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Theme Title

Background Paper on Access and Infrastructure

EXECUTIVE SUMMARY

1. BACKGROUND

The principal objective of the "Connect Arab" Summit is to take stock of the existing situation in the region and redouble efforts to achieve the connectivity targets set by the World Summit on the Information Society (WSIS)¹ in 2003 and 2005. These targets are geared to achieving the United Nation's Millennium Development Goals² by 2015. The Connect Arab Summit takes place in the context of an increasing recognition that broadband networks capable of carrying greater quantities of data at higher speeds can fundamentally transform the social and economic fabric of a nation – for the better.

2. PURPOSE OF THIS PAPER

The purpose of this paper is to facilitate discussion on the next steps that extend the existing access networks to ensure availability of broadband connectivity, including rural and remote areas; and secondly to attract investment in ICT infrastructure. For a broadband-enabled economy to emerge, it is crucial that necessary workforce skills are built across the society. The intention in presenting this paper is to develop consensus among various stakeholders on approaches for mobilizing resources for accelerated investment in order to achieve the following:

1. Complementing and extending the existing access networks to ensure connectivity in rural and remote areas, through wired or wireless communication systems; and
2. Fostering development of an enabling environment aimed at attracting investment in ICT infrastructure, encouraging public-private partnership, harmonizing policies and regulatory frameworks, as well as building human capacity for maintaining and ensuring the sustainability of established backbone and access networks.

This paper is divided into three parts. Part A addresses the state of the telecommunication infrastructure in the region, taking into account adoption of new technologies, provision of new services and the regulatory and policy environment which has provided an impetus to such developments.

Part B provides an overview of the advantages of the transition from analogue to digital terrestrial broadcasting, the challenges that will be encountered, and the factors that need to be considered in preparing a roadmap for the transition. The possibility of using the transition

¹ World Summit on the Information Society: <http://www.itu.int/wsis/index.html>

² United Nation's Millennium Development Goals: <http://www.un.org/millenniumgoals/>

as an opportunity to promote accessible television for persons with disabilities is highlighted. This section also discusses the role of spectrum management in the process of building telecommunication infrastructure.

Part C focuses on infrastructure of a different kind – a nation’s human capital – and leveraging the investment in broadband infrastructure to develop in the Arab region a competitive, broadband-enabled, knowledge-based economy and to promote the social and economic development of persons with disabilities and women.

PART A

BUILDING A SUSTAINABLE BROADBAND ECOSYSTEM

1. CURRENT STATUS OF BROADBAND ECOSYSTEM IN THE ARAB REGION

In order to take root and achieve its potential in transforming the social and economic structures, broadband is dependent on several elements which constitute its eco-system. These are literacy, computer literacy, availability of local content and applications apart from, of course, affordability. Regulatory structures are both part of and an important factor in determining the evolution of broadband services³.

The last decade has seen a remarkable spurt of growth in several Arab countries. Significant changes in the regulatory and policy area has seen the emergence of competitive markets, increased penetration of telecommunications, greater usage of Internet and generally lowering tariffs. These developments have coincided with investments in education and institution building.

There has been over the last few years increasing investments in mobile infrastructure. Yet, there are gaps in coverage in rural areas where the costs of services tends to be high in relation to average local incomes. Since 2008, while there has been a general drop in the prices of fixed broadband services in developing countries tariffs continue to remain expensive in this region. A major development in terms of broadband is the increasing availability and data rates of 3G mobile-broadband networks and services resulting in impressive gains both in terms of increased productivity and growth of GDP.⁴ This fact points to the need for governments to accelerate the deployment of broadband if they want to maximize its economic impact.

New technologies are being deployed on a large scale in the Arab region. Over two thirds of the countries have launched WiMax services. In several of these WiMAX services have proved very effective competition to established ADSL based services. LTE is also being adopted in the region - operators in Saudi Arabia and the United Arab Emirates (UAE) are examples.

2. SUMMARY OF EXISTING SITUATION

³ A forthcoming study by BDT will focus on examining the regulatory approaches taken throughout the world to stimulate ICT growth in a converged environment and increase access to broadband services. An advanced copy of the study will be published by the end of February 2012 at <http://www.itu.int/ITU-D/treg/index.html>

⁴ ITU, The impact of broadband on the economy, January 2012, to be published by mid of February 2012 www.itu.int/broadband

Fixed line sector: The fixed telephone line penetration in the Arab Region has stagnated at around 10 percent over the last five years. A large majority of fixed lines are deployed in urban areas.

Mobile sector: The Arab Region mobile penetration has grown quickly in recent years. Mobile penetration in the region will have grown from 27 percent in 2005 to an estimated 97 per cent by end 2011. This growth is a reflection of increased competition in the mobile market (13 countries). The region has also been in the forefront of adopting new technologies. Yet seven out of 21 countries in the region have not launched 3G by end of 2010. All of the 3G/3.5G cellular operators in the Arab countries provide mobile Internet services, and most operators provide local video calling services. Many of these operators also provide mobile TV services.

Internet sector: The average estimated end 2011 Internet penetration rate of the Arab Region is 29 percent. (See Table1).

Broadband: ITU's end 2011 estimates suggest that fixed broadband penetration in the Arab States, at 2.2 percent, remained relatively low, and below both the world and developing country average of 8.5 and 4.8 per 100 inhabitants, respectively. This figure, however has to be seen in the context of relatively large size of households in the Region. ITU estimates that by the end of 2011, the region will have a mobile broadband penetration of 13 percent, which compares to an estimated 17 percent globally and 8.5 percent for developing countries.

Table 1: ICT penetration rates by region, end 2011 estimates

	Fixed telephone lines per 100 inhabitants	Mobile Cellular suscriptions per 100 inhabitants	Internet users per 100 inhabitants	Fixed Broadband suscriptions per 100 inhabitants
Arab States	9.7	96.7	29.1	2.2
Africa	1.4	53	12.8	0.2
Americas	28.5	103.3	56.3	15.5
CIS	26.3	143.0	47.6	9.6
Asia & Pacific	13.0	73.9	27.2	6.2
Europe	39.1	119.5	74.4	25.8
World	16.6	86.7	34.7	8.5

Source: ITU (http://web.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom.html)

Backbone: The majority of the telecommunication operators in the Arab Region have extensive fiber optic backbones, microwave radio relay networks and submarine cable links. In addition, international traffic is carried by satellite in some countries, such as Lebanon. In several cases, backbones are connected by gateways with neighboring countries. There are several ongoing initiatives in the Arab Region to expand and upgrade the backbone infrastructure, in addition to increasing the bandwidth.

Internet Exchange Points: Given the need to keep intraregional traffic within the region and for efficient use of international bandwidth, efforts have been afoot for establishing IEXs. By end of 2011, six countries in the Arab Region had Internet Exchange Points (IXPs).

International Connectivity

Submarine Cables: All Arab countries are very well connected via submarine cables, with the exception of the Palestinian Authority. The number of launched and planned submarine cables in the Arab Region exceeded 40 by the end of 2011. Major submarine cables already

deployed in the region include FLAG Europe-Asia (FEA), Fiber Optic Gulf (FOG), SeaMeWe-3, SeaMeWe-4, FLAG FALCON and SEACOM/Tata TGN-Eurasia.

Recently commissioned submarine cables include India-Middle East-Western Europe (I-ME-WE) cable, EASSy, GBI, EIG.

- ME-WE is funded by nine entities, the 13,000-kilometre submarine communications cable system has a design capacity of 3.84 Terabits per second. In the Arab region cable landing stations in Egypt (Alexandria, Suez), Lebanon (Tripoli), Pakistan (Karachi), Saudi Arabia (Jeddah) and the United Arab Emirates (Fujairah).
- The 10,500km submarine cable system, Eastern Africa Submarine System (EASSy), with a capacity of 4.72 terabits per second has landing stations in the region in Somalia and Djibouti.
- The Gulf Bridge International Cable System (GBI) is the Middle East's first privately owned submarine cable system, with a capacity of 5.18 terabits per second links countries within the Gulf, Gulf to India, Gulf to Egypt, and across the Mediterranean to Italy. Telecom Egypt's TE North Cable connects to France.
- Europe-India Gateway (EIG) cable system was commercially launched in 2011. EIG stretches from Mumbai in India to the UK, with landing stations in UAE, Oman, Saudi Arabia, Djibouti, Egypt, Libya.
- TGN-Gulf cable, commissioned in 2011 acts as a gateway to the TGN network with landing stations in Bahrain, Oman, Qatar, Saudi Arabia and the UAE. Another cable, FLAG Hawk has landing stations in Egypt.
- MENA (Middle East and North Africa) Submarine Cable System expected to be launched during 2012 spans Europe, Africa and Asia.
- Africa Coast to Europe (ACE) submarine is 17,000 km-long and will stretch from France to South Africa, with an overall potential capacity of 5.12 Terabits per second. To be operational in the first half of 2012, it will connect 23 countries, either directly for coastal countries or indirectly through terrestrial links for landlocked countries.

Terrestrial Cables: Two major terrestrial fiber cable projects were announced in 2010. The Regional Cable Network (RCN) is a high capacity redundant Dense Wave Division Multiplexing (DWDM) terrestrial cable network project. The 7,750 km cable will extend from UAE to Turkey passing through Saudi Arabia, Jordan and Syria. The communications cable will be the longest fully-redundant terrestrial system in the Middle East, and will be capable of covering the entire Gulf region. The second cable is the JADI Link, connecting Saudi Arabia, Jordan, Syria and Turkey. An alternative to the submarine cables, it will increase redundancy.

A number of terrestrial cables exist between several Arab countries. For example, Iraq is connected to several neighboring countries via terrestrial cables, including Iran, Syria, Jordan, Saudi Arabia and Kuwait. Saudi Arabia is also connected to Kuwait, Jordan, UAE, Bahrain, Qatar, Yemen and Oman, while Syria is connected to Lebanon, Turkey and Jordan.

International Internet bandwidth is a crucial link in the provision and price of broadband services. International bandwidth has increased substantially between 2005 and 2010 (see Figure 1). While the Arab States have increased their international Internet bandwidth per Internet user from 817 in 2005, to over 11'000 by 2010, the Region still lags behind most of the other regions in the world. Within the region, the UAE, Saudi Arabia, Qatar and Bahrain have significant lead in the capacity.

Regulatory environment: The last few years have seen a sea-change in the regulatory environment in the Arab region. Monopoly mobile markets have disappeared – 13 countries are competitive. 14 have competitive internet markets. 15 countries have launched WiMax services. The Table below details the regulatory environment in the Arab Region.

The preceding discussion shows that the Arab Region presents a diverse picture. Some countries are well advanced and have high quality telecom infrastructure and some others lag behind. A third of the countries in the region are yet to establish a separate ICT regulator.

Over 80 per cent of Arab countries enjoy competition in Internet services and around 60 percent have competition in DSL and fixed wireless broadband. The situation in other segments, however, such as cable modem (15 percent) and international gateways (54 percent) is less competitive. The mobile revolution has significantly affected the spread of telecommunications in the region. There are variations within countries themselves, with less developed countries typically showing lower penetration rates, and with their rural and remote areas still lacking coverage. In the LDCs of the region significant sections of the population cannot afford new services because of low per capita incomes. Yet, there is high unsatisfied demand in all the countries. This presents an opportunity for potential new players given favorable market entry conditions. Much remains to be done in order to enable countries to expand telecoms to rural and remote areas and provide advanced ICT services. Coordinated initiatives with a focus on remote and remote areas can make a significant difference within a short period.

3. CHALLENGES

In general, many of the Arab countries face challenges in three major areas: policy and regulatory domain; technical and economic domain; and human resources.

In the policy and regulatory area the major challenges are the following: national frequency plans are not available in many countries and there is the absence of national broadband plans. Many countries also do not have policies on media-telecom convergence.

In technical and economic terms, the challenges faced, particularly in LDC Arab countries relate to the availability of energy; difficult terrain and scattered populations increase the cost of providing services. Lack of infrastructure– government offices for delivery of services, schools, hospitals etc act as disincentives.

Finally, in terms of end users/ human Resources the challenges are low economic activity and consequently low incomes; limited availability of technical personnel; low rates of literacy and digital literacy; and limited technical and management competence in some areas.

4. OPPORTUNITIES

The challenges faced also create opportunities for the countries.

- **Attract new players with incentives:** Unsatisfied demand for high speed access service represents a major opportunity for the emergence of new players.⁵
- **Role of Governments:** Government can act as a catalyst to private sector broadband network deployment by becoming a major user of broadband networks.
- **The Content bottleneck** is an opportunity to encourage the emergence of local content industry.
- **New business models and financing mechanisms** need to be devised to address both investment and use of services geared to specific local features.
- **Take advantage of transition from analogue to digital broadcasting to** free up spectrum and introduction of new services.

5. RECOMMENDATIONS

⁵ For more analysis on this topic, see ITU, The impact of broadband on the economy, January 2012, to be published by mid of February 2012 www.itu.int/broadband.

Access to the Internet via broadband is important for the development of information societies at all levels, individuals, businesses and governments. A broad set of recommendations may be noted as countries plan for investments in broadband networks.⁶

Make use of a wide range of funding mechanisms for promoting the deployment of broadband Infrastructure, through partnerships and universal service programmes;
Foster private investment in broadband through regulation and incentives, rationalizing licensing regimes; making spectrum available for mobile broadband; and granting tax incentives.

Stimulate innovation and development of applications and services, by nurturing the creation of applications, services, content and enforcing Intellectual property rights.

In the context of supportive policy structures, private sector will play a central role in broadband development. A range of incentives need to be put in place to spur infrastructure roll-out, stimulate traffic growth and development of services and applications. Therefore, policy makers and regulators need focus on the following areas:

Adopt policies to promote open access, simplified administrative processes and technology neutral approach

- Set out the general principles of open access, promote infrastructure sharing to maximize benefits to all parties;
- Adopt administratively simplified and flexible licensing regime; and
- Adopt a technology-neutral approach, to facilitate the use of all transport mechanisms.

Adopt Appropriate Spectrum Management Policies

- Ensure efficient allocation and assignment of the digital dividend spectrum and harmonize frequency allocation to ensure wireless broadband services in rural areas;

Encourage Investment in Broadband

- Create a nationwide broadband plan with clear objectives, targets, policy directions and funding schemes.
- Encourage public-private partnerships (PPP) and examine approaches such as revenue sharing schemes and delegation of public services;
- Encourage the roll-out of broadband infrastructure (especially in remote and underserved areas) by providing suitable incentives;

Create demand for Broadband Services

- Invest in complementary activities in addition to infrastructure - in e-services for public administration, education, health care, development of local content;
- Connect local government buildings, educational institutions and hospitals;
- Access to broadband should be coupled with increasing computer penetration and enhancing e-skills through training and provision of equipment.

6 Best practice guidelines issued by ITU: <http://www.itu.int/bestpractices>;
GSR11 Best Practice Guidelines: <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/consultation/consultation.html>

PART B

**TRANSITION FROM ANALOGUE TO DIGITAL TERRESTRIAL TELEVISION
BROADCASTING AND SPECTRUM MANAGEMENT**

a) Transition from analogue to digital terrestrial television broadcasting

1. SUMMARY OF EXISTING SITUATION

Transition from analogue to digital terrestrial television broadcasting, presents governments, broadcasters, regulators and the general public with immense opportunities and challenges. This section briefly describes factors that need to be considered in preparing a roadmap for the transition.

The advantages of digital broadcasting can be summarized as follows:

- More programmes can be provided with the same bandwidth at a higher;
- Provision of interactive information and transaction services (such as television shopping, and banking, etc.);
- Freeing of frequency spectrum which can be used for new services; and
- Convergence - broadcasters can provide services such as data-casting and Internet access etc., while other networks can provide broadcasting services such as video on demand and IPTV;
- The transition to digital terrestrial TV broadcasting represents an ideal opportunity for countries in the region to take the necessary steps to ensure TV is accessible to persons with disabilities.

All of the Arab countries are part of the GE-06 plan. As a consequence the latest analogue switch off date is 17 June 2015 (for some countries in some frequency bands this deadline is 17 June 2020). Some countries are well advanced in the process; some of them are still at the beginning or have not yet started.⁷

Twelve countries in the Arab Region have deployed, or have transition plans for deploying digital terrestrial broadcasting. Most of these countries have frequency plans, and have chosen to deploy the DVB-T standard. However, only a few indicated that a legal and regulatory framework is in place. The duration of the transition ranges from 18 to 91 months. With the exception of Morocco and Saudi Arabia, most of these countries have a limited number of DVB-T transmitters on air. It is worth mentioning that DTH Satellite broadcasting is available in all countries in the Arab Region.

A main inhibitor for digital broadcasting in the Arab region is the high scale of content piracy. Terrestrial TV viewership in the region has fallen drastically as households switch to the wider choices and richer content of Satellite TV. End users, for the most part, are not used to paying for content. Arab states should enforce copy rights and anti-piracy laws as an incentive for investment.

⁷ Jordan, for example, has planned for the digital transition in two stages. The first stage consists of the main TV broadcasting stations (11 cities), beginning 2012 and completed by end of 2012. The second stage consists of transitioning in the rural and remote areas and will be implemented in 2013-2015. There will be one year of overlapping after the first stage between digital and analogue broadcasting to allow end users to upgrade their receivers.

IPTV and Mobile TV are not widely adopted in the Arab Region. IPTV is deployed in eight countries, whereas Mobile TV services were implemented in 12 countries. Eleven countries have deployed 3G IP-based Mobile TV, compared to only 3 for DVB Mobile TV. Lack of content and absence of clear regulatory framework are main reasons for not deploying IPTV and Mobile TV.

2. CHALLENGES OF TRANSITION

The transition process presents challenges in several domains:

- **Regulators:** Regulators need to review license conditions including spectrum and broadcasting rights. Options relating to transmission technology, TV presentation format, compression and simulcast policies need to be decided.
- **Operators:** Operators need to decide network planning issues such as Multi-Frequency Network (MFN)⁸ and Single-Frequency Network (SFN)⁹ and identify key applications.
- **Consumers:** Consumers need to use set-top boxes or replace their current analogue equipment (main television, secondary televisions and video-recorders) with digital receivers.

3. RECOMMENDATIONS

The transition to digital broadcasting is a complex process, requiring the involvement and cooperation amongst legislators, regulators, broadcasting companies (content producers, broadcasters and network operators), manufacturers and viewers.

Some common key factors driving a successful transition can be recommended:

- A successful digital switchover and analogue switch-off (DSO/ASO) will require the active participation of, and coordination between, the government and the television industry in order to ensure a minimum amount of disruption for viewers;
- The decision to stop analogue television services needs strong leadership to affirm when and how the analogue switch-off will proceed; and
- Viewers need to have access to sufficient information in a timely fashion, including: why the DSO/ASO process is planned and what the benefits will be; the availability of alternative television platforms; the date when the analogue terrestrial television will end; new equipment needed; and finally the costs associated with receiving digital television programmes.
- Countries in the Arab region may wish to consider using the transition to digital terrestrial TV broadcasting as an opportunity to take the necessary steps to ensure that TV is accessible for persons with disabilities in line with the practical steps identified in the BDT Thematic Report, "Making TV Accessible."¹⁰

The Arab region may wish to consider establishing a coordination group for harmonizing the digital broadcasting transition process, collecting relevant information and practices of countries which have already switched to digital broadcasting. This will also help in the process of capacity building and coordination of the utilization of the digital dividend.

⁸ Multi-Frequency Network: the network of transmitting stations using several RF channels.

⁹ Single-Frequency Network: the network of synchronized transmitting stations radiating identical signals in the same radio-frequency (RF) channel.

¹⁰ These solutions and the practical steps that can be taken to ensure that television becomes accessible are explored in a new BDT thematic report, "Making TV Accessible" available at <http://www.itu.int/ITU-D/sis/PwDs/index.phtml>. A series of podcasts further exploring these issues is available at the same link.

b) Spectrum management

1. SUMMARY OF EXISTING SITUATION

A number of factors such as introduction of competition, rapid deployment of mobile and wireless technologies and the high demand for frequency spectrum from different user segments has highlighted the importance of spectrum management and effective and efficient use of the spectrum a major policy issue.

In the context of technological changes and the convergence of technological platforms, there is a need for developing and promoting regional harmonized policy and regulatory framework. This would encourage private sector participation and investment and ensure more efficient and rational allocation and use of the spectrum. **A number of countries in the Arab region lack effective spectrum management plans that timely respond to technological changes spectrum requirements.**

It is important for the region to address the policy, regulatory and technical challenges facing the countries in the field of spectrum management, to strengthen regional organizations and the capacity of the countries of the Arab region in the fields of frequency planning and assignments, spectrum management and monitoring.

2. RECOMMENDATIONS

- In order to harmonize the spectrum use in the Arab region and in the sub-regions it is recommended to develop harmonized National and Regional Frequency Allocation Tables (NFAT and RFAT). National Spectrum Management Systems can be established on the basis of the Spectrum Management System (SMS4DC) developed by ITU;
- For efficient spectrum use set up harmonized borderline frequency coordination mechanism e.g. based on the agreement used in Europe, the HCM (harmonized calculation method) and develop a regional Spectrum Pricing Policy Framework; and
- Enhance regional expertise through capacity building activities.

PART C

Building a Broadband-Enabled Economy and ICTs for the Social and Economic Development of Women and Persons with Disabilities

Part C focuses on infrastructure of a different kind – a nation’s human capital – and leveraging the investment in broadband infrastructure to develop in the Arab region a competitive, broadband-enabled, knowledge-based economy and promote the social and economic development of persons with disabilities and women.

1. SUMMARY OF THE EXISTING SITUATION

Recognizing Human Capital as Infrastructure

An important determinant of a country’s competitiveness in the global economy is its human capital, in particular the skills, education and productivity of its workforce. The building of human capital – of both men and women alike -- begins at primary schools and extends all the way to universities, research and development centers and trade or ‘applied’ schools. Adult persons with disabilities and women who did not receive or complete their education as children, and who therefore lack basic language literacy, digital literacy and job skills, can also be part of this process. ICTs can be used to deliver training and education and to ensure that children with disabilities receive an inclusive education. Access to ICTs coupled with a skilled and educated workforce will enable the Arab region to develop a vibrant knowledge society and respond to the evolving ICT industry¹¹. The World Bank’s Knowledge Assessment Methodology evaluates a country’s preparedness to compete in the knowledge economy. Figure 2, which includes 15 countries from the Arab Region, compares their Knowledge Economy index from 1995 and 2009.

2. CHALLENGES AND OPPORTUNITIES

2.1 Literacy and Basic Education

2.1.1 Challenge

The *Arab Knowledge Report 2009*¹² carried out a review of knowledge capital accumulated by educational institutions in the Arab countries. According to this report, the Arab region lags behind most of the rest of the world in adult literacy rates, secondary school enrolment rates, and enrolment in tertiary education, ranking sixth out of eight regions of the world, placing higher only than South and West Asia and Sub-Saharan Africa.

Who make up the ranks of those excluded from an education? Many of them are persons with disabilities, girls and women. Over one billion people worldwide live with some form of disability, this includes between 93 and 150 million school-age children. UNESCO statistics for

¹¹ Indeed, education and ICTs are two of the four essential pillars of a knowledge society: :

- An economic and institutional regime to provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship;
- *An educated and skilled population to create, share, and use knowledge well;*
- An efficient innovation system of firms, research centers, universities, consultants and other organizations to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology; and
- *Information and communication technology* to facilitate the effective creation, dissemination, and processing of information.

Entrepreneurship and innovation are addressed in the Innovation Background Paper.

¹² A joint report sponsored by the UNDP and the Mohammed bin Rashid Al Maktoum Foundation (MBRF), found at <http://www.mbrfoundation.ae/English/Documents/AKR-2009-En/AKR-English.pdf>

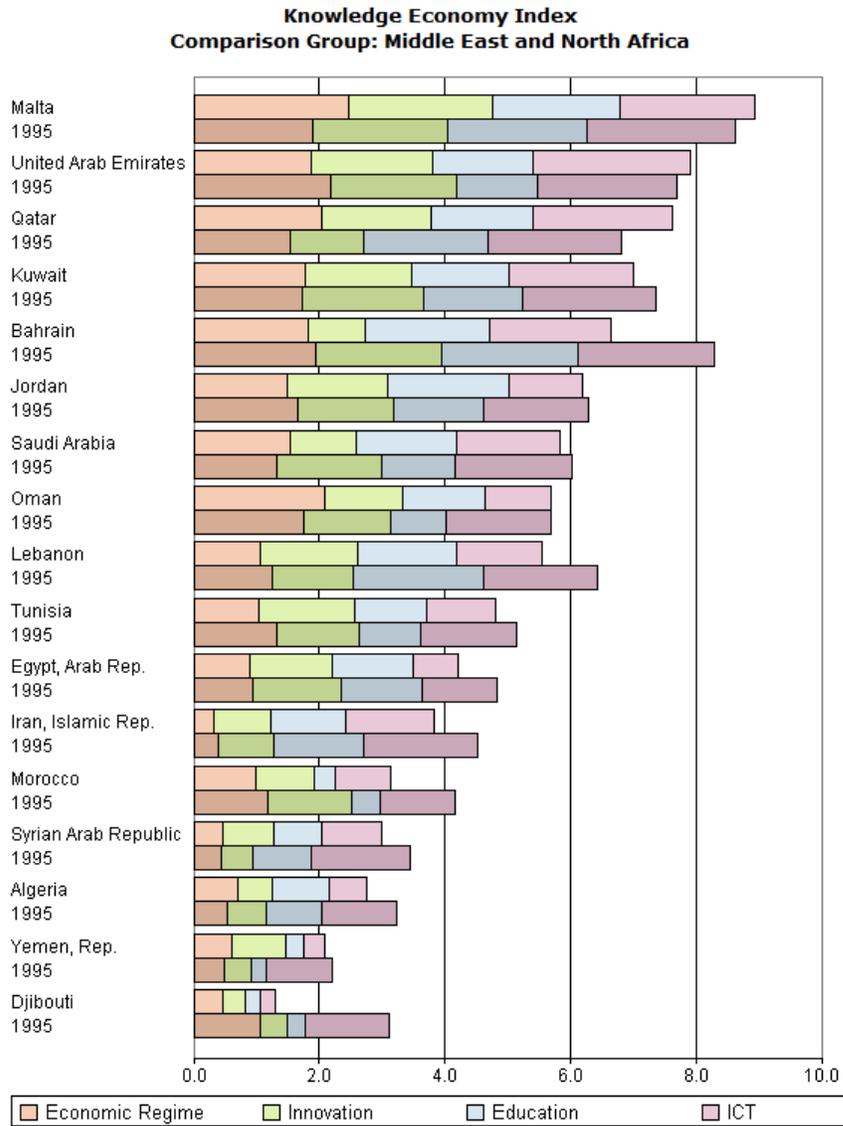


Figure 2

2008 estimated that there were 39 million illiterate women in the Arab world, with certain countries suffering from extremely low female literacy rates.¹³ The regional adult illiteracy rate is 29 per cent¹⁴.

2.1.2 Opportunity: Broadband-enabled Second-Chance Education

Policy makers are increasingly focusing on second-chance education schemes to provide basic life skills (e.g. language literacy and numeracy) and vocational training to address the needs of generations of women and persons with disabilities who have not completed their education. One of the opportunities of creating a broadband economy is the ability to provide online language literacy and vocational training and to promote widespread digital literacy among adults to enhance business development and job creation. While a number of

¹³ These include Mauritania, Morocco, Sudan, and Yemen. In Algeria and Yemen, the illiteracy rates for women are more than twice those of men. (2010, Education For All (EFA) at 96).

¹⁴ EFA 2010 at 97.

countries in the region have begun to take action to address this need, online literacy training materials could be developed to be used across the Arab region.

2.2 Computer Technology Instruction and Analytical Reasoning

2.2.1 Challenge

The *Arab Knowledge Report 2009* notes the total absence of computer technology instruction and the scarcity of countries in the region that have introduced this subject into their primary school curricula. This has been compounded by the high cost of personal computers and laptops, making it even more difficult to provide computer technology instruction in schools. In addition, this Report identifies the need for Arab educational curricula to teach the skills necessary to promote entrepreneurship, innovation and research and development.

These challenges are particularly acute for the region's burgeoning youth population who currently face high unemployment levels. Sixty percent of the region's population is under the age of 15, while unemployment levels in the region are among the highest in the world. The World Bank has suggested that 100 million new jobs need to be created in the region before the year 2020.

2.2.2 Opportunities: Curriculum and Connectivity for a Broadband World

One of the opportunities presented by these challenges is for the region to revise its educational curricula to ensure schools develop the necessary skills to enable Arab citizens to fully participate in the knowledge society and to develop an ICT workforce that generates employment and keeps up with the fast-paced and dynamic ICT sector.

Likewise, there is an opportunity to ensure that all schools are connected to broadband services and equipped with low cost computing devices¹⁵, including accessible ICTs to ensure an inclusive education for children with disabilities. Connected schools can then be leveraged as community ICT centres to provide training to the generation of users so far left behind, including in rural and remote areas.¹⁶ Jordan, for example has more than 180 community centers in remote and deprived areas that provide digital literacy and other types of training while Oman is training teachers to use assistive ICTs to assist children with disabilities and provides digital literacy training and certification to women in community centres.

Using low-cost, Open Source tablets also makes content development easier and facilitates the distribution of free and paid educational content through App-stores, creating business opportunities for publishers and leading to sustainable deployment models.

Some countries in the Arab world have already launched ambitious education projects to promote development of a knowledge society, including Saudi Arabia, Jordan, Qatar and the United Arab Emirates.

2.3 Beyond Infrastructure: Addressing the special needs of persons with disabilities and women

2.3.1 Challenge

Building infrastructure alone is not enough to ensure that persons with disabilities and women can participate actively in the Knowledge Society. Persons with disabilities must also have accessible and assistive technologies adapted to their needs in order to use the internet or a phone, while women may require language literacy training in order to use job-training sites

¹⁵ India, for example, has developed the Aakash Android-based tablet priced as low as USD 35 per unit.

¹⁶ See the ITU Connect a School, Connect a Community Toolkit of Best Practices and Policy Advice and Repository of Training at www.connectaschool.org. The Toolkit shares best practices on the policies and practices needed to connect schools, develop low cost lap top programs and design community ICT centres for women, indigenous peoples and persons with disabilities. .

on the web. Few countries in the region have developed policies and regulations to ensure that accessible ICTs are available for persons with disabilities or use their universal service funds to subsidize the cost of phones with accessible apps for persons with disabilities or to fund programs to train women to become digitally literate.

2.3.2 Opportunity

Promoting the digital inclusion of people with special needs can be addressed as a legal or social obligation as well as a business opportunity and as part of a broader strategy to stimulate broadband demand. Article 9 of the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD)¹⁷ requires ICTs such as mobile telephony, television, and the Internet to be accessible for persons with disabilities. There is an opportunity for policy makers, regulators and operators across the Arab region to develop frameworks, like the one recently adopted by Qatar, to promote ICT accessibility for persons with disabilities, including captioning for TV broadcasting and web accessibility guidelines. Mobile operators could develop codes of conduct for providing accessible mobile phones and implement practices such as that used by Etisalat in Egypt to purchase bulk licenses of screen readers and make them available free of charge to their blind subscribers. ITU has a number of resources on promoting accessible ICTs for persons with disabilities for use by both the public and private sector¹⁸.

There is also need to ensure that women become more represented in the ICT sector for a number of compelling economic reasons. The growing ICT sector generally offers more competitive pay and working conditions which will improve women's social and economic status. Closing the male-female employment gap is good for economic growth while gender diversity in leadership positions is good for business performance. Perhaps the most compelling reason to promote women in the ICT sector is that there is an overall increase in demand for technical workers. Estimates from Europe, the United States and Brazil alone predict a skills shortfall in the ICT sector of over 1.7 million in the coming years. For these reasons, ITU and its members have agreed to recognize Girls in ICT Days on the 4th Thursday of every April where girls and university students are invited to spend the day at the office of ICT companies and government agencies so they better understand the opportunities the ICT sector holds for their future. Information on a range of programs designed to encourage more girls and young women to enter the ICT sector are available on the ITU Girls in ICT Portal at www.girlsinict.org.

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 Building workforce skills for a broadband-enabled knowledge-based economy

"In the 21st century, classification will be on the basis of information: societies with knowledge, and others without. Our region's success depends on creating an environment conducive to acquiring knowledge and on providing tomorrow's leaders with motivation to build a better future."

H.H. Sheikh Mohammed bin Rashid Al Maktoum

Recommendations for creating such a knowledge society include:

- Ensuring that computer technology and digital literacy training is provided at the primary education level;

¹⁷ Ten countries in the Arab region have ratified the UN CRPD: Algeria, Bahrain, Egypt, Jordan, Oman, Qatar, Syria, Tunisia, United Arab Emirates and Yemen.

¹⁸ These ITU resources include the online [ITU-G3ict e-Accessibility toolkit](#), the [Connect a School, Connect a Community toolkit module on "Using ICTs to promote education and job training for persons with disabilities"](#), and the BDT Thematic Reports on Making TV Accessible available on the Special Initiatives website. A report on Making Mobile Phones and Services Accessible will be published on the Special Initiatives website in 2012 at <http://www.itu.int/ITU-D/sis/PwDs/index.phtml>.

- The curricula of the secondary and tertiary educational systems is revised to build skills of young men and women in areas of:
 - Developing learners' abilities to collect, organize, sift, and analyze information
 - Leadership and management
 - Entrepreneurship and innovation
- Starting the building of capacity in education systems with skills development for teachers and school heads, accompanied by investment in R&D. Development of teaching resources can be directed at exploiting open standards, so that the market mechanisms for development of teaching aids are enabled to function as well as possible.
- Universities can seek to ensure that the courses they offer are constantly upgraded to ensure relevance to industry needs – this includes through internships and mentoring programs which include feedback loops whereby the private sector advises schools, colleges and academic institutions on the skills and courses required to better meet its needs.
- Universities themselves can develop their institutional capacity by working in partnership with other universities as is widely practiced in a growing number of Gulf countries where universities have developed partnerships with premier universities and research organizations.

3.2 Recommendations on ICTs to Respond to the Special Needs of Persons with Disabilities and Women

The following measures can be adopted to leverage ICTs for the social and economic development of persons with disabilities and women and as part of a more comprehensive strategy to stimulate demand for broadband services:

- Connect all schools to broadband networks.
- Equip schools with low cost computing devices, including accessible and assistive technologies to ensure that children with disabilities receive an inclusive education.
- Leverage connected schools as community ICT centres addressing the social and economic needs of persons with disabilities, women and people living in rural and remote areas.
- Develop online Arabic literacy training materials to provide literacy training for women that can be distributed free of cost to governments and NGOs¹⁹.
- Encourage mobile operators in the region to develop post-literacy training for women delivered over mobile phones.
- Complement language literacy training with digital literacy training that teaches ICT basics and how to use ICTs to support and enhance women's ongoing economic activity²⁰ in line with the ITU-telecentre.org Digital Literacy Campaign to train one million women to become digitally literate by year end 2012²¹.
- Develop policies and practices that promote accessible ICTs for persons with disabilities, including accessible TV and mobile phones and services; these practices can include, e.g. mobile operators buying bulk screen reader licenses and making them available for free for blind customers or developing open source versions of screen readers in Arabic.
- Ensure that more women and girls are encouraged to enter the ICT sector, including by organizing Girls in ICT Days every year on the 4th Thursday of April in line with ITU Plenipotentiary Resolution 70 (Guadalajara 2010) and providing scholarship and internship opportunities to women in the ICT sector.

¹⁹ ITU, through initial funding provided by the Telecommunications Regulatory Authority, UAE, ALESCO and the Arab Women's Organization plan to develop such training materials, and actively seek sponsors and partners to complete this work.

²⁰ See www.connectaschool.org for training materials used in the Asia Pacific Region on using social networks and government agriculture sights.

²¹ See http://www.itu.int/ITU-D/sis/Gender/digital_literacy.html