms.

INNOVATION

Innovation in the MENA region has traditionally been slow. One common indicator is the number of patents and this has remained consistently low¹⁹.

Most states are now making an effort to address this often²⁰ by using existing state resources (often generated by funds derived from petrochemical exploitation) to invest in certain companies and to build links between higher education and industry. Others need to build an approach without such readily available investment. For example, Egypt has an innovation policy based around policies to generate investment, venture capital, business incubators, SME development and entrepreneurship. However, what is lacking is formal coordination, as various ministries and funding bodies exist. Similarly, Jordan has identified the need for a structured approach, but lacks an overarching policy to generate resources or gather together key skills.

If domestic innovation is insufficient



Innovation rates in the MENA remain very low and the main alternative has mostly gone into the petrochemical sector.

then sometimes foreign direct investment can compensate. But the problem in many countries is that most FDI has gone into specific sectors, such as petrochemicals²¹. Ideally, FDI should, in turn, generate domestic response as know-how and technologies are diffused²². However, this has been less pronounced due to the relative gap in many GCC states between the petrochemical sector and the rest of the economy. There is also a problem that, with the exception of Saudi Arabia, these are states with low domestic populations, making it harder for domestic firms to expand and make best use of new innovative practice, or, indeed, to feel any incentive to innovate. A common solution to this has been the creation of partnerships that lead to growth in the size of a firm but no particular technological innovation. A further problem is that the SME sector has traditionally been a source of family-based employment rather than innovation (the two are not always exclusive, but many SMEs exist essentially to provide employment and an income for the owners). This is discussed below in the section on entrepreneurship.

One area where FDI is becoming allied to innovation is in information and communications technology. Countries such as Egypt, Turkey, Morocco, Jordan, UAE and Tunisia have successfully positioned themselves in the market of global ICT-enabled services and ICT outsourcing. By 2017, Egypt had 90,000 jobs directly related to ICT outsourcing and Turkey more than 80,000. Many of these jobs were outsourced from the GCC²³.

However, again, weaknesses in the educational system limit the impact of this investment as the number of people able to work in complex fields in ICT is limited, a situation worsened by a lack of adequate English and weak analytical abilities²⁴.

Further weaknesses stem from the structure and policies of financial institutions²⁵ that are unwilling to support startup businesses. In turn, this places greater reliance on the various sovereign wealth funds as the major investor in most of the large firms²⁶. This state role has implications wider than just company ownership. Historically, most GCC states have invested their petrochemical revenues in social welfare systems, but they possess the



wealth to drive significant innovation.

However, such funds are often derived from now diminishing petrochemical revenues and also need to be used for transformation of the energy systems toward renewable energy²⁷ and the wider infrastructure. Investments are likely to be especially high in the electricity and transport sectors, particularly road construction. Electricity and transport are estimated to account for about 43 percent of total infrastructure needs in MENA, followed by ICT (9 percent), and water and sanitation (5 percent)²⁸.

Workers clean the exterior of the Museum of the Future in Dubai.
AFP

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AUTOMATION

Automation of many jobs is inevitable, and some estimates place the likely job loss rates across the MENA region at between 46 and 52 percent²⁹. That suggests significant economic turmoil, even in states where this figure mostly represents a loss of jobs currently held by expatriate workers. Other states with significant numbers of young, already under-employed, workers are at risk of social unrest, especially as those most likely to see their jobs disappear are those with low-to-medium levels of education and experience³⁰.

LABOUR MARKET, SELECTED MENA COUNTRIES³³

		Egypt	Lebanon	Occupied Palestinian Territories	Saudi Arabia	Tunisia
1	Labour force participation rate	46.7	43.4	45.8	55	47.4
2	Unemployment rate- basic level off education	8.5	8.8	26.1	1.2	9.9
3	Unemployment rate- immediate level off education	15.9	9.7	24.1	7.1	16.3
4	Unemployment rate- advanced level off education	20.6	11.1	33.2	10.7	30.2
5	Youth unemployment rate	30.8	-	41.7	30.2	34.7
6	Share of youth not in employment, education or training (NEET)	27.6	-	32.3	16.1	-

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Table 1: Labour Market, Selected MENA Countries³¹

On the other hand, some states in the region have ambitious plans to exploit the possibilities for increased productivity by allying automation to the expansion of a 5G network. This becomes one of those areas where addressing existing educational weaknesses³² is very important, as the extent that the workforce has the skills to take advantage of this transformation³³ will determine whether or not this process is socially beneficial or simply worsens existing employment problems.

In particular, the region is investigating how to automate its cities³⁴, improving their ability to adapt to climate change and to use them as a basis for the planned knowledge-based economies intended to replace petrochemical wealth. Thus the Saudis have identified \$500 billion for investment in NEOM, a city designed from the ground up and intended to embed the latest technology.

One goal is that all vehicles will be fully autonomous³⁵, creating a transport system with no human input within the planned urban area. Based on a 5G network, and with the benefit of not having to adapt to older technologies and urban planning choices, this offers the opportunity to explore just how much automation is possible in the vehicle sector and how this could be applied in other situations.

In effect, Saudi Arabia could become the leading state in the practical application of automotive technology at a time when most other states are only exploring how to run vehicles that still need human control.

It also, feasibly, allows the Saudis to work out the legal and insurance implications of such a technological leap. Even if the plans for NEOM are not realized, this could place Saudi Arabia well ahead of the field, not least in developing solutions to the significant practical problems.

ENTREPRENEURSHIP

One important method of embedding innovation across the wider economy is to grow the SME sector. At its most successful, this can be robust, link into the core developments, exploit the gains from FDI and start to address gaps in domestic innovation.

At one level this is already happening as the SME sector expands both in the GCC region and also in Jordan, Lebanon and Egypt. However, at the moment, while the SME sector is growing, it is not particularly doing so in the high-tech sectors. One problem is the enduring shortcomings of the financial system and its attitude to and involvement in innovative activities (in particular a lack of venture capital). Reasons for this weakness include the existence of commercial risks inherent in the launch of new initiatives, of high country risks, the absence of guarantee systems, and a “family” type business management system which is suspicious of external investors and prefers to generate capital from family investment.

A further problem is that the SME sector has often been used by women to avoid restrictions on entering employment. This has often seen them creating businesses using their own (or drawn from their family network) capital, as they sometimes possess substantial personal wealth, and using such

enterprises to employ other women.

A common theme is of using the creation of their own business as a means to escape social restrictions on female employment. This relatively liberal approach compared with restrictions on formal employment means that Saudi women have used self-employment as a means to enter the labor market on their own terms and, by 2012, women made up 15 percent of the labor force, but with 26 percent of those described as entrepreneurs owning around 4-12 percent of all registered businesses³⁶.

In Iran, one issue is that while home working is acceptable within the wider legal framework, there is a lack of encouragement and financial support, meaning that women often set up such businesses essentially for “push” reasons — as a means to earn money when they are excluded from other options³⁷.

Overall, more women than men in low-income countries are entrepreneurs, but their businesses are smaller, more likely to be informal, act as substitutes for exclusion from the labor force, and with a focus on providing a family income.

In effect, the SME sector is currently mainly used to generate economic activity and earnings for the owning family³⁸ rather than the wider economy. This can help to create viable local economic units, but will not assist in moving GCC states from a dependence on oil and gas to a more balanced future.

Equally, the focus of such enterprises will not readily dovetail with high-tech firms brought in either using FDI or created using the existing sovereign wealth funds.

SUMMARY

Since 2010, the technological base of the MENA countries, and also Muslim states such as Pakistan and Bangladesh, has started to improve substantially. Before then, local firms operated either in purely local markets or with a degree of protection from competition. The main exception was the oil and gas sector, in which most countries invested substantially and ensured access to the most recent technology. Exceptions such as Iran and Iraq reflected the impact of either enduring sanctions or the consequences of military action and resulting civil strife.

Of note, internet connectivity has expanded rapidly since 2013-15 in the main as wireless technology has become allied to widespread



In some Muslim-majority countries, the challenge is one of adaptation within the constraints of relative poverty and large numbers of young people.

usage of mobile phones. However, this framework has biased most activity toward social media and what can be seen as leisure usage, a weakness exposed when the COVID-19 pandemic disrupted conventional schooling and created a need for an online digital learning environment³⁹. If the relative success in expanding access is to bring about sustained change in work, industrial organization and overall productivity, more needs to be done, first, to expand 4G access and then to create the basis for more widespread 5G.

The latter offers an opportunity to lead in the fields of automation of urban environments. Saudi Arabia and other GCC states are exploring how cities can be made resilient to climate change and use full automation of vehicle traffic. The latter, in particular, is ambitious, and possibly beyond current technology, but offers the chance to chart out practical solutions not just in technical terms but also in assessing the impact on social relations and the necessary changes to legal and insurance frameworks. In effect, a combination of state direction and the assets in sovereign wealth funds creates the scope to implement a new level of technological development.

However, set against this are two separate, but related, problems.

For some states, automation, and the loss of low-skilled jobs, can be accommodated essentially by reducing the number of expatriate workers they have. In an immediate sense this solves one part of the problem (unemployment) but at the cost of exporting that under-employment back to the Indian subcontinent and other MENA states as workers return.

A second problem, and this applies widely to the process of automation, is the potential loss of consumer demand as the number of wage earners decreases. So states such as the UAE might cope with the social aspects of automation by reducing their workforce, but in doing so they also reduce the domestic market available to their own domestic firms. For others, the fear is that automation simply increases unemployment, especially among the young and those lacking university-level education.

The second problem is the risk of a disconnect between the new high-tech digital cities and the rest of society and the economy.

One challenge already is that most technological gain has been in the petrochemical fields, and there is little intersection between that and the domestic SME sectors. Since at the moment the SME sector is often made up of people looking for alternative means to earn a living, it is technologically weak and focused on family capital, assets and income. Thus sovereign wealth funds can create new infrastructures, and back specific large companies, but are not an ideal tool for creating a broad-based SME infrastructure that can use that investment for the wider economy.

Education is not the focus of this report but, again, many of the problems noted in that document will affect the creation of new technology and its adoption. A schooling system that often fails to teach basic numeracy and communication skills⁴⁰, and with a focus on formal certification to enable progression to work or further education⁴¹, is not a good basis for the sort of skills that will be needed if the region is to embrace a digital future. Gender-based exclusion, allied to problems of ensuring children from poor backgrounds receive the education to which they are entitled, makes this worse. The same problems carry forward into higher education, and significant education reforms are as important, and possibly more so, as largescale investment in innovative high-tech environments.

RECOMMENDATIONS

Many of the recommendations from the education report also apply in this context. The largest barrier to innovation remains a workforce lacking suitable skills, which means that areas of real innovation tend to become isolated from the wider society.

In terms of internet connectivity, the growth in recent years has been impressive, but has mostly not supported an expansion



Syrian pupils in school in Damascus during the COVID-19 pandemic. AFP

of 4G networks and usage has tended to remain mostly in terms of social media. There is a need to make 4G more widely available and, as in many countries, to improve computer literacy so a minimal level of programming skills becomes more widely available.

For the GCC region, a major challenge is to use the existing sovereign wealth funds to move the economies away

from petrochemicals. This is essential, both because of the climate emergency and also that demand will inevitably start to fall. Linked to this is the need to adapt to the likely extreme climate events that are now all but inevitable.

There is much that is innovative, but it is mostly state directed, and there remains a real risk that the new urban environments, and favored sectors of the economy, remain dislocated from the rest of society. Thus addressing legal, social and economic constraints on technology innovation and diffusion are critical. The natural bridge is the domestic SME sector and at the moment this is ill-equipped for such a role.

Elsewhere among the Muslim-majority states, the challenge is one of adaptation within the constraints of relative poverty and large numbers of young people. The temptation is to look for solutions that are based on low-waged but large-scale work. The problem is such jobs are inevitably being taken by automation and this trend will continue regardless of the policy choices of individual states.

In this case, and lacking the assets of a large accumulated wealth fund, the solution has to lie in a steady focus on the quality of the education system, and the necessary reforms of legal and governance structures. Absorbing outsourced work and FDI are short-term solutions, but will not meet the demands unless such work leads to innovation across the wider economy.

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