UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

ICTPOLICYREVIEW

Egypt

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Arab Republic of Egypt
Ministry of Communications and
Information Technology

UNDP

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NOTE

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PREFACE

Information and communication technologies (ICTs) are increasingly widespread in the world and are of growing importance to economic and social development. The international community has recognized the potential benefits of ICTs and encouraged governments to elaborate comprehensive, forward-looking and sustainable national ICT strategies as an integral part of their development plans and poverty reduction strategies. Many developing countries have already put in place one or several national ICT plans and others are in the process of doing so.

Regular reviews of ICT policy plans, involving the different stakeholders, are important. Failure to take early steps to monitor the implementation of ICT policy measures can delay ICT developments and restrict future policy measures. At the same time, assessing the impact of policy measures and sector-specific interventions is a challenging task.

Against this background, UNCTAD has developed a model policy review framework. It draws on our ongoing work on ICT policies and on ICT measurement for economic development and trade. The core aim of the ICT Policy Review (ICTPR) is to assess the implementation of national ICT strategies by examining how ICT and e-business development issues have been operationalized in the development strategies and to identify policies, programs and implementation mechanisms favouring the development of the information economy.

At the request of the Ministry of Communications and Information Technology (MCIT) of Egypt, UNCTAD has carried out this first ICTPR from 2009 to 2010. It focuses on selected policies and initiatives contained in *Egypt's ICT Strategy 2007-2010*, and proposes a set of recommendations intended to serve as inputs into the next national ICT strategy, which is currently being prepared. It should be noted that the Review was concluded before the "25 January 2011 revolution". Thus, it does not take into consideration the implications of recent political events in Egypt.

Egypt has a unique set of circumstances and strengths that could help the country emerge as a major ICT player among information economies in the Middle East and North Africa (MENA) region. It is my hope that the Review will help the Government to quantify the main achievements regarding the implementation of ICT policy measures as foreseen in its ICT strategy. I also expect it to facilitate the identification of critical success factors, best practices and conditions, as well as reasons for failure to be able to adjust and reform ICT policies. Understanding past developments is important in formulating new and targeted policy proposals that can support and accelerate ICT penetration within government, businesses and the society at large. More broadly, the ICTPR can help the Government to evaluate the extent to which national ICT policies have contributed to the country's overall development strategy. In this context, the Review will also help other countries in their policy-making process by the sharing of best practices.

Based on consultations with the MCIT, it was decided that the ICT Policy Review of Egypt would concentrate on five areas:

- Development of infrastructure – with particular emphasis on broadband;
- Development of human resources/skills required by a growing ICT industry;
- Development of ICT use in education;
- Development of local content in key ICT applications (especially the Internet); and
- Promotion of an export-oriented ICT sector, notably in the area of ICT-enabled services.

The Review has benefited from excellent contributions from the MCIT, other government ministries and agencies, as well as representatives of the private sector and civil society. I would like to express my sincere appreciation to all involved.

Supachai Panitchpakdi
Secretary-General
UNCTAD

STATEMENT BY THE MINISTER OF COMMUNICATIONS AND INFORMATION TECHNOLOGY

The aim of this Review, executed jointly by the Ministry of Communication and Information Technology (MCIT) Information Center and the United Nations Conference on Trade and Development (UNCTAD), was to assess the implementation of Egypt's National ICT Strategy, which drove the development of the sector in the past era and to develop recommendations for policy makers to overcome the challenges that have emerged.

In that context, the Review has explored five main areas: the development of infrastructure – with particular emphasis on broadband; development of human resources/skills required by a growing ICT industry; development of ICT use in education; development of local content in key ICT applications (especially the Internet); and promotion of an export-oriented ICT sector, notably in the area of ICT-enabled services.

However, it is important to note that the analytical work related to the Review was completed at the end of 2010, before the "25 January 2011 revolution", and hence, the Review did not incorporate the crucial implications defined by the pivotal role that ICT played in the recent political evolution of Egypt.

Looking forward, I view 2011 as the dawn of a new era for ICT in Egypt, with even more Egyptians joining and embracing the information society as we continue to work to forge a knowledge economy. We have seen Egyptians using ICT tools not only to express their desire for change, but also to realize it.

I believe that the coming period will witness greater use of ICT by Egyptians as they channel their dynamism through political debate to pave the future of the country. Many changes in the coming period are to shape the face of ICT for Egypt, starting with changing the communications law in order to prevent future abuse of the telecom services. The ICT will continue to play its role in improving the citizens' welfare and stimulating the economy's growth, and will add to it a new role in the political arena through electronic voting.

MCIT is proud to support this progress by promoting ICT for democracy, just as it has previously championed ICT for development. The present Review will be of great value in this context.

Dr. Mohamed Abdel Kader Mohamed Salem
Minister of Communications and Information Technology
Egypt

STATEMENT BY THE RESIDENT COORDINATOR, UNDP EGYPT

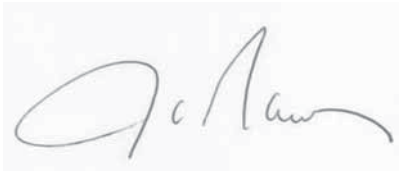
Over the past decades the United Nations, through its different specialized agencies, funds and programmes, has identified a wide variety of options to accelerate human development and liberate human capacities. The role of Information and Communication Technologies (ICTs) is one of these options as ICTs increase people's access to knowledge and information and provide new avenues for communication.

For its part, the United Nations Development Programme (UNDP) has long recognized ICTs as important instruments of empowerment that contribute to developing an information society and, in so doing, creating job opportunities and fostering education. ICTs are also effective tools for social and political accountability, as was witnessed in the central role social media platforms played in mobilizing the public and communicating social and political demands during the events in Egypt earlier this year.

Since the 1990s, ICTs have witnessed unprecedented growth in Egypt and their impact on the Egyptian society has expanded. In this regard, I wish to commend the constructive role played by the Government of Egypt, and, in particular, the Ministry of Communication and Information Technology (MCIT), with which UNDP has had the honor of collaborating since its establishment in 1999. The MCIT has led the drafting and implementation of national plans, initiatives and strategies to develop ICT infrastructure in Egypt, especially in rural areas. In so doing, the MCIT has recognized the important role of ICTs in Egypt's development process, and the benefits to be derived from partnerships between the public and private sectors, and with international partners, such as UNDP.

During this period, fixed lines, mobile services, personal computer (PC) access, Internet and post office services have experienced significant growth, with better quality and lower prices. Today, the different platforms of the Web 2.0, such as Facebook and Twitter, reflect how the younger generation chooses to interact and exchange information.

This ICT Policy Review offers the opportunity to build on past experiences and lessons learned, to ensure that ICTs continue to expand opportunities for Egyptians, and to build a more inclusive and just society. I congratulate all those involved with its preparation.



James W. Rawley
UNDP Resident Representative
Egypt

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The UNCTAD team comprised Cécile Barayre and Torbjörn Fredriksson, as well as two international consultants, Shahid Akhtar and Richard Labelle. Overall direction was provided by Mongi Hamdi and Anne Miroux.

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CONTENTS

LIST OF ABBREVIATIONS

ABT	Agreement on Basic Telecommunications
ADSL	Asymmetric Digital Subscriber Line
ARP	Advanced Research Program
B2B	Business-to-Business
B2G	Business-to-Goverment
BAU	Business As Usual
BMI	Business Monitor International
BPO	Business Process Outsourcing
CA	Certification Authority
CAF	Community Access Facilities
CAGR	Compound Annual Growth Rate
CBC	Community Broadband Centre
CBL	Community Broadband Library
CEE	Central and Eastern Europe
CELAC	Collecting and Exchanging Local Agricultural Content
CITC	Chamber of Information Technology and Communications
CMMI	Capability Maturity Model Integration
CoE	Center of Excellence
CLC	Community Learning Center
CPI	Consumer Price Index
CultNet	Center for Documentation of Cultural and Natural Heritage
DSL	Digital Subscriber Line
DRM	Digital Rights Management
EBRD	European Bank for Reconstruction and Development
EEI	Egyptian Education Initiative
EELU	Egyptian e-Learning University
EISI	Egyptian Information Society Initiative
e-LCC	E-Learning Competence Center
ERP	Enterprise Resource Planning
ESE	Egyptian Stock Exchange
EITESAL	Egyptian Information, Telecommunications, Electronics and Software Alliance
EIU	Economist Intelligence Unit
ERTU	Egyptian Radio and Television Union
EUN	Egyptian Universities Network
FDI	Foreign Direct Investment
FTTB	Fiber to the Business
FTTC	Fiber to the Curb
FTTH	Fiber to the Home
FTTP	Fiber to the Premises
FTTX	Fiber to the X
FY	Fiscal Year
G2B	Government-to-Business
G2G	Government-to-Government
GAFI	General Authority for Investment
GATS	General Agreement on Trade in Services
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GeSI	Global e-Sustainability Initiative

GHG	Green House Gas
GITR	Global Information Technology Report
GPON	Gigabit Passive Optical Network
GOE	Government of Egypt
Gbps	Giga bytes per second
GTI	Global Talent Index
HSBB	High Speed Broadband
HSPA	High Speed Paquet Access
HSDPA	High-Speed Downlink Packet Access
HVAC	Heating Ventilation and Air Conditioning
ICANN	Internet Corporation for Assigned Names and Numbers
ICDL	International Computer Driver's License
ICT	Information and Communication Technologies
IDC Inc.	Market research firm
IOC	Independent Operator Company
IP	Internet Protocol
IPR	Intellectual Property Rights
IPRO	Intellectual Property Rights Office
ISP	Internet Service Provider
ISTQB	International Software Testing Qualifications Board
ITAC	Information Technology Academia Collaboration
IT	Information Technology
ITeS	Information Technology enabled Services
ITI	Information Technology Institute
ITIDA	Information Technology Industry Development Agency
ITO	Information Technology Outsourcing
ITU	International Telecommunication Union
Kbps	Kilo bytes per second
KTP	Knowledge Transfer Partnership
KPO	Knowledge Process Outsourcing
LAN	Local Area Network
LE	Egyptian Pound
LSE	London School of Economics
LTE	Long Term Evolution
M&A	Mergers and Acquisitions
Mbps	Mega bytes per second
MCMC	Malaysian Communications and Multimedia Commission
MENA	Middle East and North Africa
MICC	Ministry of Information, Communications and Culture
MCIT	Ministry of Communications and Information Technologies
MoE	Ministry of Education
MoHE	Ministry of Higher Education
MSAD	Ministry of State for Administative Development
MSC	Multimedia Super Corridor
NASSCOM	National Association of Software and Services Companies
NBI	National Broadband Initiative
NeLC	National e-Learning Center
NHCBP	National Healthcare Capacity Building Program
NICTS	National Information and Communication Technology Strategy
NGN	Next Generation Network
NRI	Network Readiness Index

NTI	National Telecom Institute
NTRA	National Telecommunication Regulatory Authority
NU	Nile University
OCR	Optical Character Recognition
OECD	Organization for Economic Cooperation and Development
OLPC	One Laptop per Child
PAU	Public Access Units
PC	Personal Computer
PDP	Product Development Program
PKI	Public Key Infrastructure
PON	Passive Optical Network
PPP	Public Private Partnership
QoS	Quality of Service
R&D	Research and Development
RDE	Rapidly Developing Economies
RDI	Research, Development and Innovation
SAP	SAP software company
SCU	Supreme Council of Universities
SDK	Software Development Kit
SECC	Software Engineering Competence Center
SEI	Software Engineering Institute
SMME	Small- Medium- and Micro-Enterprises
SSN	Smart Schools Network
TIP	Technology Incubation Program
TNC	Transnational Corporation
ToR	Terms of Reference
ToT	Training of Trainers
UAE	United Arab Emirates
UAF	Universal Access Fund
UAS	Universal Access Strategy
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
US$	United States Dollars
USF	Universal Service Fund
UPS	Uninterrupted Power Supply
USP	Universal Service Provision
VMWare	Hardware virtualization company
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminals
WDM	Wavelength-division Multiplexing
WEF	World Economic Forum
WiMax	Worldwide Interoperability for Microwave Access
WIRC	Wireless Intelligence Research Centre
WTO	World Trade Organization

EXECUTIVE SUMMARY

Towards an inclusive information economy

At an early stage, the Government of Egypt recognized information and communication technology (ICT) as an important enabler for national economic and social development and for strengthening the country's competitiveness. Since the 1990s, it has created multiple institutions and designed several ICT strategic plans to support the adoption and use of ICTs by the public and private sectors.

The Ministry of Communication and Information Technology (MCIT), formed in 1999, is charged with the task of supporting and empowering the information society. Three national ICT plans have been implemented so far by MCIT, in close cooperation with relevant government agencies and the private sector. During preparation of the next ICT strategy (2011-2014), the MCIT decided that an evaluation of the impact of policy measures and sector-specific interventions of the most recent national ICT strategy was needed to assess the progress made and to stake out directions for the future.

This Review responds to the need for such an evaluation. It documents the considerable progress made so far and helps the Government of Egypt understand its strengths and the challenges ahead to create a more inclusive information economy. It proposes best practices from other countries to help the Government identify its medium- to long-term strategic ICT objectives and options available to achieve them.

The next strategy must be considered against the background of the ambitious goal set by the Government to make Egypt a frontrunner in the information and knowledge society. It is essential that the new strategy builds on achievements already made, addresses areas in which progress has been less pronounced, as well as keeps up with the continuous technological and market changes occurring in the global ICT landscape.

In its efforts to assess progress, the MCIT developed a series of indicators, including those developed by the UN Partnership on Measuring ICT for Development.

Thanks in part to strong Government commitment, Egypt has seen marked improvements in, for example, ICT infrastructure, the availability of trained human resources, exports of ICT-enabled services and promotion of digital content. The Review evaluates the main achievements by Egypt in the area of infrastructure development, skills developments for the ICT sector, ICT use in the educational system, e-content development, and the promotion of an export-oriented ICT sector.

In terms of achievements in **ICT infrastructure**, the Government has implemented a number of policy measures to improve connectivity and access, including the deregulation of the telecommunication sector with the allocation of three licenses to mobile operators. High-quality fiber broadband connections are now available in main cities and business parks, such as the Smart Village. Mobile uptake has improved dramatically; penetration surged from 25 subscriptions per 100 inhabitants in 2006 to 90 in December 2010. The number of people accessing the Internet using a mobile or a USB modem has also increased, from around 7 million at the end of 2009 to 8.6 million at the end of 2010.

For ICTs to have maximum impact on development, policy action should not only aim at developing the infrastructure, but also seek to strengthen the capacities to use such tools. The Government of Egypt has long invested in ICT-relevant human capital to ensure that the market's growing needs are met. In this context, it has launched various programs through several institutions to support the generation of ICT engineers and technicians demanded by the private sector, in particular for the Information Technology Outsourcing (ITO) and Business Process Outsourcing (BPO) sectors. As a result, Egypt has been ranked among the top ten emerging economies for its IT skills.

With regard to ICT use in the educational system, Egypt has launched several initiatives, such as the Egyptian Education Initiative, the Smart Schools Network (representing less than five per cent of all schools) and IT Clubs. These initiatives have been successful in raising the quality and extent of ICT-based education in the school system. The challenge, however, is enormous, with a young and growing population, over 52,000 primary and secondary schools and 12 million undergraduates.

To promote greater uptake of ICTs in Egypt, another central element is the availability of **relevant e-content in Arabic** on the Internet and other forms of ICTs (such as mobile devices). Although e-content development in Egypt, as in the rest of the Arab region, is still emerging, the Government of Egypt has made considerable progress in several areas, such as the Arabic e-Content for Books and Software Initiative; cultural and educational content development, and e-government content. At the same time, the development of such content remains a growth opportunity, as much of it could potentially be generated locally for the Egyptian market and other Arab-speaking markets.

With regard to the **promotion of its export-oriented ICT sector,** Egypt has achieved significant success in establishing itself as a recognized location for BPO services. In A.T. Kearney's Global Services Location Index, Egypt climbed from 12th position in 2007 to 4th in 2011. Other reports confirm this trend. Egypt's main strengths in this context are its geographic location, relatively low costs of doing business, a proactive and supportive business environment, an active and well-financed program to support the offshoring industry, and a young, well-trained and multilingual work force. Another asset has long been the strong support from the highest political level. This has helped to ensure good coordination between different players involved in promoting the sector.

Based on the assessment of the main achievements of the Government of Egypt in the selected areas, the Review identifies main challenges and makes policy recommendations. The latter are based on the findings of the evaluation and lessons learned from other countries. For each area, the Review proposes indicators that can serve as a basis for setting clear and measurable targets in the next national strategy. Some of the main recommendations can be applied to several of the policy areas discussed in the Review. Due attention to these areas should help to realize the untapped potential in the Egyptian ICT landscape and maximize the development impact.

Make policies more demand-driven

In order to make sure that the next national ICT strategy sets the appropriate priorities and uses the most efficient means to reach the development goals identified, it is essential to make strategies and policies more demand-driven. This is of particular importance as ICT markets and technology are in a constant state of flux.

Greater use of market and demand studies would help: a) to identify the priority needs of Egyptian consumers and businesses in terms of information and services, in the case of broadband deployment or e-content development; b) to understand the evolving needs and challenges of ICT companies, teachers, instructors and students to meet the changing needs of the ICT industry; and finally c) to track the markets and demand for higher-end ICT-enabled services.

Make ICT policies more inclusive

In order to bring Egypt to the forefront in leveraging ICTs for development, it is important to extend the reach of access to, and benefits from, ICTs. This means, among other things, enhancing infrastructure coverage in underserved areas, promoting greater use of ICTs among enterprises that are located outside the technology parks, and finding ways to reach Arabic-speaking users. The Review makes several concrete recommendations to this end. For example, in terms of reaching underserved areas, the new broadband strategy should be well integrated with the universal access strategy, promoting a combination of market-based incentives and government subsidies. The Government may choose to encourage municipalities to take the lead in planning, building, owning and operating their own broadband networks.

Given the much higher penetration rates for mobile telephony than for other ICTs in Egypt, adequate attention should be paid to the provision of services and content development using mobile platforms. UNCTAD proposes that a task force involving mobile operators and international mobile content developers should be established by the Government to look into, and/or advise policy makers on, ways to speed up progress in boosting mobile applications and services in Arabic.

Potential contributions from small- and medium-sized enterprises (SMEs) should be considered in the next strategy from both the supply side (as producers of ICT goods and services) and the demand side (as users of ICTs). SMEs represent an important (but so far little exploited) vehicle in order for Egypt to succeed in growing the ICT sector. They should play a key role in the exports of ICT services and in the production of relevant content in Arabic. Egypt should also make

sustained efforts to foster greater ICT use among smaller enterprises.

Work in partnership with the private sector

The Government already has considerable experience in partnering with the private sector in various areas of the ICT strategy. Private sector operators can play a great role in fiber deployment and in the provision of network services through Public Private Partnership-based models. The same applies to content development and training programs: by stating that private sector operators can have a role to play in service delivery, the Government may encourage and engage private entrepreneurs in making investments and sharing skills and expertise that can assist the Government in providing on-line services. Key actions include: determining the demand for different kinds of digital content; creating a legal environment that supports the use of e-commerce; introducing e-payment solutions; and creating incentives for the development of company websites in Arabic.

Move towards exports of higher value-added services

The value of ICT-enabled services has grown to more than US$ 800 million and the Government expects to meet its target of US$ 1.1 billion by 2010. At present, contact centre services are one of the most important segments of the ICT-enabled services market in Egypt.

MCIT recognizes the importance of developing services with higher added value because this would allow companies to take advantage of the increasingly skilled and plentiful IT-related graduates and technicians in this area. In the next few years, MCIT, the Information Technology Industry Development Agency (ITIDA) and the Egyptian General Authority for Investment (GAFI) should work together to develop and promote higher value outsourcing services such as Knowledge Process Outsourcing, ITO and technical support, application development, business application implementation, remote infrastructure management, and the 'Arabization' of software. There is also a need to encourage innovating companies and researchers to come to Egypt. In this context, the Government may enhance its efforts at curbing software piracy and ensuring a sufficient supply of adequately trained staff.

Leverage foreign skills and expertise

In order to allow Egypt to speed up its expansion into services of higher value added, as well as to promote innovations, the Government should design a targeted strategy to leverage foreign skills and expertise. This is an important way of complementing domestic efforts at building the skills needed by an expanding ICT sector.

The Review highlights the untapped potential represented by Egyptian experts in the diaspora and the need to encourage brain circulation. The Government can do more to help bridge the gap between government organizations and diaspora communities, for example, by enhancing communication and information sharing with the diaspora communities through the use of modern and targeted services mediated by web-based and on-line information sharing platforms. Along with efforts to attract world-class Egyptian experts, the Government should seek to attract other international expertise by removing barriers to such inflows.

Strengthen coordination among government entities

Several different ministries, agencies, public corporations and business associations are operating in the ICT field. They need to work more closely on the strategic ICT issues of tomorrow to make the overall efforts of the Government as effective as possible. This Review has identified several areas in which such collaboration could be strengthened. The Government's actions can have an important effect on raising awareness. For example, by encouraging organizations under government control to speed up the development of e-government services, and by encouraging them to work in partnership with the private sector in developing appropriate solutions, it can both improve the level of services to various stakeholders and stimulate more content development among enterprises.

Make use of the latest technology

Staying abreast of technological change is highly demanding for any government, especially in an area as dynamic as the ICT sector. Innovation in the ICT sector takes place at the speed of the Internet. Of particular significance are rapidly advancing innovations in 4G technologies, Web 2.0, IPv6, ultrafast broadband and next generation networks in general, smartphones and related applications, pervasive

computing, and wireless sensor networks. Green ICT and related clean technologies (cleantech), especially smart grids, smart buildings and smart transportation/logistics, Green Growth, and the development of new outsourcing services, are also highly relevant.

In education, infrastructure costs associated with extending the Smart Schools Network and related initiatives to the entire country were found to be prohibitively high. One novel solution involves the use of virtualization technologies to reduce the number of central processing units servicing school labs, where one virtualized PC, or ultra-thin client device, can be turned into 10 independent workstations at a cost of about US$ 50 per seat. Egypt may consider this technology, for example, to computerize schools and other parts of the educational system. A variant on this approach is to use cloud-based services.

MCIT is already developing a Green IT strategy. As part of this initiative, it could consider how smart energy technologies, as well as alternative power technologies (including solar and wind), can assist in reducing the energy and carbon footprint of the ICT sector (PCs and network resources). It can also analyse how to use ICTs to enable energy efficiency and to limit greenhouse gas emissions in other sectors. The Smart Village is the natural place to demonstrate these technologies.

Egypt needs to be aware of, and seize the opportunities for, taking part in global research and development activities. Green Growth is a growing trend that requires ongoing research about energy efficient technologies, including green ICTs and nanotechnology in general.

Set quantifiable targets and continue to monitor progress

A detailed implementation plan is needed for the execution of the next strategy. In the plan, the Government should set measurable targets and indicators of performance and should track and report on these regularly to all stakeholders involved. The implementation, or action, plan can and should change over time in response to government policies and priorities, but also in response to the rapidly changing technology development and innovation environment. This Review proposes a set of indicators for each policy area. The Government must decide which of these it thinks are best harmonized with its overall development objectives. The Government must also try to arrive at realistic but ambitious goals in each area and make active use of the chosen benchmarks when assessing performance. The choice of indicators should reflect discussions with relevant stakeholders in order to ensure that targets are shared to the greatest extent possible across society.

Establish a long-term vision

In its next ICT strategy, the Government of Egypt should outline a vision that extends beyond 2014. While rapid changes in the technological landscape make it difficult to identify the concrete initiatives over a period longer than three to four years, it is important also to set medium- to long-term strategic objectives. Some efforts – such as expanding the availability of skills – take time to realize. It is therefore desirable that the Government specifies the direction it wants Egypt to take for the longer term. Such a guiding framework should allow for adjustments in policies when needed, but should set clear targets to be achieved by different points in time. The ICT strategy should also include budgetary estimates for relevant initiatives, as well as a framework of processes to guide the institutional implementation of the strategy, taking into account the need to coordinate the various contributions by relevant stakeholders.

CHAPTER I. INTRODUCTION

A. ICTs for development and the role of policies

Information and communication technologies (ICTs) are increasingly widespread in the world and are radically changing the economic landscape. Greater use of ICTs is contributing to economic growth in both developed and developing countries. The worldwide spread of mobile telephony and communication systems, the growth of Internet networks and expanding use of a broadband infrastructure continue to affect international production and trade patterns.

Advances in technologies, in conjunction with the results of their convergence, offer new challenges and opportunities. This technological evolution calls for continuous evaluation and monitoring of policies aimed at reaping benefits from ICTs.

Global trends in ICT use, diffusion, innovation, as well as relevant consumer market trends, need to be considered when preparing the future ICT strategy. Several important trends are influencing ICT diffusion, use and the market place. These include, for example, the growing importance of wireless solutions for both voice and data traffic and the rapid growth of smart phones. Other clear trajectories include the rapid deployment and upgrading of the Internet and broadband technology, as well as the continued development of Web 2.0 technologies and social networks based on open standards that ensure interoperability.

The recent turbulence in the global economy adds to the complexity of the task.[1] Global competition means that countries that have created an enabling environment for the digital economy will attract investments and generate wealth and economic growth. This is the case for countries that have decided to specialize in offshoring of IT and ICT-enabled services. In order to remain competitive, they need to continue to improve their locational advantages and identify niches in which they can compete most effectively.[2] Encouraging these developments necessitates a regular assessment of existing policies to ensure that they are in line with market developments. It requires strategies aimed at, not only expanding the infrastructure, but also at creating legal, institutional and policy frameworks that encourage productive use of ICTs and generating the necessary skills in government, business and civil society.

[1] UNCTAD (2009a). Information Economy Report 2009: Trends and Outlook in Turbulent Times. United Nations publication. New York and Geneva

[2] Ibid.

B. The UNCTAD ICT Policy Review

ICT policies are dynamic tools that must be continuously updated to keep up with national and international economic and technological developments. Assessing the impact of policy measures and sector-specific interventions is a challenging task.

In fact, a coordinated national response and regular review of the effectiveness of policies is needed to assess how ICTs are effectively used by governments and enterprises to foster economic growth and how effective the policy framework is in terms of achieving relevant objectives. Regular reviews of ICT policy plans, involving the main stakeholders, are important in this context. Failure to take early steps to monitor the implementation of ICT policy measures can delay ICT developments and reduce the effectiveness of policy measures. Many developing countries have not yet defined, as part of their ICT plans, mechanisms for ongoing policy review, assessment, and monitoring to ensure that evolving ICT strategies are consistent with their development goals and to maximize the positive contributions of investment in ICT.

To assist developing countries in evaluating their ICT policies, UNCTAD has developed a model framework for conducting ICT policy reviews (ICTPRs). Its core aims are: a) to assess the implementation of national ICT master plans by examining how ICT and e-business development issues have been operationalized in country development strategies; b) to identify policies, programs and implementation mechanisms favouring the development of the information economy; and c) to make recommendations for policy improvements. In this context, specific e-business policies and cross-cutting policies that are intimately linked to the development of the information economy – such as telecommunications infrastructure, legal and regulatory issues, and human resources – are evaluated.

The ICTPR is intended to help policy makers:

- Quantify achievements regarding the implementation of ICT policy measures as foreseen in the national ICT plan(s);
- Identify critical success factors, best practices and conditions, as well as reasons for failure to be able to adjust and reform ICT policies; and,
- Formulate new policy decisions to support and accelerate ICT penetration in government, businesses and the society.

C. Egypt – a pioneer in leveraging ICTs

The ICT Policy Review of Egypt is the first undertaken by UNCTAD. It was prepared in response to a request from the MCIT as an input to the country's next national ICT strategy, which will cover the period 2011-2014. The evaluation of the results of the previous policy initiatives is expected to assist the Government in improving its approach to leveraging the role of ICTs for economic and social development. The focus of the Review was defined with the Minister of Communication and Information Technology and his team. It mainly addresses initiatives presented in the last ICT strategy 2007-2010.

Egypt has a varied economy where the tourism, agriculture, industry and service sectors contribute in almost equal parts to national production. Consequently, the economy is developing at an increasing rate, based on a business-friendly environment that attracts investments due to proper legislation, convenient policy, internal stability, as well as trade and market liberalization. This is in addition to what Egypt possesses in infrastructure related to transportation, communication, energy sources, manpower, modern industrial communities, the banking system and the stock market.

The Government has long recognized ICT as an enabler for national economic and social development and for strengthening the country's competitiveness, and has in particular invested in the ICT sector for many years. Since the 1990s, it has created dedicated institutions and designed three main ICT strategic plans to support the adoption and use of ICTs by the public and private sectors:

- National Plan for Information and Telecommunications (1999/2000–2001/2002)
- Egyptian Information Society Initiative (EISI) (2003-2006)
- National Information and Communication Technology Strategy (NICTS) (2007-2010)

The Ministry of Communication and Information Technology (MCIT), formed in 1999, was charged with the task of fostering an Egyptian information society. It prepared the National Plan for Communications and Information Technology in 1999. The strong and vibrant engagement of the successive Ministers of Communications and Information Technology has allowed Egypt to be a front-runner in Africa and the Middle East.

The pioneering efforts of Egypt have enabled the country to make significant achievements. In close cooperation with relevant government agencies and with the private sector, the commitment of the MCIT has been translated into an expanding telecommunications infrastructure, hundreds of information technology (IT) clubs, a growing pool of ICT skilled labor, and rich national information systems and databases with critical information on the diffusion and use of different ICTs. The development of ICT indicators by the MCIT has helped the Government to assess policy measures of the different strategies in the area of telecommunications and the ICT sector. Because of those indicators, adjustments have gradually been made to better meet the objectives as planned in the national ICT strategy.

The main objectives and priorities set out in the current NICTS are the following:

- To continue development of state-of-the-art ICT infrastructure that provides an enabling environment for government and businesses throughout Egypt and links it globally;
- To create a vibrant and export-oriented ICT industry;
- To leverage public-private partnerships as an implementation mechanism whenever possible;
- To enable society to absorb and benefit from expanding sources of information;
- To create a learning community whose members have access to all the resources and information they require, regardless of gender and location, thus allowing all to achieve their full potential and play a part in the country's socio-economic development;

- To support the development of the skills required by the ICT industry; and
- To support research and innovation in the field of ICT.

This Review addresses specifically those parts of the NICTS that seek to strengthen the competitive capacity of Egypt through the use of ICTs in general and specifically in the ICT-enabled services market. Thus, the following five areas have been selected by the MCIT for detailed analysis in this ICTPR:

1. Development of infrastructure – with particular emphasis on broadband development (chapter II);
2. Development of human resources/skills required by a growing ICT industry (chapter III);
3. Development of ICT use in education (chapter IV);
4. Development of local content in key ICT applications (chapter V); and
5. Promotion of an export-oriented ICT sector, notably in the area of ICT-enabled services (chapter VI).

As part of the methodology applied to carry out the Review, the following steps were followed:

- The definition of objectives of the Review, delimitation of its scope, and identification of the policies under review in cooperation with the MCIT;
- Field missions with structured interviews with key stakeholders (representatives from the Government, industry, academia and NGOs)[3] to inform them about the Review and discuss priorities, constraints and issues at stake;
- Desk research and review of available literature on the implementation of ICT in Egypt and in other relevant countries.

In addition, for the purpose of this Review, an on-line survey tool, SurveyMonkey (www.surveymonkey.com), was used (box I.1). It was administered in the English language and was carried out from November 2009 to March 2010. Its objective was to gather feedback from private sector operators involved in the ICT/IT sector in general, and the BPO (Business Process Outsourcing) or ITO (Information Technology Outsourcing) industries in particular. A total of 45 questions were answered by 115 respondents, of which 16 companies were foreign-owned. Response rates varied by question.

Box I.1. Profile of companies in the UNCTAD on-line survey

MCIT figures published in the first quarter of 2010 show that the total number of registered ICT firms in Egypt was 3,470, of which 460 (13 per cent) were operating in the "ICT-enabled services" sector, the focus of the UNCTAD survey. A total of 115 of these firms participated in the survey. The response rate was fairly high and represented a significant proportion of the firms operating in the sector.

Most of the firms that participated are relatively small. About 53 per cent of them have fewer than 100 employees. Moreover, 34 per cent of 115 respondents have an annual turnover in the Egyptian market of less than the equivalent of US$1 million, while 67 per cent generate less the US$ 5 million. Only 5 firms generate incomes higher than US$ 100 million.

Some four-fifths of the responding firms are majority owned by Egyptian individuals or entities and 97 out of 115 respondents indicated that their firms' head office is located in Egypt. Also, 93 of 108 respondents indicated that their firm is privately held. Based on these and other responses, it is estimated that about 15 of the firms are foreign affiliates of multinational firms.

Source: UNCTAD.

D. Structure of the Review

Chapters II to VI are dedicated to the specific policy areas under review. Each discusses the main achievements and challenges and proposes recommendations for the next strategy. Where possible, international comparisons are made to place Egypt within an international context using comparable statistics, where possible, and national statistics. The final chapter concludes.

[3] See Annex VII.1.

CHAPTER II. ASSESSMENT OF INFRASTRUCTURE DEVELOPMENT

A competitive ICT infrastructure is essential for a country to benefit from the information economy. In response to the infrastructure challenge, the Government of Egypt has launched a range of initiatives to expand access to such ICTs as fixed and mobile telephony, personal computers (PCs), the Internet and broadband. ICT diffusion has improved significantly in the past few years, reflecting these efforts.

According to the NICTS, a key priority in the area of ICT infrastructure was: "To continue development of state-of-the-art ICT infrastructure that provides an enabling environment for government and businesses throughout Egypt and links it globally". At present, the Government is pursuing the deployment of broadband technology as a priority task. Against this background, this chapter pays particular attention to policy actions related to promoting the expansion and use of broadband (fixed as well as mobile).

A. Main achievements

An analysis of the accomplishments realized so far in Egypt, per the NICTS, shows that the implementation of a number of policies and initiatives have helped to improve the ICT infrastructure and provided a good basis for the next phase. In terms of ICT diffusion, Egypt made great progress between 2008 and 2010.

Mobile signals now cover 99.7 per cent of the country. A fiber-optic backbone network now runs the length of the country along the Nile. In Cairo, the telephone exchanges are connected to fiber. Fixed and mobile broadband connectivity has been extended to urban and peri-urban areas. However, rural areas are still underserved. International Internet bandwidth has increased by more than 40 per cent from 2009 to 2010, and reached 142 Gbps as of December 2010. Egypt is at the crossroads of several global fiber-optic backbone cables and is in a unique position to leverage this resource for content distribution in the region and beyond.

The following policy developments have been the main drivers behind the deployment of broadband, as well as mobile and Internet uptake.

1. Deregulation of the telecommunications sector

The telecommunications sector has been partially deregulated and liberalized, especially in the wireless and data services areas. The National Telecommunication Regulatory Authority (NTRA) has allocated three licenses to mobile operators. The fixed telephony sector is in the process of being opened up to competition. VoIP remains heavily regulated, however.

2. Broadband development in main cities and business parks

Broadband infrastructure has improved, especially in the main cities and for the productive sectors, notably the growing ICT industry. High-quality fiber broadband connections are available in key locations such as Egypt's technoparks. Businesses in the Smart Village, the Maadi Call Centre Business Park and in the Damietta Business & Logistics Park[4] enjoy privileged access to broadband.

As outlined in the NICTS, a new policy framework for the provision of broadband services making use of the developments in wireless communications has been established. HSDPA services have been regulated and the three mobile service providers offer high speed broadband using some version of the HSDPA standard. The deployment of services based on the new 4G standard, LTE (Long Term Evolution), was announced by Vodafone Egypt in June 2010 on a trial basis.[5] No Wi-MAX licenses have yet been allocated, but tests have been completed and Wi-MAX technology has been deployed within the framework of a pilot project in two cities: Luxor and Sharm El Sheikh.

While fixed broadband showed a compound annual growth rate (CAGR) of 45 per cent for the period 2007-2010, actual uptake is still low in absolute terms: around 2 per cent of the population.[6] As of December 2010, there were about 1.4 million ADSL subscribers. The actual number of users is much higher as a result of subscription sharing. A report by the Arab Advisors Group "revealed that 81.9 per cent of households with broadband connections shared their service with

[4] Smart Village Company. 2008. Damietta. The forthcoming Smart Village Damietta. http://www.smart-villages.com/docs/damietta.asp

[5] Vodafone Egypt. 2010. Vodafone launches LTE technology. Cairo, Jun. 24, 2010. http://www.vodafone.com.eg/en/AboutUs/PressCenter/PressReleases/VF_013253.html

[6] MCIT. 2011. ICT Indicators in Brief. January 2011. Monthly issue.

more than three neighbouring households".[7] Mobile Internet uptake shows its high potential as being the most promising means for connecting to the Internet in Egypt as recent data from the MCIT make clear. This may help to explain recent trends.

Fixed broadband penetration is estimated by the MCIT to have reached about 1.8 subscribers per 100 inhabitants in December 2010 or close to 12 per cent[8] (if shared subscriptions are taken into consideration). Statistics from the MCIT's for 2010 show 7.3 million "Internet users through mobile" and also that there were about 1,310,463 USB modem users in Egypt at that time.

Mobile Internet data services are growing rapidly from a low level. According to MCIT statistics, there were 20 million Internet users in the country at that time, representing a penetration rate of about 25.3 per cent. Of these, 40 per cent are estimated to be accessing the Internet using mobile Internet services, i.e. using either smartphones or USB modems. From the end of 2009 to the end of December 2010, the number of users accessing the Internet using a USB modem (3G) tripled from 446,278 to 1,310,463. This significant growth rate suggests that Egypt is moving rapidly to enhance mobile broadband access.

Most of the mobile data users are thought to be individual consumers rather than businesses. Because of current pricing policies and the relatively high cost of data over wireless networks versus ADSL, most downloading occurs over fixed broadband networks. Most of the Egyptian ICT businesses consulted in the course of preparing this report used ADSL instead of relying on mobile wireless data services for this reason. Similar observations have been made also for other developing countries, such as Senegal and Singapore.[9]

Broadband development is on-going and a strategy due in 2011 is being prepared to increase the current low level of penetration and its speed throughout the country.

3. Mobile and Internet uptake

The penetration of mobile subscriptions among the population rose from 25 subscriptions per 100 inhabitants in 2006 to 55 in 2008 and 90 in December 2010. Growth continued despite the economic crisis and, according to MCIT, there were about 71 million mobile subscriptions in December 2010. This can be compared with the ratio of only 12.3 fixed telecom lines per 100 inhabitants in December 2010.

What is remarkable is the very fast rate of uptake of mobile Internet services. The number of people accessing the Internet using a mobile or a USB modem increased from around 7 million at the end of 2009 to 8.6 million at the end of December 2010. This is consistent with the data presented in the content section of this report, which states that the preferred destinations for many of the mostly young people who are connecting to the Internet in the Arab world to social networks such as Facebook mostly do so using a mobile device.

Internet penetration is also rising. Between 2006 and December 2010, it increased from 13.7 to 25.4 users per 100 inhabitants. ADSL appears to be the main fixed broadband service option available. MCIT reports 36.5 per cent growth in ADSL uptake over the one-year period ending in December 2010.[10] About 47 per cent[11] of all localities in Egypt had access to the Internet as of December 2010, a figure that remains unchanged from March 2010.

The number of IT Clubs in Egypt increased from 1,593 in November 2007 to 2,152 in December 2010, 89 per cent of which are connected to the Internet. These clubs offer a communal solution to problems of affordability, accessibility and awareness, in particular in underserved localities.[12]

4. Introduction of converged services to compounds around Cairo

In addition to broadband, special attention was given in the NICTS to the growing importance of converged services, different ways of extending broadband networks and different approaches to leveraging international connectivity to promote high value-added services. Converged services in the form of triple play have been introduced to gated communities outside of Cairo, but the penetration levels are very low. Two triple play licenses were issued in mid 2010.

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[7] Oxford Business Group. 2009. Shared connections. Text box in The Report. Egypt 2009. IT overview. Page 164. London. 224 pp.
[8] Estimated upon MCIT calculations.
[9] UNCTAD forthcoming. *Information Economy Report 2011: ICTs as an enabler of Private Sector Development*.
[10] MCIT 2011. ICT Indicators in Brief. January 2011. Monthly Issue.
[11] Ibid.
[12] Ibid.

B. Challenges

MCIT is committed to improving national ICT uptake and to playing a growing role at the regional level as a hub for delivering converged services, and at international level with regard to the ICT sector. To realize this goal, the next national ICT strategy should continue to make the deployment of broadband a priority. Broadband is recognized as an important tool for economic development[13] and is of fundamental importance in promoting Egypt as a top exporter of ICT-enabled services. The growth of Internet and broadband use is proceeding rapidly around the world as countries, as well as companies, recognize its importance and consumers continue to demand services that require broadband. Wireless broadband is also expanding fast, pushing demand for even more bandwidth. Video downloads and triple play offers are also increasing, placing high demands on the quality of networks. In addition, average broadband speeds are rising.[14] Current trends are encouraging more broadband adoption.[15]

Overall, broadband capacity is still low in parts of Egypt. Fixed-line broadband services provided vary from around 500 Kbps up to 24 Mbps. According to NTRA, the deployment of fiber-optic cabling is limited. The priority of NTRA is reportedly to provide fiber to the curb (FTTC) and fiber to the home (FTTH) in urban areas. A key challenge, however, is that access rights (rights of way) are unclear and information concerning underground obstacles that may be encountered is lacking. The cost of installing fiber in urban areas is very high. The private sector has to be involved and encouraged to invest in fiber-optic network development.

The rate at which mobile broadband diffuses into the market and provides the basis for what is becoming a major business opportunity is of particular relevance to Egypt. Both 3G and now 4G adoption trends will, in part, dictate advances in mobile Internet products and services. Egypt needs to ensure that it does not lag behind developed markets when it comes to 3G uptake.

Strategies need to be devised to help extend broadband access to underserved areas and facilitate broadband use by SMEs and communities located outside the technology parks. While it is easier to provide access to fiber-optic networks and to other amenities to companies grouped together in a few locations such as business parks, the Government will need to enhance ICT development for Egyptian SMEs and other businesses operating elsewhere.

So far, very limited infrastructure use has been achieved in rural and underserved areas. The universal service fund (USF) has not yet been fully operationalized, even though there is a fiber-optic backbone running the length of the country and therefore located in proximity to over 90 per cent of the population. Moreover, even in high density population areas, broadband connection speeds are low. Businesses outside of the Smart Village report having difficulty securing high speed broadband services and some report quality of service issues. Cost is also a concern and the issue of differential subsidies was raised in consultation with representatives of the private sector.

Another main challenge is to develop Egypt's role as a regional hub, taking advantage of the new international fiber-optic connectivity for Egypt. In this context, Egypt should leverage the over 90 Gbps of the utilized incoming bandwidth reported by the MCIT,[16] and its fiber backbone running the length of the country and into each of the telephone exchanges in Cairo and possibly other cities. Egypt is at the crossroads of several international fiber cables (SEA-ME-WE cables 3 and 4, and FLAG) linking Europe, Africa, the Middle East and Asia. The competitive framework for licensing new cable systems to link Egypt to regional markets needs to be clarified. The opportunity is significant given the shift to cloud computing and the demand for content in Arabic. Akamai and other content delivery network service providers (CDNs) may also be operating in Egypt. This market segment could represent an opportunity for Egyptian content aggregators.

C. Recommendations

The new national broadband strategy should spell out the intentions of the Government and the policy ac-

[13] OECD. 2008. *Broadband and the Economy, Ministerial background report prepared for the OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, 17-18 June 2009*, available at http://www.oecd.org/dataoecd/62/7/40781696.pdf. See also Broadband Commission. 2010. *A 2010 Leadership Imperative: The Future Built on Broadband*. http://www.broadbandcommission.org/outcomes.html.

[14] Akamai. 2010. *The State of the Internet Report. 4th Quarter, 2009*. Cambridge, MA, USA. 32 pp. http://www.akamai.com/stateoftheInternet/

[15] Morgan Stanley. 2010. *Internet trends* http://www.morganstanley.com/institutional/techresearch/Internet_trends042010.html

[16] MCIT Website, http://www.mcit.gov.eg/Indicators/Internet_item.aspx

tions that will take place to enhance access to broadband for all over the coming years, and establish clear and measurable targets. In the following, recommendations are made with a view to encouraging further developments and use of broadband in Egypt. The recommendations are based on the findings of the project and lessons learned from other countries, as well as international best practice.

1. Make technological choices based on the demand side

In speeding up the deployment of broadband, several parameters have to be taken into account. The choice of technology is often a question of cost. It is also determined by the needs of communities to be served and the ease with which the private sector can bring these opportunities to market. In most countries, a mix of fixed or wireless technologies is implemented in urban and rural areas. In rural areas in many countries around the world, including in Africa, wireless operators have found profit. According to the ITU,[17] the drivers are increased competition, lower taxes, lower costs for handsets and the reduction of termination rates. These factors are contributing to "*help ensure continued growth in the mobile market and promote widespread universal access to communications in Africa*". In order to speed up broadband deployment, the Government should identify which technologies are best suited to meet the varying needs, put into place the regulations required to harness the potential of ICT diffusion, and allow the private sector to do so without unnecessary encumbrance.

In general, fiber-based broadband networks are considered the only technology that can move the terabytes of data required to meet growing demand for multimedia based content over the Internet. The 3G and higher (4G) wireless technologies require smaller and more cell towers. Backhaul requirements are also much greater, as the bandwidth requirements to satisfy consumer expectations are much higher than they are with 2G wireless services. Broadband upgrades and deployment will be costly to cope with, given the trend towards next generation networks (NGNs), ubiquitous computing and instant video on demand. Egypt needs to recognize these realities and act upon them to meet the needs of consumers and of private sector investors now and in the near future.

[17] ITU. 2009. Information Society Statistical Profiles 2009 Africa. ITU, Geneva.

a. Quantify in time and space the demand for broadband

There is little mention in the NICTS of demand-side considerations for broadband deployment. To boost broadband uptake in underserved areas, the Government needs to identify the demand "drivers". These are the needs and services that are in such demand that providing them using a broadband connection makes them compelling to the public and thus drives users to exploit, and in fact expect more broadband connectivity and related services. Until now, the focus has been on ensuring broadband access for certain productive parts of the economy. There is strong demand for improved broadband connectivity among diverse stakeholders, including ICT outsourcing companies in the Smart Village and the Maadi Call Centre Business Park. There is also significant demand from ISPs, mobile telephony operators, Government offices for the delivery of e-government services, universities, private developers also offering high speed broadband to gated communities, other corporate users, including public utilities, broadcasters and content delivery networks, to mention just a few.

It may be useful in this context to consider the experience of Malaysia. The Government of Malaysia sought, through the Multimedia Super Corridor (MSC) initiative, to develop its ICT industry by attracting global ICT companies. However, another objective of the Government was to provide the same enabling environment for Malaysian ICT SMEs to improve their competitiveness. The MSC project initially privileged companies that were located in the CyberJaya site, near Kuala Lumpur. Companies that were not located at this site were not eligible to benefit from the significant advantages and incentives that companies located in the super corridor enjoyed. This led to resentment and limited the impact of the MSC. Malaysia subsequently revised its policy by removing the requirement for firms to be physically present in the cyber park, allowing other locations in the country to be designated Super Corridor sites as well. Advantages were shared, as well as the benefits for all of the companies concerned.

Egypt should seek to avoid a similar situation by making it easier for local firms to have access to broadband infrastructure beyond the business parks. By expanding the location of business and technology parks to serve an increasing number of sites around the country, Egypt will encourage a more balanced model of economic development where local busi-

nesses, especially SMEs, in the ICT sector can also benefit.

The Government should develop infrastructure plans in view of user needs identified by demand and market studies, universal access demand studies, and broadband strategy demand studies. Demand studies would also help to understand the "*development impacts of new service provision into formerly underserved areas*".[18] They should also help identify the priority needs of Egyptians in terms of information and services, and to determine the extent to which this demand can be met using the Internet. Another objective of demand studies is to determine the ability to pay for communication services. The resulting outcome of the studies should be integrated into the national broadband strategy.

Demand surveys have been carried out in many countries and in all regions around the world.[19] These have allowed planners and service providers to better understand what services to offer first and to plan accordingly. They also help Governments in choosing between different types of technological solutions.

b. Encourage the development of municipal broadband solutions

With a view to speeding up broadband deployment in rural and remote areas, the Government should consider encouraging municipalities to take the lead in planning, building, owning and operating their own municipal broadband networks, while leveraging the expertise of telecom operators. It may be better not to rely exclusively on the telecom operators to initiate such plans as they may not recognize the full value proposition of municipal broadband networks and therefore underestimate the demand. Municipalities can develop proposals and go to tender for operators to provide the services. This would encourage competition and allow innovation in the delivery of broadband services at the municipal level.

Municipal broadband projects are not telecommunications projects; they are community development projects that leverage the power of modern telecommunications technologies, i.e. ICTs, for local and community development. They are developed in recognition of the public utility in enhancing access to ICTs for economic, social and human development. A large body of knowledge and experience exists on municipal or community networks and there are different models and examples that have been experimented with and adapted to different needs and circumstances.

For the implementation of municipal networks, collaboration between municipalities and private sector operators can often be organized on a PPP basis or otherwise. To allow this to happen, further deregulation would be required. The Government may consider starting with one or two test cases, develop the business case and look at various options, including that of having the private sector develop this service on a commercial basis. Where advantages are apparent to the municipality and its residents, businesses and consumers, municipalities could be allowed to build and operate their own broadband networks.

While municipalities may not have the expertise to build, own and operate such services, they have acquired the ability to do so in other areas where infrastructure is exploited for the public good in their jurisdictions: roads and highways, waterworks, electrical plants and transmission and distribution grids, as well as other utilities. In the process of meeting public needs, they have also developed rights of ways that facilitate delivery of these services to the community, i.e. homes, offices and factories. The starting point for developing municipal broadband networks is developing the business case. This includes not only looking at demand for telecommunications services in relation to existing levels of service, but also considering various scenarios to enhance broadband connectivity and exploring the issues that may limit access to broadband for municipal development. The business case should develop scenarios and make suggestions for policy, regulatory and other changes that could further justify a given business model.

Municipal governments may sub-contract private sector operators or enter into PPP arrangements with them to implement the projects using one of several PPP types.[20] PPP arrangements for infrastructure projects are usually easier to set up and implement and the risks are more readily quantifiable than in other areas of the

[18] InfoDev and ITU. 2008. Module 4. Universal Access and Service, ICT Regulation Toolkit. http://www.ictregulationtoolkit.org/en/index.html

[19] Intelecon Research. 2010. Intelecon projects. World-wide, Central and Eastern Europe, Asia, Africa. http://www.intelecon research.com/pages/projcont.html

[20] See e.g. Atos Consulting. 2007. Background study on Public Private Partnerships (PPPs) in e-government. and Labelle, R. 2008. Module 8. Options for Funding ICT for Development. "Academy of ICT Essentials for Government Leaders", http://www.unapcict.org/news/update-of-academy-module-8-on-options-for-funding-ict-for-development

ICT sector. PPPs could also liberate public funds for other areas if the private sector partner assumes the financial risk, as is often the case in PPP projects.

Pilot projects should be run to acquire proof of concept before proceeding further. There are many examples of "muni" networks in the United States and in Europe, which have been operated successfully for some time.[21] The development of municipal or community owned broadband networks could be run on a corporate basis by the municipalities themselves or outsourced to private sector operators on a tender basis. Open access policy could serve as a basis for these networks. A business plan would need to be developed to clarify the value proposition and develop the proposal accordingly.[22]

Managing this successfully may require overcoming concerns of the state-owned telecom operator, Telecom Egypt, and other operators who may see this initiative as unwelcome competition or public interference in their markets.

There are two predominant models of municipal networks: the municipal or public network model and the open access model of municipal networking.[23] They are similar, in that the municipality basically owns the network infrastructure.

In the open access model, the underlying network infrastructure, i.e. the dark fiber, is owned exclusively by an independent operator who is responsible only for the operation of the network infrastructure and who cannot compete in the provision of services to end users. Services are openly provided on a competitive basis by different on-line service providers, including ISPs. The service providers cannot own or participate in the management of the infrastructure. They can, on the other hand, be subcontracted to provide upkeep or even to install the infrastructure. The key feature of an open access network model is the separation of ownership from service.

In *the municipal or public access model*, there does not have to be separation between infrastructure ownership and service provision. The municipal network model allows more flexibility in that the public operator, acting through an independent operator company (IOC) for example – which can be a public utility company or the municipality itself – is responsible for establishing and operating the municipal network for the benefit of the community. The IOC can exercise more control over the development of the network and can actually initiate the operation under conditions where there may not be many service providers interested in competing.

Open access models require operators to come to the market, whereas in the municipal network model, the IOC provides the service, and may also open it up to competition. The IOC can also be involved in ensuring that the services are adapted to the needs of the community, as well as being cost effective. In many cases, the IOC is an established public utility, as in the case of Chattanooga, Tennessee and in many other municipalities in the United States, where it is the local electricity utility. Electric utilities or power companies sometimes also operate municipal networks. They may also have deployed fiber cabling to facilitate communications and to control the electricity grid.

In the open access model, the infrastructure provided may or may not include all of the terminal equipment for connecting to the end user. In some cases, the terminal equipment is provided by the service provider, e.g., an ISP that wishes to own its own terminal equipment so that they can customize the services provided. Private sector operators, including the incumbent, are invited to compete with each other to provide services to the end users.

Along with access services, an array of different on-line services can be marketed over the municipal network, and operators can apply to use the public access municipal network to reach end users. Among the access services are e-government services developed and or implemented by the private sector on behalf of municipal government or others. There can also be a variety of e-commerce services provided especially by the private sector – including banks and financial service providers – and also by the public sector, for example on-line tax payments, on-line services payment and registrations.

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[21] Case studies of municipal fiber / broadband networks in the USA, Europe and elsewhere in the world are available at http://www.bbpmag.com/, For information about municipal broadband deployments and background information for helping to develop a municipal broadband proposal, see also http://www.bbpmag.com/m12.php and http://www.bbpmag.com/snapshot/snapshot2008.php. Mitchell, C. 2010. *Breaking the Broadband Monopoly. How Communities Are Building the Networks They Need.* New Rules Project. May 2010. Minneapolis. 57 pp. http://www.muninetworks.org/reports/breaking-broadband-monopoly.

[22] InfoDev provides a source of useful information on open access networks for Africa. See Spintrack. AB. 2005. *Open Access Models*. *Options for Improving Backbone Access in Developing Countries (with a Focus on Sub-Saharan Africa*). Study available at http://www.infodev.org/en/Publication.10.html

[23] This section is inspired by: Mitchell, C. 2010. Breaking the Broadband Monopoly. How Communities Are Building the Networks They Need. New Rules Project. May 2010. Minneapolis. 57 pp. http://www.muninetworks.org/reports/breaking-broadband-monopoly.

While some consider this model -- where the municipality provides or ensures access -- to be uncompetitive, it allows the municipality, where there may be no effective competition, to create a market where one was not present, or to open up an existing underserved market to competition, i.e. to increase market efficiency.

Many municipalities in Europe and North America have adopted this model to accelerate access to high speed broadband services, i.e. fiber broadband, because either the commercial operators acted in a monopolistic fashion, or would not provide the service or upgrade to fiber or in some cases, would obstruct access to fiber broadband by the municipalities themselves by raising various legal challenges.

Municipalities view high speed broadband services as essential to the economic development of their communities. In many developed countries, communities with fiber access attract more private sector investment and are more likely to attract highly skilled residents and high end services as a result.

The outcome is that the end user benefits from greater choice. Another advantage is that the fiber broadband, i.e. fiber to the premises (FTTX), uses technologies such as passive optical network (PON) that are readily upgradeable, provide what some consider to be unlimited bandwidth with the advent of technologies such as wavelength-division multiplexing (WDM) and related technologies, and which many consider future proof.

An important consideration is that FTTX networks are fully symmetrical, i.e. download and upload speeds are the same, which encourages local content creation and sharing. Given the significant efforts that Egypt has invested in multimedia content creation, municipal networks can also encourage greater Arabic language content dissemination, as well as more locally specific content generation (chapter V).

In some cases, municipalities have come together to connect local government offices, schools, hospitals and other public institutions to a high speed broadband connection, usually a fiber-optic network (box II.1). The United States broadband strategy recognizes the important role that such deployments can play in connecting and transforming communities into networked communities.[24] High speed connections have been useful in maintaining and enhancing economic competitiveness, job creation, and in attracting businesses and investment along with residents to locations that would otherwise not be considered viable. Invariably, communities with locally owned fiber-optic networks have been able to attract wealthier residents who contribute to the economic, social and cultural development of the networked communities in which they come to live.

In Africa, wireless mesh networks based on Wi-Fi may also provide a low cost solution to communities in poorer rural areas.[25] This solution may also apply to parts of Egypt and has already been tested in the two Governorates of Luxor and Sharm El Sheikh, where Wi-Max technology was used to connect Wi-Fi spots in 2006.

Case studies:

The Stokab municipal network in Stockholm[26]

The Stokab municipal network was established in Stockholm in 1994 upon the liberalization of the Swedish telecommunications market. Stokab provided dark fiber to 27 surrounding municipalities in order to meet pent up demand in the more lucrative commercial areas. The objective of Stokab was to "*facilitate and stimulate sector investment and innovation*". Although in 1994 there was little demand for broadband services for the consumer market, no one was expecting IP to become a universal platform among telecommunications service providers. Today the Stokab network has connection points throughout the municipality of Stockholm and covers 6,500 square kilometres.

Citynet, Amsterdam

This example is more contemporary and deals with issues that are common to many Egyptian cities: how to deliver fiber to buildings in densely populated and built environments such Cairo and other Egyptian cities.[27] The Citynet project has involved the City of Amsterdam working in partnership with two private investors and

[24] Federal Communications Commission. 2010. *Connecting America: The National Broadband Plan*. Washington, 373 pp. Recommendation 8.19: Congress should make clear that Tribal, state, regional and local governments can build broadband networks http://www.broadband.gov/

[25] Wireless Africa. 2009. *Wireless Africa Home Page*. See discussions on "community-owned decentralized mesh networks built on open source technology". http://wirelessafrica.meraka.org.za/wiki/index.php/Wireless_Africa_Home_Page

[26] See Spintrack. AB. 2005. Open Access Models. *Options for Improving Backbone Access in Developing Countries (with a Focus on Sub-Saharan Africa).* http://www.infodev.org/en/Publication.10.html

[27] Wagter, H. 2010. *How Amsterdam was wired for open access fiber*. http://arstechnica.com/tech-policy/news/2010/03/how-amsterdam-was-wired-for-open-access-fiber.ars

service providers selected by public tender to build and operate an open access network model that will connect over 40,000 Amsterdam buildings using FTTX.

The Citynet model, which was designed in 2005, includes three components or layers.[28] A passive layer, which is the dark fiber along with facilities in the end users premises for the equipment of the active communication layer of the network. Several parties, including private investors and the municipality of Amsterdam formed a company to build and own the passive infrastructure layer.

An open tender was let for the construction and operation of the passive optical fiber network that includes premise based space and cabinets or equivalent to receive the active network components of the access service providers. Oversight of the operation of the active network layer was also tendered to an operator who is responsible for providing wholesale network access services to access providers according to the rules of the municipality. These rules support municipal economic and social development objectives and stipulate openness to all service providers on an equal footing and access to services for all clients without discrimination.

On-line service provision is open to all providers and includes Internet access services, technical support and other services, as well as content delivery. The services are offered on an open and competitive basis.

Because Amsterdam, like many cities in Egypt, is densely populated, a point-to-point fiber topology was put into place using GPON (Gigabit Passive Optical Network) technology. This topology involves running individual fibers from each apartment back to a local aggregation point like the phone system, except that the fiber cables are much smaller and more capacity can be accommodated accordingly. This ensures that the optic cabling installed outside the premises and along the roadways will last far into the future.

Chattanooga, Tennessee, USA

"*On September 13, 2010 - every business and home that is connected to Chattanooga's fiber-optic network will have access to a 1 gigabit per second Internet connection. By the end of this year, this will be true of 170,000 businesses and homes in a 600 square mile service area*".[29]

In September 2009, the public power utility company, EPB,[30] of Chattanooga, Tennessee started offering fiber-based triple play services to 17,000 residents with the intention of reaching all 160,000 potential subscribers within three years. EPB will run fiber to every home that wants high speed broadband services. EPB will also use the network to install a smart grid. EPB hopes to recoup its investment from the benefits of the smart grid services (which will mean that it will not have to continue to read 160,000 meters manually). Extra revenues are also expected to be generated from new video and telecommunications services made possible by the fiber-optic network. The EBP strategy is to promote local content and faster service delivery. It is estimated that 2,600 new jobs will be created in the municipality as a result of the operation of the fiber network and as a result of the economic benefits of the network.[31] The EPB network can offer fully symmetrical 1 Gbps Internet bandwidth service for US$ 350/month and is generating much interest.[32]

There are several other examples of municipal networks in the publications mentioned above. The town of Coquitlam in British Columbia in Canada has announced that it has created "*North America's First City-Owned Fibre Optic Network Lease Company*",[33] the Coquitlam Optical Network Company. QNet offers secure fiber to the premises service and operates as an equal opportunity, non-competitive carrier helping telecommunications service providers and ISPs reduce costs of reaching over 2,400 businesses and over 10,000 Multiple Dwelling residential Units.[34]

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[28] Citynet. 2010. Citynet. Three layer model. On-line translation from Dutch. 20101205 http://www.citynet.nl/index.php?fuseaction=home.showPages&pagenr=DbjJDGBv&taal=ned_

[29] Chattanoogagig.com. 2010. *Your GIG is here. Right here in Chattanooga*. Accessed 20101205. http://www.chattanoogagig.com/

[30] http://www.epb.net/

[31] Mitchell, C. 2010. *Breaking the Broadband Monopoly. How Communities Are Building the Networks They Need*. New Rules Project. May 2010. Minneapolis. 57 pp. http://www.muninetworks.org/reports/breaking-broadband-monopoly.

[32] Malik, O. 2010. *Chattanooga Goes Choo-Choo with 1 Gbps Broadband.* Sep. 13, 2010. http://gigaom.com/2010/09/13/chattanooga-goes-choo-choo-with-1-gbps-broadband/

[33] Coquitlam City Hall. 2008. *Coquitlam Launches North America's First City-Owned Fibre Optic Network Lease Company*. Jun. 11, 2008. http://www.coquitlam.ca/_Media+Centre/News+Releases/City+Projects/Coquitlam+Launches+North+Americas+First+City+Owned+Fibre+Optic+Network+Lease+Company.htm

[34] QNet. 2008. *QNet: lighting your future*. http://www.qnetbc.net/default.htm

Box II.1. Community broadband in rural United States

Bristol, Va., is an example of the potential of community broadband in rural America. This small town, which also operates the local electric utility, initially deployed a fiber-optic network to connect its government, electric utility and school buildings. Local businesses and residents expressed interest in connecting to this high-speed network, so Bristol made plans to build a fiber-to-the-premises network. After overcoming a series of state legislative barriers and legal challenges by incumbent providers offering slower services, Bristol launched a FTTP service. Today 62 per cent of Bristol's residents and businesses subscribe to the service despite competition from the incumbent telephone company and cable.

Source: Federal Communications Commission. 2010. Connecting America: The National Broadband Plan. Washington.

2. Promote greater competition and infrastructure sharing

Greater competition and an enhanced role for the private sector are cornerstones of effective strategies in this area (see annex II.1). Experience from other countries, including the Republic of Korea, suggests that decisions about deployments, policies, and balancing the needs of operators and specific development objectives have to be analyzed and dealt with on a case-by-case basis, while keeping in mind the need for market competitiveness rather than uniform adhesion to policies.[35] Egypt has a spectrum of strategic choices and decisions to encourage competition based broadband deployment and use. The basic objective is to increase access to broadband using market-based principles.

On the one hand, the regulator can encourage *facilities or infrastructure based competition* between operators, or it can encourage *sharing of facilities and infrastructure based on the principles of open access networks*, i.e. where competition is focused on the service provided and the sharing of infrastructure to cut down costs. Reality is likely to lie somewhere in between these options. In the broadband strategy, special attention should be given to opening up access to the fiber infrastructure owned and operated by public utilities. This represents a significant opportunity for the private sector to take advantage of this infrastructure and to roll out related data services.

a. Develop models of open access and share broadband infrastructure

Facilities based on new and competing fiber infrastructure are likely to be too costly to implement in Egypt as it is elsewhere, e.g. in the European Union (European Regulators Group).[36] MCIT, through NTRA, should encourage sharing of broadband infrastructure and facilities to reduce costs and risks.

The Government needs to mitigate the costs of facilities-based competition by encouraging the development of models of open access and shared facilities that are customized to meet the needs of fiber-optic cabling and networks, their operators and end users.

The Government needs to act on this to allow new operators and investors to take the initiative to leverage existing fiber-optic and other publicly owned and financed broadband infrastructure to develop appropriate and innovative services and applications for the Egyptian market. By encouraging this model of broadband development, the Government would make it clear that it supports the roll-out of services to meet the needs of enterprises, consumers and the public sector. The net advantage to the Government will be more investment in the provision of services adapted to the needs and circumstances of the Egyptian market.

This would involve developing, promoting and experimenting with an open access model for targeted locations, instead of boldly undertaking this at the national level. For example, it could be interesting to see what an open access model could do to encourage broadband access at the level of a governorate or a given municipality. To attract investor interest and municipal engagement, the possibility can be proposed and decided on the basis of a competition for the best proposal from given governorates and/or municipalities. This would encourage competition between jurisdictions and encourage private sector operators to partner with various jurisdictions.

[35] Korea Information Strategy Development Institute. 2003. *Broadband Policy in Korea*. 22 PowerPoint slides. www.apiicc.org:90/database/Broadband%20Policy%20in%20Korea.pdf

[36] Berkman Center for Internet & Society. 2010. Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world. Final report. Cambridge, Massachusetts.

b. Make use of the alternate fiber-optic networks owned by public corporations and utilities for extending Internet access

There are reportedly significant fiber-optic network links in the country that belong to various public utility companies, such as the national railways, the national gas and petroleum companies, and others who operate fiber-optic networks along their easements and rights of way. However, there does not appear to be any use made of the alternate fiber-optic networks owned by public corporations and utilities for extending Internet access to consumers and businesses. Egypt could leverage unused fiber available from public utilities and companies that could be leveraged by service providers.

Regarding the sharing of public utilities, the example of the Government of Rwanda could be relevant for Egypt. In 2007 and 2008, it secured investment from the international community to deploy a national fiber-optic network along the corridors of the national electrical grid. The backbone network is owned by a public corporation and operated by one of the telecom operators selected on the basis of a tender. A government agency oversees the operation of the network with a view to ensuring that all service providers and operators that wish to access the fiber-optic infrastructure can do so at a reasonable cost not far from the actual market cost. This is a variant on the open access model of network deployment, where the objective is to encourage operators to focus their efforts and investments on services and not to disperse their efforts by having to pay very high rates for broadband infrastructure access fees.

The intention of the Government of Rwanda was to extend the connections to schools, hospitals and communities located within 5 kilometers of the network cables as part of the national broadband strategy. As a result of the recent landings of several marine fiber-optic cables on the coast of Kenya, Rwanda and several other countries of Eastern and Central Africa are now looking at linking with these fiber-optic cables to complete their connection to the global Internet backbone. Even though Rwanda and Egypt may not be readily comparable on many counts, this model may be an interesting one to explore further.

c. License other operators for fixed line telephony and data services

The Government has decided to issue a second license for fixed line telephony and data services. Opening up this sector will allow competition in the fixed line telephony services market and also help facilitate competition in the provision of fixed broadband services. It would be important to consider opening the market to more than one additional operator.

The high population density and benefits of extending broadband into population cores could drive uptake of broadband technologies such as FTTH/FTTB in areas where the consumers are willing and prepared to pay, assuming that operators could secure the authorizations and agreements that would allow interconnection and broadband sharing with existing broadband infrastructure. Issuing a license to a second (or even a third) fixed line operator would help to capitalize on this opportunity.

As noted above, very high speed broadband services in the form of FTTH are already being offered on a commercial basis in selected gated communities. The company that has been licensed by NTRA to provide fiber to gated communities had deployed fiber to over 30,000 homes or buildings as of December 2009. Most of them were to newly built gated communities in and around major urban centres. Still, only 500 subscribers had been registered.[37]

In dense urban areas, such as Cairo, where all telephone centrals are already linked by fiber, there is the possibility of extending the reach of these services to urban communities such as parts of Zamalek where wealthier consumers may be willing and able to pay for fiber-based and other high speed broadband services, such as triple play. Even though trenching to lay fiber-optic cables in built areas may be a challenge, there are other options for connecting users to high speed services. Aerial fiber, line of sight laser based optical connections also exist, as well as a variety of wireless technologies (including microwave), could be exploited at the building level. Microwave based connections are cheaper than fiber, but do not have the same bandwidth. The main objective in urban communities is to connect to the buildings. Once a building has been connected using FTTH/FTTB, and then

[37] IDATE Consulting & Research. 2010. *FTTH Panorama: EU36 & ME14*. December 2009. FTTH Council Europe. http://www.ftthcouncil.eu/documents/studies/IDATE_FTTx_Panorama_Dec_09_v2.pdf

a variety of other technologies including Wi-Fi can be used to share the connection within it.

In this context, Egypt may wish to consider developments in other countries in the region. For example, the UAE and Saudi Arabia are moving to deploy broadband in the form of FTTH and FTTB.[38] Similarly, Lebanon is considering driving FTTH into parts of the country. The high cost associated with fiber-optic network deployment and the limited capacity of most Egyptians to pay for FTTH/FTTB and related services such as triple play are significant challenges.

In the Republic of Korea, one reason for the rapid rollout of broadband infrastructure to citizens is that most Koreans live in high rise apartments. The high density of population has been harnessed. It has formed the basis of the market demand that has driven broadband to consumers and homes. High population density is a feature also of the Egyptian market. In the Republic of Korea, the Government, working through and in collaboration with the operators, has been able to encourage significant private sector investment in broadband deployment. An important difference is that the purchasing power of the average consumer in the Republic of Korea is higher than in Egypt.

For rural areas, FTTH or FTTB may generally be too costly an option in Egypt. However, the Government can have a role to play in reducing costs and encouraging the use of existing fiber-optic cabling resources. Given that the vast majority of the population is located within a few kilometers from the Nile or in the Delta and therefore within ready reach of fiber-optic infrastructure that runs North – South along the Nile, it would seem feasible to encourage operators to connect to this national resource for the purpose of connecting the entire nation. Open access networks, community or municipal networks may be a solution, as noted above.

Facilitating access to the fiber backbone could yield significant development dividends. In the Republic of Korea, constant communications between the many competitors, the regulator and the Government, along with vigilance and strong oversight, were some of the reasons the dominant infrastructure owner, Korean Telecom, was not able to impose a restrictive monopoly on access to the fiber backbone. The regulator implemented regulations on tariffs and interconnection fees and set measures against anti-competitive behavior such as bundling and cross-subsidies.[39]

There are opportunities to provide access to some communities of users in some parts of large cities, such as Zamalek in Cairo. Operators need to have the possibility of interconnecting and using a mix of alternate technologies to do so, with little regulatory overhead to allow this to happen. Based on the response to the call for a second fixed license, more than one company or consortia of private sector operators and investors may see a business case in offering these services.

d. Encourage private sector investment in network infrastructure and fiber deployment

The next ICT strategy should continue to encourage broadband deployment and look at business models that will encourage the private sector to invest in fiber deployment and in the provision of network services. PPP-based models for the construction and operation of broadband networks and for the creation of public services on-line need to be considered. Such models have worked in India and may also work in Egypt, which has been successful in implementing several PPPs in other areas. The Government may consider removing the rate caps imposed on Internet access prices since such restrictions could be a deterrent to a PPP-based model of implementation.

e. Identify and deal with network quality of service issues

While it appears that international bandwidth to the country is keeping pace with demand, some private sector operators have commented on poor quality and high cost of broadband services such as fiber-optic cabling for companies located outside of the Smart Village. Remaining quality of service issues in the provision of broadband services to the private sector in particular, and especially to operators located outside of the business parks need to be considered. The Government should further assess and, if need-

[38] Yankee Group. 2010. *Emerging Markets & Next-Gen Broadband*. Benoît Felten, Principal Analyst, Wally Swain, Senior VP. March 30, 2010. Yankee Group webinar. Date: Tuesday, March 30, 2010. Time: 11:00 a.m. – 12:00 p.m. EDT. http://www.slideshare.net/yankeegroup/emerging-markets-and-nextgen-broadband Abbassi, J. 2010. *Overview of the Arab World's Telecom and Broadband Markets*. Presented at the FTTH Council Europe 2010 meeting in Lisbon, Portugal, Feb. 24-25, 2010. Arab Advisors Group. 18 slides.

[39] Korea Information Strategy Development Institute. 2003. *Broadband Policy in Korea*. 22 PowerPoint slides. www.apiicc.org:90/database/Broadband%20Policy%20in%20Korea.pdf.

ed, address these issues in consultation with relevant private sector operators.

3. Promote underserved areas access to broadband using Universal Access Funds

The new broadband strategy should be well integrated with the universal access strategy (UAS) rather than undertaken separately.[40] Many countries, including developed countries (such as United States[41] and Germany[42]) and developing countries are promoting universal access to broadband, and it is imperative that the UAS becomes part of the national broadband strategy. However, providing access to underserved areas still requires a methodology of its own.

The objective of the UAS should be to encourage network access for all Egyptians using a combination of market-based incentives and government subsidies. It should help put into place the policy and regulatory environment for this to happen.

The plan to provide access to rural and underserved areas should include a detailed funding strategy to implement this strategy without unnecessary delay.

The UAS should include access to voice communications, broadband Internet at a certain speed (say 1 Mbps), and access to emergency communications. Most UASs define universal access in terms of distance from the facilities or time to reach the facilities where these services are to be found. Increasingly, for underserved areas, these tend to be located in shared or community based access facilities.

The following steps are recommended to assist the NTRA and the MCIT in developing a UAS that responds to the specificities of Egypt:

a) Undertake an in-depth analysis of demand and ability to pay given existing best practice in UAS design, development and implementation. Consider what best practice leaders in UAS development such as Botswana, Brazil, Burkina Faso, Mozambique, Nigeria and South Africa[43] have done based on the experience to date.[44] The European Bank for Reconstruction and Development (EBRD) has undertaken demand studies in the preparation of Universal Access Fund (UAF) proposals in Kyrgyzstan[45] and Mongolia.

b) Bring in experts through an international tender to undertake this work. Seek support of agencies such as the World Bank, ITU and others to develop the proposal and tender.

Key components or steps involved in undertaking a universal access strategy include the following:[46]

- Sector analysis (ICT market, socio-demographics, economy, sector policy and regulation);
- Stakeholder and industry consultation;
- Policy development;
- Revision and drafting new regulatory instruments (including Universal Service Funds);
- Demand studies;
- UAS and broadband strategy and program development;
- Design, management and evaluation of competitive bidding processes;
- Pilot implementation, monitoring and evaluation;
- National program implementation; and,
- Program review, analysis and recommendations for the next phase.

As a component of the national broadband strategy, the UAS should set the stage to encourage public and private sector organizations at all levels, including municipalities, to exploit existing broadband infrastructure. The strategy should be undertaken in close conjunction with work related to developing the national broadband strategy to avoid duplication or contradictions.

UASs should benefit communities where the ability to pay is not sufficient to justify a commercially based model. These communities will qualify for support from

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[40] Intelecon Research. 2010.
[41] Federal Communications Commission. 2010. *Connecting America: The National Broadband Plan*. Washington, 373 pp. Recommendation 8.19: Congress should make clear that Tribal, state, regional and local governments can build broadband networks http://www.broadband.gov/
[42] Pyramid Research. 2009. *An Ambitious Broadband Strategy in Germany*, in Pyrami Points. Global telecom market analysis. http://www.pyr.com/points/item/090309.htm
[43] http://www.inteleconresearch.com/pages/home.html
[44] InfoDev & ITU. 2010. *4.1 Universal access and service policy framework. ICT Regulation Toolkit*. http://www.ictregulationtoolkit.org/en/Section.3255.html
[45] EBRD. http://www.ebrd.com/country/country/kyrg/cs.htm
[46] Intelecon Research. 2010. *Universal access & service / broadband*. Web page. http://www.inteleconresearch.com/pages/serv-universal.html. InfoDev and ITU. 2008. *Module 4. Universal Access and Service, ICT Regulation Toolkit*. http://www.ictregulationtoolkit.org/en/index.html.

the Universal Access Fund (UAF), which is a component of the UAS. The rules, regulations and governance mechanisms to oversee the UAF have to be developed at the same time as the national UAS and broadband strategy are put into place. These rules need to be consistent with international best practice.

Options available to implement universal access can be grouped as follows:[47] 1) mechanisms that promote efficient markets through regulation and that aim at closing the market gap; and 2) mechanisms that foster access beyond what market forces alone can achieve to close the access gap (see table 4.1 of World Bank, 2010). Similarly, several options for financing can be considered (table 4.2 of the same report). The present Review is not able to assess which of these instruments would be the most appropriate in the Egyptian context. However, the NTRA and the MCIT should consult with relevant experts to consider the way forward, and that this should be done in the context of the development of the national broadband strategy and action plan.

The broadband strategy should consider the role of community access facilities (CAFs) in general and cybercafés along with IT Clubs and post offices in particular. These facilities can be an important solution in providing access to broadband facilities and services for those who cannot afford to benefit from broadband otherwise. In the eyes of the end users, cybercafés are no different from IT Clubs or any other CAFs.

In Kyrgyzstan,[48] the national postal administration has created community access facilities (Public access units - PAUs) in post offices, with UAF supporting the initial start-up of the PAUs. The PAUs provide a variety of network ready services, including access to the Internet, gaming, photocopying, training, VoIP connectivity and a host of other services adapted to the specific clientele. To ensure that community access facilities are sustainable, support must be provided in the form of technical assistance to train and assist the operators of access facilities. In Kyrgyzstan, operators can be associated with these initiatives, in which case the operators are responsible for funding these initiatives. The 980 plus post offices of the Ministry of Post and Telecommunications represent an attractive opportunity to build a potentially sustainable network of PAUs. At least seven post offices already have PAUs. The Kyrgyzstan Post Office already provides a nationwide "communications" network within Kyrgyzstan with particularly strong coverage of rural areas. Each post office has the theoretical potential to host a PAU, which would have high visibility in each rural village. Kyrgyzstan's UAS 2010 specifically notes the post offices as a vehicle for enhancing rural access.

Egypt may consider, in addition to the IT Clubs, integrating similar units within post offices as part of the current reform of Egyptian postal services, which aims to develop postal services that support e-government and e-commerce.

4. Allow VoIP and Wi-Fi mesh networks for community based connections, especially in rural, remote and underserved areas

VoIP is a "killer application" for broadband in rural areas.[49] "*The expected revenue stream from voice services is critical in their business model. Finally, competitive and open access to international gateways is also critical for Internet-based voice services. Voice service delivered through the Internet (VoIP is a widely used example) is important inasmuch as it builds a better case for broadband access in rural areas*" .[50]

VoIP with access to international gateways could be a key driver of broadband connectivity in underserved areas. However, given that the cost of mobile telephony is relatively low in Egypt, a comparative analysis should be undertaken to determine the economic feasibility of this opportunity. Consultation with the private sector and especially with cybercafé and IT Club operators, as well as representatives of local government authorities and consumers, will help in this context, as would a demand study.

Closely linked with VoIP is access to Wi-Fi as a way of propagating network access. Mesh networks at the local and community level can be a relatively easy

[47] Muente-Kunigami, A. & J. Navas-Sabater. 2010. *Options to Increase Access to Telecommunications Services in Rural and Low-Income Areas*. World Bank Working Paper No. 178, Washington, D.C. 56 pp. http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Options_to_Increase_Access_to_Telecommunications_Services_in_rural_and_Low-Income_Areas.pdf or http://bit.ly/bhXMdh

[48] Great Village International Consultants and The Aylmer Group. 2005. *Republic of Kyrgyzstan. Universal Access Implementation Group. Universal Access Strategy Report. Universal Access Project, December 7, 2005*. Great Village International Consultants and The Aylmer Group and funded by the European Bank for Reconstruction and Development (EBRD) and the Canadian International Development Agency (CIDA). 165 pp.

[49] Muente-Kunigami, A. & J. Navas-Sabater. 2010. *Options to Increase Access to Telecommunications Services in Rural and Low-Income Areas*. World Bank Working Paper No. 178, Washington, D.C.

[50] Ibid.

way, assuming technical skills are available, to propagate network access in underserved communities especially. By deregulating, private sector operators will fill this space and provide this type of service. The main benefit is increased network access at the local and community level at a relatively low cost driven by market demand and local entrepreneurs. Training and awareness promotion will be required to help drive the supply side of this equation.

5. Establish clear and measurable targets

There are already a number of internationally agreed indicators for measuring Internet and broadband access and use. The MCIT has been forthcoming in the production and publication of statistics about the growth and diffusion of ICTs in Egypt for a few years, including broadband.

Internationally agreed indicators[51] regarding broadband include the following:

- Number of Internet users/subscribers per 100 inhabitants
- Broadband Internet subscribers per 100 inhabitants
- Proportion of households with Internet by broadband access
- Proportion of businesses/employees using Internet/broadband
- International comparison of relevant price baskets
- Number of ISPs

Other indicators include:

- Number of public and private partnerships implemented
- Reduction of the gap between the broadband access to companies located in Business Parks and outside
- Perceived broadband quality of service
- Number of IT Clubs or other PAUs in underserved areas
- Number of telecom demand studies in rural and underserved areas.

Realistic targets should be set within the next ICT strategy for the short, medium and long term. The example of the Government of Malaysia could be of use for Egypt in many respects, with regard to the objectives planned, the broadband deployment by zones and use of UAFs. In addition, the Government of Malaysia, like Egypt, is expecting broadband to create opportunities and markets for applications and content developers (box II.2).

[51] ICT Core indicators, Partnership on Measuring ICT for Development, see www.measuring-ict.unctad.org

Box II.2. Malaysia's National Broadband Initiative

The Government of Malaysia launched the National Broadband Initiative (NBI) in 2010 to ensure that all Malaysians, whether in the suburbs, rural or remote areas, have access to broadband services. The NBI was envisioned to transform Malaysia into a knowledge society and to leapfrog into a high-income economy by 2020.

Under this initiative, the Ministry of Information, Communications and Culture (MICC) has targeted a 50 per cent or equivalent to 3.2 million homes broadband penetration by end-2010. This is expected to contribute one per cent to GDP and create 135,000 new job opportunities this year.

A PPP between Telekom Malaysia and the Government was concluded to develop next-generation High Speed Broadband (HSBB) infrastructure and services for the nation. The NBI divides the country into three zones. Zone 1 consists of high economic impact areas such as the inner Klang Valley and the Iskandar Development Region in Johor. Zone 2 will be other urban and semi-urban areas while Zone 3 will be rural areas.

The NBI plan envisions private initiatives bringing broadband to zone 2 areas. The rollout of broadband in zone 3 will require intervention by the Malaysian Communications and Multimedia Commission (MCMC) using Universal Service Provision (USP) funds. Provision of broadband in these areas includes Basic Telephony (through fixed and mobile network), Community Broadband Library (CBL) and Community Broadband Centre (CBC).

The cellular coverage in these areas will be widened by building more communication towers funded through the USP to facilitate the cellular operators expanding their coverage to 97 per cent of the population by 2011.

Source: UNCTAD.

Annex II.1 – What makes broadband policies successful in OECD countries and developing countries – lessons learned

Broadband developments in the OECD countries have been encouraged by:

- Effective competition and continued liberalization in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, non-discriminatory market policies.
- Policies that encourage investment in new technological infrastructure, content and applications in order to ensure wide uptake.
- Technologically neutral policy and regulation among competing and developing technologies to encourage interoperability, innovation and expanded choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.
- Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market.
- A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and more generally, strengthened cross-border cooperation between all stakeholders to reach these goals.
- Both supply-based approaches to encourage infrastructure, content, and service provision and demand-based approaches, such as demand aggregation in sparsely populated areas, as a virtuous cycle to promote uptake and effective use of broadband services.
- Policies that promote access on fair terms and at competitive prices to all communities, irrespective of location, in order to realize the full benefits of broadband services.
- Assessment of the market-driven availability and diffusion of broadband services in order to determine whether government initiatives are appropriate and how they should be structured.
- Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management, without disadvantaging innovative e-business models.
- Encouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness.

In addition, a study of policies adopted by developing countries for broadband development[52] points out the following principles to consider when developing a national broadband strategy:

- Policies that facilitate market provision of broadband services should be proposed.
- High-quality and low-cost international connectivity is essential for domestic broadband development, otherwise high uptake of broadband will face a major bottleneck.
- Government should not be involved in providing services, but instead should improve access to services provided by the private sector.
- Regulatory and policy tools that can enhance entry into the market and competition should be considered first.
- When governments intervene, they should minimize unfair competition and, when subsidizing broadband infrastructure, the subsidized networks should be open access so that all market participants can access bandwidth in a non-discriminatory way
- Governments can encourage infrastructure development and investments by the private sector by developing access to passive infrastructure, for example ducting, towers, cable conduits, and opening rights of way.

International broadband pricing needs to be competitive and not favour the incumbent, otherwise, these principles may not apply.

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[52] Kim, Y, Kelly, T. and S. Raja. 2010. *Building broadband: Strategies and policies for the developing world*. World Bank . Global Information and Communication Technologies (GICT) Department. Washington, D.C.

CHAPTER III. ASSESSMENT OF SKILLS DEVELOPMENT FOR THE ICT SECTOR

The supply and quality of ICT skills are critical factors in fostering greater usage of ICTs and in facilitating growth in the ICT sector. The Government has long invested in ICT-relevant human capital to ensure that the market's growing needs are met. In this context, it has launched various programs to support the generation of ICT engineers and technicians demanded by the private sector.

One of the stated priorities of the NICTS 2007-2010 was to "*support the development of the skills required by the ICT industry*". Several institutions are responsible for implementing the policy measures adopted in this area, including the National Telecom Institute (NTI), the Information Technology Institute (ITI), the E-Learning Competence Center (eLCC), Nile University, specializing in engineering technology and business administration, and the Software Engineering Competence Center (SECC). ICT companies are represented by various associations including the Egyptian Information Telecommunications, Electronics and Software Alliance (EITESAL), the Information Technology Export Community (ITEC), the ICT Committee of the American Chamber of Commerce in Egypt and the Chamber of Information Technology and Communications (CITC).

The Information Technology Industry Development Agency (ITIDA) supports capacity building initiatives aimed at enhancing the competitiveness of Egyptian companies in the ITO sector. More formal educational activities are undertaken in collaboration between the MCIT, various specialized institutes of the MCIT (such as ITI), the Ministry of Education, as well as the Ministry of Higher Education.

Through these various organizations, objectives have included: 1) expanding specialized capacity-building and certification programs addressing the needs of individuals, institutions and industry; and 2) strengthening the relationship between the ICT industry and academic and research institutions to increase the flow of trained individuals into the labour market.

Egypt has partially achieved its objectives as stated above. The main shortcoming appears to be related to the challenge of graduating ICT specialists who are immediately productive in a corporate environment. The information described below on achievements suggest that the number of graduates meet the needs of the ICT sector, but that quality needs to improve so that firms do not have to retrain new employees and instill in them the values and behaviour consistent with working in the private sector.

A. Main achievements

Egypt has accomplished a lot in terms of providing skills for the ITO and BPO sectors. As a result, Egypt has been ranked among the top ten emerging economies for its IT skills.[53]

Because of various government initiatives, the number of graduates who receive formal training in ICTs has increased significantly since 2006,[54] when there were about 27,000. As of May 2010, there were close to 40,000 formally trained ICT graduates. In 2009, Egypt graduated about 330,000 students from its universities: 14,000 in science, 63,000 in commerce and 17,000 in engineering. Another 24,000 English-speaking graduates become potentially available for the BPO sector every year, along with 2,500-3,000 French, 1,200-1,600 Italian, 800-1,000 German and 300-400 Spanish speaking graduates.[55] The availability of trained technical staff graduating from Egyptian universities is expected to meet market demand for the coming several years. According to ITIDA, there will be a talent surplus for at least the next five years that should sustain the current ICT outsourcing growth rate of 30-40 per cent.[56]

Official data show that the total number of people passing through the professional ICT training programs of the ITI and specialized ICT training programs of the NTI had reached 38,350 by the end of Q3 2009, compared to 32,970 a year earlier, an increase of 16 per cent.[57]

In the area of software development, the *Software Engineering Competence Center (SECC)* has since 2003 been delivering courses and offering advisory services

[53] A.T. Kearney. 2007. *2007 global service location attractiveness*.
[54] MCIT. 2010. Egypt ICT indicators portal. http://www.mcit.gov.eg/Indicators.aspx Accessed on 20100222
[55] ITIDA. 2009. *Destination Egypt: Value Proposition*. October 2009.
[56] Datamonitor. 2009. Global Delivery Locations - Focus on Egypt (Analyst Insight). BFTC2326/ Published 03/2009.
[57] MCIT. 2009. *Information and communications technology indicators bulletin. December 2009. Quarterly issue*.

to Egyptian companies to assess their maturity level. Employees of over thirty companies have attended these courses and have achieved certification for Capability Maturity Model Integration (CMMI) maturity levels 2-5. By meeting the requirements of the SECC, Egyptian ICT companies can claim that they meet internationally acceptable criteria for software development, which helps them compete internationally.

SECC also undertakes training and testing of individual specialists as a member of the International Software Testing Qualifications Board (ISTQB).[58] Testing is used as a way to enhance the certainty associated with the software development process. The SECC has trained around 11,000 people from over 500 companies on this basis. It has identified a market in the region and beyond for these services. Clearly, developing talent is a challenge and the SECC is meeting a growing demand for these services. To date, the SECC has been focusing especially on lower level certifications. Only a handful of Egyptian companies have so far achieved CMMI certification levels 4 or 5. Nevertheless, the SECC expects that it will be able to provide level 4 and 5 certifications in the near future.

The ITI works through two main programs: EduEgypt (Education Development for Universities in Egypt) and the 9-Month Professional Program, a formal training program for recent graduates. The EduEgypt program targets undergraduates in Egyptian universities, offering them training in soft skills, languages and technical competence. Students must dedicate 300 hours of work beyond their usual workload to meet EduEgypt requirements. The program is being expanded to apply progressively throughout the four years of undergraduate study. For the period 2007-2009, over 3,100 students graduated in the first phases and out of these, 1,700 (or 55 per cent) secured jobs with ICT companies. Over 10,500 students were enrolled in the Phase III of this initiative through 2010. Phase III included students from 15 universities (54 faculties) enrolled in both 3rd and 4th years in their universities.

The 9-Month Professional Program was developed in 1994 and gained wide regional and international recognition for the caliber of the young IT professionals who graduate with practical, hands-on experience with different IT concepts. The demand to hire the graduates of this program is intense, because they are trained in programs that meet the immediate needs of ICT companies. Compared to graduates from other institutions of higher learning in Egypt, ITI graduates are typically in the highest demand.

In terms of results, over 6,000 students have graduated in IT to date over the course of the 9-Month Professional Program. Graduates of this program receive a post-graduate IT Diploma upon successfully completing their studies and project. The diploma is accredited with several European institutions. Students are chosen through a rigorous selection process designed to attract the best and the brightest.

Moreover, the Professional Training Program, which was initiated in 2001, generates a workforce of IT, telecommunications and networking professionals. Graduates of this program (29,000 in 2010) serve as an important base for the ICT industry in Egypt. Available at over 70 training centres across the country, the program offers courses, through teamwork projects, presented through private IT companies, including ACCIT (Academy Company for Communication & Information Technology), AMAC, Fujitsu, IBM, Orascom, Raya Academy, Synergy, Vision, New Horizon, Virgi Tech and YAT. The program lasts for nine months, at the end of which participants receive an internationally recognized certificate enabling them to work in a field of specialization, such as software development, software engineering quality, web development, or networking, Java Mobile, Object Oriented, graphics and multimedia, as well as ERP.

With another training program, the Super User Training program started in 2003, MCIT tailored training for specialists (application oriented training program). The graduates obtained international certification in office application (Microsoft office specialist) as well as repair and maintenance (Network+, Server+); 8,000 specialists were enrolled in this program which ended in 2007.

Finally, the Mobile IT Clubs – a bus or caravan equipped with PCs or laptops with satellite Internet access, software, network and trained qualified instructors – provide various ICT services offered by normal IT Clubs. Mobile IT Clubs are moved to communities in rural areas where it is not feasible to have a normal IT Club for various reasons. Mobile IT Clubs are also used occasionally in ICT gatherings or events. Usually these Mobile IT clubs visit these locations and stays there for about 4 to 6 weeks; the table below illustrates the visits for different locations and people visiting these places in the past six years.

[58] See http://www.istqb.org/mission.htm.

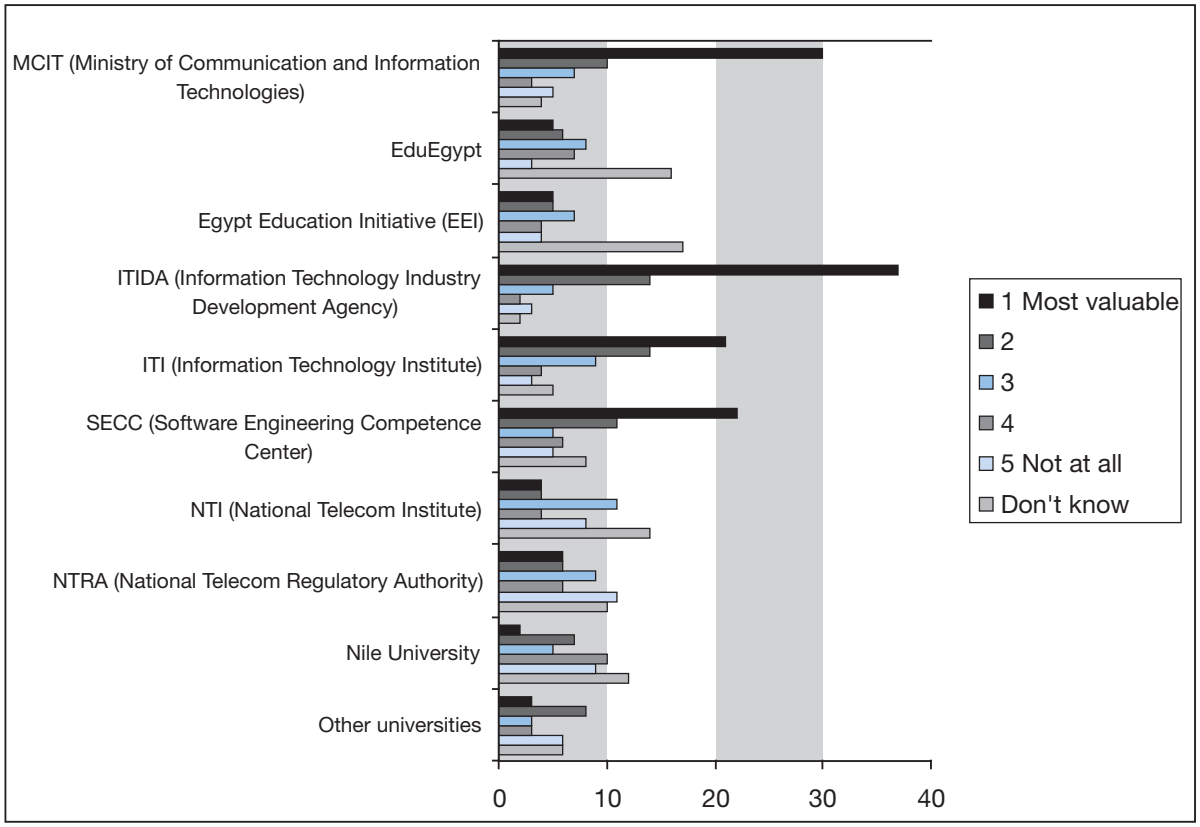
Table III.1. Mobile IT Club visits 2005-2010

S	Year	Governorate visited	visits	per/ day	Male	Female	Total	Daily rate
1	2005	9	20	465	14924	13106	28030	60.3
2	2006	13	14	648	23156	20386	43542	67.2
3	2007	6	11	510	17514	17291	34805	68.2
4	2008	9	11	486	16513	16782	33295	68.5
5	2009	7	12	500	16333	21303	37636	75.3
6	2010	5	11	390	13572	9738	23310	59.8
Total			**79**	**2,999**	**102,012**	**98,606**	**200,618**	**66.9**
				%	50.8	49.2		

Source: MCIT, 2010.

Overall, survey responses and interviews suggested that private sector operators support MCIT efforts to improve the supply and quality of graduates. They regard the improved access and quality of ICT skills as a strategic advantage for Egypt. Among the various ICT training and capacity building initiatives, the efforts of the MCIT directly, as well as those of ITIDA, are particularly appreciated, followed by those of the ITI and the SECC (figure III.1).

Figure III.1. Assessment of ICT training and capacity building initiatives provided by the Government of Egypt



Source: UNCTAD on-line survey.
Note: The "x" axis is for the number of respondents answering the question asked.

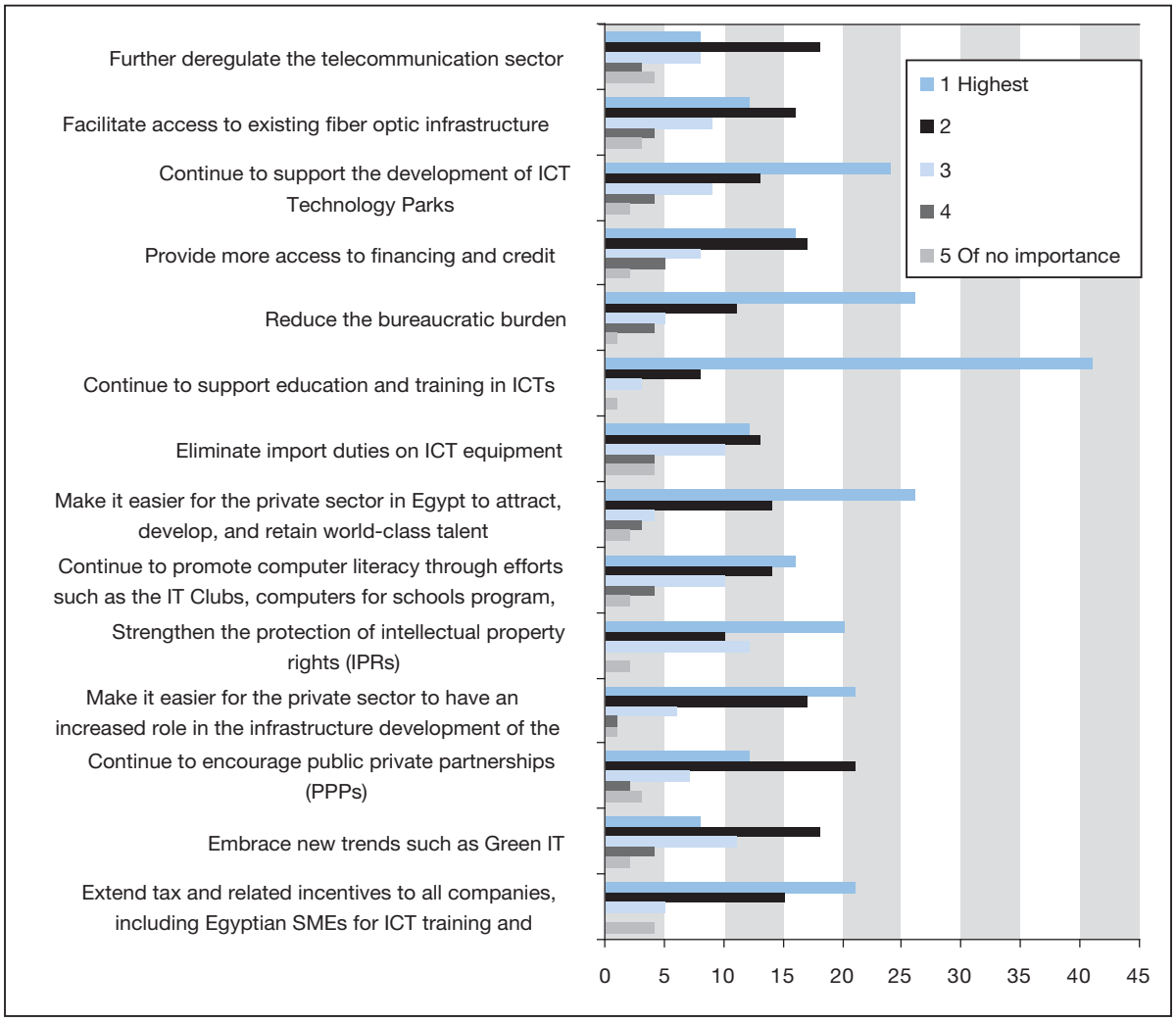
B. Challenges

1. Enhance the capacity of Egyptian graduates

Many private sector representatives interviewed for this Review were concerned about insufficient preparation of graduates from Egyptian universities for the work force and their lack of managerial skills. ICT companies feel that additional "on-the-job" training is required to make full use of new graduates. There appears to be a perception that more needs to be done to instill in graduates a better understanding of the work place environment and to make graduates more employable. Entrepreneurial skills are also an area that still needs more attention, judging from interviews with ICT companies.

In the UNCTAD on-line survey, Government efforts to support training and education to provide market ready and ICT savvy technicians, managers and ICT companies are considered the most important of all initiatives to promote ICT sector growth. Over 78 per cent of the respondents to this question identified continued support to education and training in ICTs as the most important policy initiative for the future (see figure III.2).

Figure III.2. Policy initiatives or developments ICT business people would like to see the Government of Egypt adopt

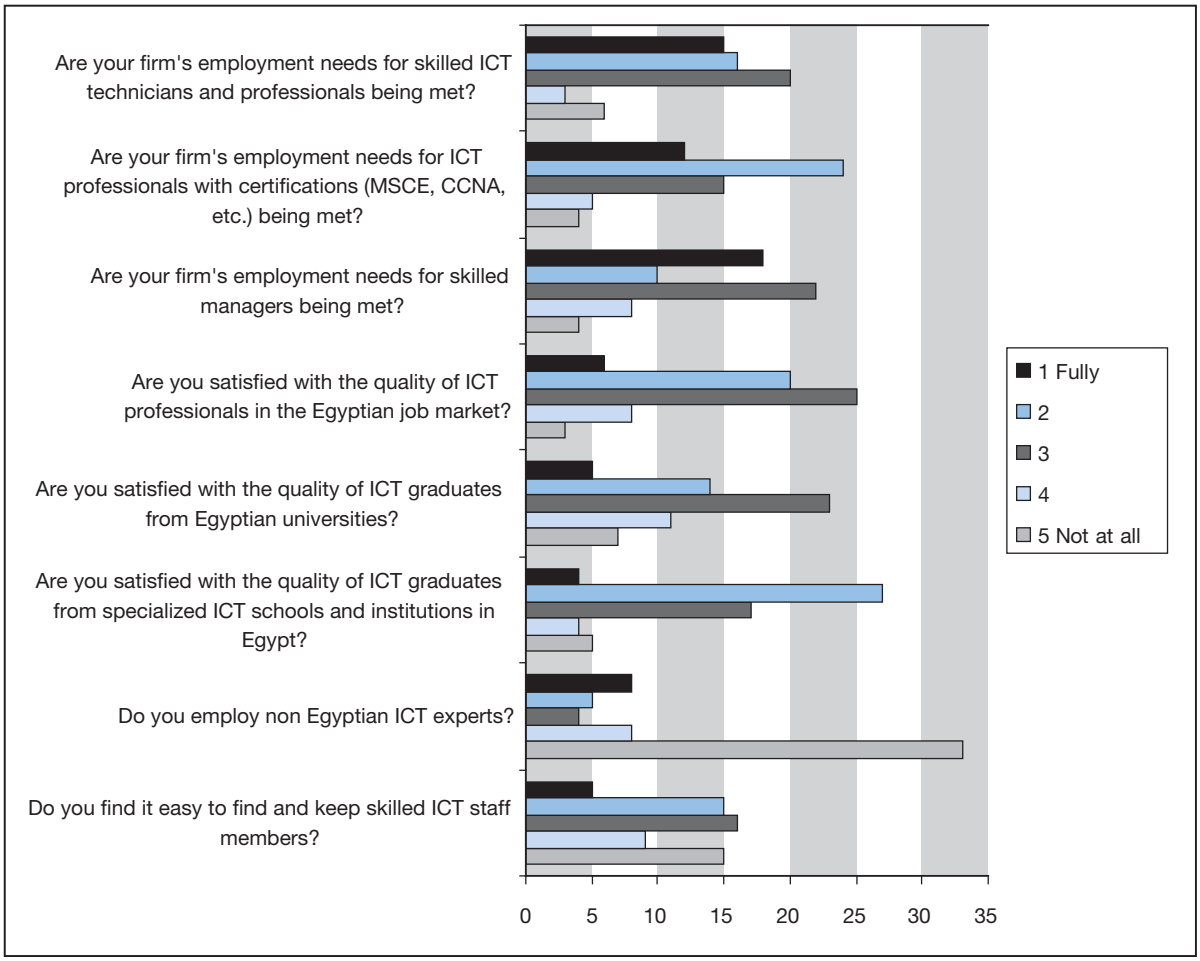


Source: UNCTAD on-line survey.

Note: The "x" axis is for the number of respondents answering the question asked.

When asked to qualify issues related to the demand of ICT firms for management and technical staff, the replies suggest that there is still some way to go in meeting the needs and concerns of the private sector (figure III.3). Respondents expressed some concerns regarding the quality of ICT professionals, the availability of skilled managers and the quality of ICT graduates. While generally appreciative, few respondents were fully satisfied regarding these factors.

Figure III.3. Demand of ICT companies for management and technical staff



Source: UNCTAD on-line survey.

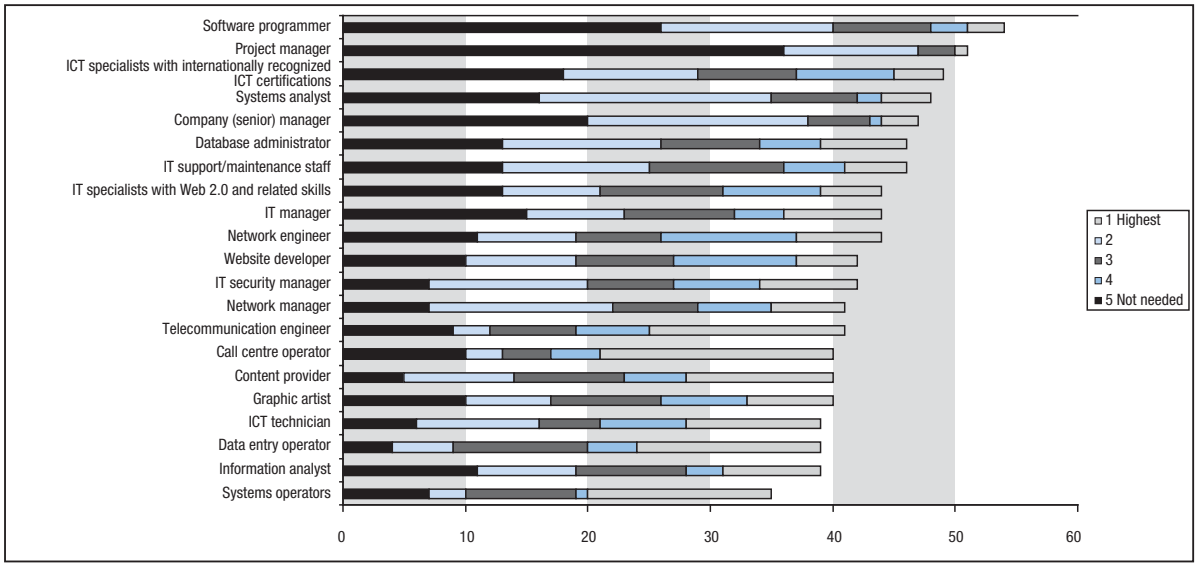
Note: The "x" axis is for the number of respondents answering the question asked.

There appears to be a lack of middle management and project management skills among Egyptian university graduates. When asked which specialized or professional ICT skills were most needed, many ICT companies mentioned that the need for project managers was greatest followed by software programs and company managers (figure III.4). In order to move Egypt's ICT outsourcing market towards higher-value ITO and BPO applications (see chapter VI), the country will need to address the skills gaps highlighted above.

High turnover of graduates was also raised as an issue. Once trained, many newly hired and trained staff move to other companies or to other countries, in particular in the Middle East, before the company's investment in training has borne fruit. About 25 per cent of the private sector respondents indicated that they were not satisfied with the ability to find and retain skilled staff; only 8.5 per cent of the respondents answered that they were fully satisfied.

In addition, there may be a particular need to explore new ways for securing access to skills among smaller ICT firms. Some companies interviewed suggested that employees have a tendency to seek work in larger firms, as these are perceived to be more stable than SMEs. In addition, salaries paid by SMEs are not commensurate with the expectations of the best graduates and experts. Larger firms – domestic and foreign-owned – have inflated salary levels in the market. This in turn has made it difficult for employers in SMEs to secure a sufficient number of adequately trained managerial and technical staff.

Figure III.4. What specialized or professional ICT skills do you need most?



Source: UNCTAD on-line survey.
Note: The "x" axis is for the number of respondents answering the question asked.

2. Make better use of the Egyptian Diaspora brain pool

According to a CAPMAS report published in 2000 and cited in recent research undertaken by the International Organization for Migration (IOM),[59] over 2.7 million Egyptians work overseas. While a significant number of them work in the rest of the Arab world, about 824,000 are in non-Arab countries. The exact numbers reported vary but some data suggest that Egyptian migrants to the West have a high educational profile. According to the Egyptian census of 2006 the "*… percentage of Egyptians in the West with a tertiary education (university or graduate degree) ranges between 21 % in Italy and 65.4% in Canada with an average of 47%. This rate is almost five times the level of their counterparts in Egypt which is 9.59 %*" (CAPMAS, 2008).[60]

Egyptians living abroad thus represent an important resource. They constitute an existing network of skills and contacts that has not been apparently exploited to the fullest for a variety of reasons made explicit in the IOM report cited above. The challenge for Egypt is to engage the Egyptian Diaspora to a greater extent in support of the NICTS, and especially in regards to the training and education of Egyptian youth and adult learners.

3. Leverage foreign experts and visiting specialists

Many internationally recognized innovation centres and business clusters such as Silicon Valley and other sites in the United States and elsewhere have achieved prominence as a result of relatively open labour movement policies. Living and working in Egypt as a foreigner is not always easy. Even international firms have difficulty hosting high profile visitors and technical experts for short periods of time. While the reasons for this are diverse, addressing this challenge can help in making Egypt a more business friendly

[59] IOM. 2010. *A Study on the Dynamics of the Egyptian Diaspora: Strengthening Development Linkages*. Cairo.
[60] CAPMAS. 2008. *Arab Republic of Egypt: Housing and Population Census, 2006*. CAPMAS, Cairo.

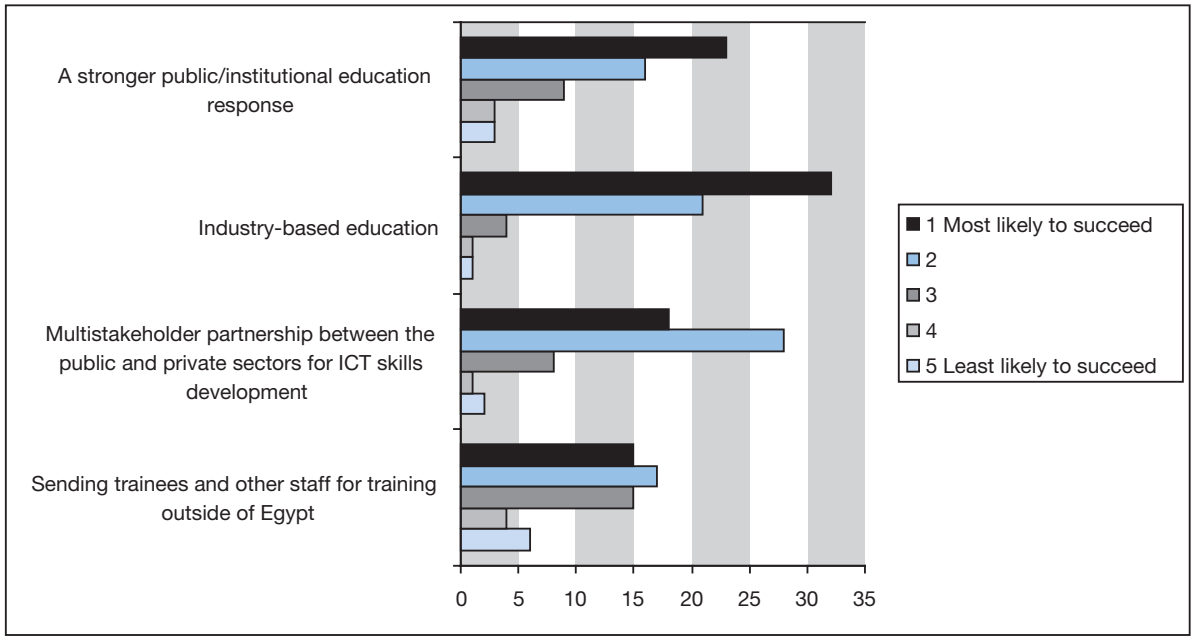
destination and in improving the availability of skilled human resources.

C. Recommendations

1. Meet the training and human capacity needs of the BPO/ITO sectors

When asked which options could best meet the training and capacity building needs of ICT firms in Egypt, 90 per cent of the respondents from the BPO/ITO sector stated that an industry-based education would be the most desirable and 72 per cent indicated that a stronger public educational response would be preferable. About 80 per cent felt that a multi-stakeholder partnership would be most successful and 56 per cent emphasized training outside of Egypt (figure III.5).

Figure III.5. What options are most likely to meet your needs for trained and skilled Egyptian technicians and managers?



Source: UNCTAD on-line survey.
Note: The "x" axis is for the number of respondents answering the question asked.

Responses suggested that MCIT, through ITIDA, should continue with their two-pronged approach to modernize the educational system from inside, while immediately providing training and educational support to the private sector through initiatives such as the 9-month training program of the ITI and the EduEgypt initiative. These initiatives should continue and be reinforced. However, the private sector itself should become more directly involved and may also need to develop its own training activities and programs. The responses received suggest that more private sector engagement is required; the public sector alone cannot meet the needs of the private sector.

In this context, it may be useful for MCIT to consider the experience of India. In that country, several companies are engaged in training and capacity building activities, helping to support skills development for the large IT/BPO market. Indian companies are also piloting BPO training activities and projects in rural areas to assess the potential that this market represents for meeting the demand for outsourcing by hiring employees in rural areas directly while at the same time encouraging employment at the local and community level. Other Indian companies are also providing BPO certification directly.[61]

[61] HeroMindMine. 2008. Global BPO certification. http://www.heromindmine.com/global_bpo.asp

In Egypt, at least one company, Allied Soft, has already concluded a partnership with an internationally recognized BPO certification program offered by the BPO Certification Institute.[62]

As shown above, the results of the UNCTAD on-line survey suggest that industry-based education is perceived as the most useful to help the sector meet its employment needs. Programs and policies to encourage BPO sector companies with internationally recognized certifications to set up their business and offer their services in Egypt will help achieve the objective of enhancing industry-led training. While the Government has already worked with many of the key international players and consulting firms in the BPO sector, it appears from the survey results and interviews that additional industry-specific training activities and services would be welcome.

2. Promote more cooperative education and consider e-coop

One concern of ITI students interviewed was a lack of exposure to the workplace. To some extent this may have reflected that the fact that interviews were undertaken before the last module of the program, which involves hands-on–training in ICT companies. Cooperative education programs may be a solution to help address this concern. It is a structured way of combining classroom based education with practical work experience,[63] and integrates "*classroom studies with learning through productive work experiences in a field related to a student's academic or career goals. It provides progressive experiences in integrating theory and practice. Co-op is a partnership among students, educational institutions and employers, with specified responsibilities for each party*".[64] The World Association for Cooperative Education (WACE) considers cooperative education a work integrated learning program.[65]

In this context, it may be useful to adapt, if this has not already begun, the experience and lessons learned from the GTZ sponsored Technical Training and Employment Program – Mubarak-Kohl Initiative (MKI).[66] MKI is a cooperative model of vocational education and training that has been active in Egypt for the past 14 years. A new technical and vocational education and training (TVET) component has been in operation since 2007 that is focused on youth employment.[67] The objective of the MKI TVET is to upgrade"… vocational education and training in Egypt… The main partners are: The Egyptian Ministry of Education, the investors and businessman association and the international cooperation enterprise GTZ.[68] The MKI … combines the theoretical aspects of technical secondary schools with practical training in the workplace. Students who take the three-year course spend two days a week in a technical secondary school and four days with a company in order to obtain the skills and qualifications the labour market demands."[69]

The MKI makes extensive use of tracer studies to measure not only quantitative impacts but also behavioral and job satisfaction issues and factors that can be used to modify and improve the MKI program. While ITI and ITIDA do undertake user surveys and consult extensively with the ITO sector businesses in Egypt, it may strengthen the approach used to adapt and learn from the MKI experience.

Similarly, the MKI TVET has agreed to develop and pilot a regional labour market monitoring and forecasting system within the Sixth of October Governorate.[70] This initiative could be tracked and the results adapted to monitor specifically the ICT sector labour market.

While the MKI focuses on TVET in Egypt, cooperative programs could also be used to allow students of ICT-relevant subjects to obtain workplace experience with overseas employers. In Canada, e-coop programs have been introduced to high schools. It may be helpful to further explore this possibility with the MKI and its partners, WACE, GTZ or other organizations. One secondary school in Canada offers all of its courses

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[62] BPO Certification Institute. 2010. Worldwide locations. http://www.bpocertifications.com/worldwide-locations.asp

[63] Wikipedia. 2010. Cooperative education. http://en.wikipedia.org/wiki/Cooperative_education Accessed on 20100813.

[64] National Commission for Cooperative Education. 2010. The cooperative education model. http://www.co-op.edu/about-coop2.html

[65] WACE is an international association founded in 1983 to foster cooperative education and other work-integrated learning. WACE globally has worked with 913 institutions in 52 countries since its inception and has more recently been involved with 260 supporting institutions from 34 countries. See http://www.waceinc.org/mission.html.

[66] Mubarak-Kohl Initiative. 2010. http://www.mki-vetep.com/default.asp, GTZ. 2010. Technical education, training and employment – Mubarak-Kohl-Initiative (MKI). http://www.gtz.de/en/weltweit/maghreb-naher-osten/aegypten/22813.htm.

[67] UNDP. 2010. Egypt Human Development Report 2010. Chap 12, Technical training. UNDP, Cairo.

[68] Unesco & Unevoc. 2010. Information on TVET in Egypt. TVETipedia Knowledge Sharing Platform. http://www.unevoc.unesco.org/index.php?id=56&tx_drwiki_pi1[keyword]=Egypt.

[69] Ibid.

[70] UNDP. 2010. Egypt Human Development Report 2010. Chap. 12. Technical training.

electronically only,[71] and includes an e-coop program for students.[72] Another institute has established a training resource in the virtual world called MySpace.[73]

The MCIT should engage in a dialogue directly with WACE, MKI/GTZ and the other organizations mentioned above to explore further the e-coop possibility in the ICT area. The advantage for students in programs such as the ITI would be the possibility of learning directly from the schools that it partners with, as well as developing working relations with some private sector ICT firms.

3. Promote more vocational training in the ICT sector with a focus on ICT-enabled services

The focus so far of efforts by the MCIT, ITIDA and partner institutions at the post secondary level has been mostly on institutions of higher learning such as universities and colleges. However, benefits to young people and the economy could come from providing more vocational training opportunities for young people who don't go on to institutions of higher learning.

The UNDP Human Development Report 2010 argues that Egypt needs to focus its attention and resources and efforts on this important labour pool.[74] Technical and vocational education and training (TVET) programs could help " … make the most of the large number of young people who would benefit both themselves and the economy by acquiring non-academic vocational proficiency, but that this opportunity has not been grasped fully".

Given the focus of the MCIT's efforts in developing the lower value services in the BPO/ITeS value chain, TVET may be an added source of employment and opportunity that could be of benefit to young job searchers and to the ICT industry itself. The UNDP report questions the quality of the training offered by existing TVET programs. MCIT in partnership with other ministries, the private sector, as well as the Ministry of Education, should partner to examine and potentially address this problem, not least with a view to meet the precise needs of the ICT industry at large and the ICT-enabled services sector in particular.

The private sector may see an opportunity through investing in TVET and offering programs that meet certain international or national certification requirements. The ICT sector in general and the BPO/ITeS sector in particular, under the aegis of the MCIT and the various ICT professional associations, should track developments of the European Commission project to reform the TVET system as described in the UNDP Egypt Human Development Report 2010.[75]

4. Promote inflows of graduates from abroad through "brain circulation"

China, India, Singapore and Taiwan Province of China are among those economies that have benefited from returning graduates who have been trained abroad in leading universities in the United States and Europe. They have seen significant inflows of business and scientists who may have earned university training abroad, as well as apprenticeship in overseas corporations and government agencies.

When these expatriates return, they bring with them technical and managerial expertise and connections and, in some cases, access to finance, to the great advantage of the country to which they are returning. Returning experts can also contribute to enhancing the quality and capacity of the educational establishment in the home country.

Existing schemes to enhance networking and research exchanges and collaboration with universities in Western and other countries are an important first step, but are insufficient. Only a few can benefit from this networking opportunity at institutions such as Nile University. A special effort could be explored to identify and attract returning ICT graduates to Egypt.

5. Engage more with the Egyptian Diaspora network

Efforts should also be enhanced to attract Egyptian experts in the diaspora to come back home and/or to take advantage of networks of Egyptians working overseas in a way similar to that which links overseas Chinese in a global network of business and collaboration. The Government of China recognizes the importance of the diaspora for building a technologically advanced and savvy society, and for expanding the scientific capacity to innovate and create new ideas. It also recognizes the importance of the millions of

[71] Ottawa Carleton e-school. 2010. Ontario's Internet high school. http://www.ottawacarletone-school.ca/
[72] http://www.ottawacarletone-school.ca/viewpage.asp?ID=149
[73] Institute for Cooperative Education. 2010. Welcome to the Institute for Cooperative Education. http://www.ice-sl.org/
[74] UNDP. 2010. Ibid.
[75] UNDP. 2010. Egypt Human Development Report 2010. Chap 12, Technical training. See Box 12.5. The EC Project: Assistance to the Reform of the TVET System.

overseas Chinese for promoting local entrepreneurship. China's talent schemes aim to attract top tier researchers from around the world by providing a variety of incentives.[76] Most of these intended beneficiaries are members of the diaspora.

The Central Organisation Department of the Chinese Communist Party launched the "One Thousand Talents Scheme" in December 2008. It aims to recruit 2,000 talents of any nationality in the next five to ten years. By April 2009, the scheme had lured the first batch of 96 scientists and 26 entrepreneurs to China, more than 80 of whom held foreign passports and four were of non-Chinese origin. More than 1.2 million Chinese had studied abroad by 2007 and of these, 200,000 had been working in developed countries, including 67,000 with titles equivalent to assistant professor and 15,000 with titles equivalent to associate or full professor.[77] The Government has also been successful in promoting returnee entrepreneurship in the ICT sector, including in technologies related to the Internet, communications, media and clean energy. By February 2009, China had established more than 110 overseas returnee entrepreneurship incubation centres, encompassing more than 8,000 enterprises and 20,000 returnees.[78]

Such "brain circulation" and networking would bring various benefits also to Egypt, including better links to foreign centres of excellence. Efforts to provide Egyptian graduates with exposure to the best the world has to offer is essential for the country to forge its place as a world class centre of research and innovation. A part of this could also include encouraging exchanges of students and faculty from foreign universities to promote exchanges and collaboration.

The International Organization for Migration report identified factors that limit the engagement of the Egyptian Diaspora with Egypt and made concrete suggestions to overcome existing barriers. Some of the reasons highlighted included the role played by Egyptian embassies and consulates, lack of proper market research and information on investment opportunities, corruption, and a lack of success cases.[79]

The Government does make efforts to promote investment in Egypt by, and returned inflows of, the Egyptian Diaspora and there are incentives for this purpose. The Government could, however, do more to help bridge the gap between government organizations and diaspora communities by taking into consideration their concerns and by facilitating interaction and engagement. A significant action would be to enhance communication and information sharing with the diaspora communities through the use of modern, well designed, and targeted messages and services mediated by web based and on-line information sharing platforms.

MCIT and ITIDA could launch a dedicated effort to target the Egyptian Diaspora with links to the ICT sector. The diaspora communities should be made aware of specific policies and incentives encouraging investment. Egyptian authorities should showcase successful examples of diaspora investors in the ICT sector or even of other international investors to help dispel erroneous perceptions. Targeted efforts could also be made to invite diaspora members, experts, investors and companies to come to Egypt and share their expertise and views. There is much experience with using diaspora experts in this fashion. Transfer of Knowledge Through Expatriate Nationals (TOKTEN) programs and initiatives were initiated by UNDP back in 1977 and have been used for many years in the Arab region.[80] The Government may seek more effective targeting of ICT-relevant groups in the diaspora.[81]

ICTs should be used to enhance the connection between Egyptian members of the diaspora, Egyptian educational institutions as well as Egyptian students. They could also be used to boost collaboration and encourage Egyptian experts overseas, including business people as well as business owners and entrepreneurs, to contribute to their home country and the young people in it. Such a proposition could be appealing to many who would otherwise not be interested or available for this purpose.

[76] China Daily. 2010. China adopts new policy to attract foreign talents. Jun. 8, 2010. http://www.chinadaily.com.cn/business/2010-06/08/content_9949522.htm

[77] Zhao L.and Zhu J.. 2009. China's Talent Schemes: Initiatives from Central to Local Governments. East Asian Policy, Vol.1, no. 4, Oct/Dec 2009. P. 34-41. http://www.eai.nus.edu.sg/Vol1No4_ZhaoLitaoZhuJinjing.pdf

[78] Ibid.

[79] IOM. 2010. A Study on the Dynamics of the Egyptian Diaspora: Strengthening Development Linkages. Cairo.

[80] UN Volunteers. 2006. TOKTEN channels global expertise back home. http://www.unv.org/en/what-we-do/countries/viet-nam/doc/tokten-channels-global-expertise.html, also: ILO. 2009. The TOKTEN (Transfer of Knowledge Through Expatriate Nationals) Program. http://www.ilo.org/dyn/migpractice/migmain.showPractice?p_lang=en&p_practice_id=26

[81] IOM. 2010. Ibid.

6. Make it easier for international experts to work and live in Egypt

Along with efforts to attract world class Egyptian experts, the Government needs to try and attract world class experts per se. Some private sector representatives interviewed found it difficult to bring in foreign experts or visiting scholars for ICT research and development into Egypt. One reason was that there are no relatively inexpensive executive class accommodations to receive such visitors along with their families. Efforts to overcome this limitation are needed for Egypt in general, and Cairo especially, to be considered a more business friendly work environment on par with other business centres and technopoles around the world. The MCIT should develop a targeted strategy together with ITIDA and GAFI to remove barriers to attracting greater inflows of international experts related to the ICT sector.

7. Measure the impact of the training provided by SECC

Any strategy should be developed according to a vision and the setting of well articulated goals, defined benchmarks and indicators in order to be able to monitor progress and analyze outcomes and results. In the case of the SECC, investments were made in the areas of software and IT services. However, the SECC is reportedly unaware of the return on investment as a result of the training offered to companies. For instance, are companies exporting more? It would be important to be able to measure the impact of the training based on, for example, the increase in the level of product exports of the companies before and after the training. Specific survey instruments need to be developed and applied using some of the on-line survey tools already used in this report. Such surveying can be done by the MCIT or outsourced to local market research firms.

8. Use survey tools to review and assess the needs and satisfaction rates of ICT sector employers, employees, educationalists and students

In order to remain up-to-date, regular surveys of ICT companies, teachers, instructors and students should be undertaken by the Ministry of Education, the Ministry of Higher Education and the MCIT and other responsible institutions to better understand their evolving needs. This can be achieved using on-line tools, especially to assess student, staff and graduate satisfaction with training and job prospects. It would also be useful to survey graduates who have been employed, as well as employers of recent graduates, to continuously track and trace concerns related to the performance of the various MCIT training, education and learning initiatives. ITIDA occasionally undertakes surveys, but these should be conducted on a more systematic basis.

While ITIDA already undertakes surveys among ICT firms and maintains ongoing communication with ICT companies, there is a need to obtain hard data to enable the education system and the programs of the MCIT in the education and learning sector to be adapted and scaled accordingly. One way of doing this is through annual surveys.

9. Define specific targets in the next strategy

With a view to monitoring progress over the next few years, the Government should define specific targets and indicators related to the availability of skills for the ICT sector. While the precise formulation of such targets would need to be developed in dialogue with the ICT industry, the following suggestions could serve as a starting point.

Rate of satisfaction among domestic and foreign ICT sector enterprises (with special focus on those in BPO/ITeS) with regard to the availability and quality of ICT skills in Egypt.

- Number of foreign experts attracted annually to work in the ICT industry in Egypt.
- Number (and value) of ICT investments by Egyptian Diaspora.
- Number of experts from the Egyptian Diaspora returned to work in the ICT industry in Egypt.

CHAPTER IV. ASSESSMENT OF ICT USE IN THE EDUCATION SYSTEM

"ICT for education and lifelong learning" is among the NICTS priorities and involves an ambitious program. The Egyptian Education Initiative (EEI) has been taken to address this requirement by focusing on reforming the educational system in Egypt. The NICTS states that a "major component of this reform is the utilization of technology in education, the primary motivation for which is the firm belief that it will stimulate student-based learning." The MCIT is working closely with the Ministry of Education and Ministry of Higher Education to this end.

The main stated objectives related to this area in the NICTS are:

1. Implementing the EEI to develop the skills needed for the knowledge economy - ICT industry development track with the Professional Training Program to build a pool of 35,000 skilled ICT graduates.
2. Integrating ICT skills within the curricula of university faculties of education, law and business.

A. Main achievements and challenges

With a young and growing population of over 80 million inhabitants, Egypt had over 52,000 primary and secondary schools in 2010. Hundreds of new schools are built each year. More than one million teachers are in service and thousands more are recruited annually. The challenge is to provide for this large and growing population and educational sector.

While over 2,000 schools have benefited from either the Smart Schools Network or the EEI initiative, this still represents less than five per cent of all schools.

As part of the EEI, about 35,000 teachers have received the International Computer Driving License (ICDL) training. Another 150,000 are qualified to take the ICDL test.[82] Around 100 technology clubs have been established inside the schools. In 2007, the EEI was honoured on the occasion of the Technology in Government in Africa (TIGA) award in Addis Ababa.

[82] According to CAPMAS, the total number of teachers in Egypt for 2009/2010 was 848,386.

At the same time, a survey published in 2009 suggests that equipping schools with technology infrastructure and training school staff on ICT tools and applications are not sufficient to enhance performance.[83] More needs to be done by way of raising awareness and creating orientation activities prior to all other inputs (i.e. infrastructure, connectivity and training) to enable schools to make good use of such inputs.

Bearing this in mind, Egypt needs to find ways to extend the Smart Schools Network and the EEI-supported schools throughout the country while keeping costs under control.

1. Higher education

The large number of universities poses a special challenge. There are "18 public universities, with approximately 300 faculties, 12 million undergraduates and 20,000 staff members. The EEI track objective focuses on the promotion of e-learning as a basic component to overcome the challenges of large numbers of students versus low numbers of teaching staff, as well as the limited size of lecture rooms".[84]

The MCIT and ITIDA are moving to address these issues. In collaboration with Cisco, 350 E-learning centres have been established, contributing to the development of e-content. All public universities and national research institutes have been connected via the Egyptian Universities Network (EUN), a high-speed network (34 Mbps) linked to the Internet and Internet II, enabling the Ministry of Higher Education (MoHE) to promote scientific research. A videoconferencing system is also part of this infrastructure.

2. Lifelong learning

IT Clubs (see chapter II), co-located and managed by local and community groups, are one of the conduits for reaching the population at large using ICTs. The EEI works with civil society organizations to promote

[83] Nasrallah, A. N. 2009. Contemplating a Theory of Change for the Effective Use of ICT in Egyptian State Schools. Pre-university Track Outcome Evaluation. June 2009. MCIT. 38 pp.

[84] MCIT. (2008). The Egyptian Education Initiative...Keys to Success. May 2008. MCIT, Cairo.17 pp. http://www.mcit.gov.eg/Brochures/SWF/PublicationsShow.aspx?file=The%20Egyptian%20Education%20Initiative....Keys%20to%20Success.swf

and use ICTs for lifelong learning.[85] However, content to assist informal learners still needs to be developed.

The IT Clubs have had some success in training people. They have been most successful where there are strong local and community level organizations that have been able to make best use of this resource for the benefit of local populations. For example, the consulting team visited a large local NGO which hosted an IT Club in Mansoura. The NGO in question also engaged in several activities at the local and community level, including operating a hospital/large medical clinic, and was closely associated with the local mosque. The IT Club has been in operation since 2001 and now has over 140 PCs at its disposal for public PC and Internet access, as well as extensive training activities. The NGO provides ICDL training for Government employees. It is a resource valued by recently graduated young people, who for the most part either receive training or take advantage of the job placement services of the NGO.

However, IT Clubs on their own are insufficient to provide the learning skills required by people at the local and community level in Egypt in general and in rural areas in particular. Some IT Clubs are too small or are unsustainable without public funding. Others are operated as simple access facilities. As a result, they are ineffective in achieving the objectives of enhancing lifelong learning in Egypt.

B. Recommendations

1. Provide education on a municipal networking platform

The Smart Schools Network and the EEI Schools have been successful in raising the quality and extent of ICT based education in the school system. Both of these projects demonstrated what is possible when funds are available. The problem with diffusing the experience of SSN/EEI Schools to the rest of country is a matter of scaling up. Under the present circumstances, it would simply be too expensive, i.e. impossible, to extend SSNs to over 52,000 schools as a one-off expense of the Government, even if spread over several years. Other factors, such as the availability of trained teachers, would also limit the ability to ramp up the program.

But there are other possibilities that can be undertaken in a stepwise fashion involving stakeholder groups and in several locations at the same time, as well as possibilities for seeking funding from a variety of sources (see below under item 2). These could subsequently be adapted to the country as a whole. The problem is not just one that affects the school system. It is a development issue as well as a capacity issue. It may be useful to experiment with a model of educational system development and computerization that is tied to ICT based local economic development initiatives, such as the municipal networks outlined in the infrastructure section.

As mentioned in chapter II, municipal networks can serve not only as economic development hubs, but also as community development and education facilities. The municipal network idea might be experimented with to include educational computerization similar to that achieved under the SSN and the EEI Schools projects and even to go beyond (see the recommendation on experimenting with ICT below). By placing these initiatives on a community basis, by enacting various incentives - appropriate policies to make municipal networks a possibility, by providing some funding, even if limited, by encouraging municipalities to compete for this funding, and by exercising creativity in procuring funding from the community, it maybe possible to create positive traction. The idea is simple: a rising tide lifts all ships.

The first step in this process is developing the municipal network concept, piloting it and ensuring that, from the outset, essential community based services such as primary and secondary education, health service provisions, as well as community access to ICTs, are components of the project. In other words, the municipal network should connect government, private sector operators, public service providers (such as schools and hospitals) and IT Clubs, as well as other community access facilities to the municipal network itself.

This can help to provide the required connectivity, and serve as a basis for encouraging computerization of the schools. Perhaps this would not be accomplished immediately to the level of the model Smart School or EEI School, but would be on the path to full connectivity and computerization, as defined by the Ministry of Education in consultation with the MCIT and other partners at the local and community level.

[85] MCIT. 2008. Ibid.

Communities where the scale of the local economy may be sufficient to sustain the initiative and perhaps even make it self sufficient in the shorter term may be the first candidates for consideration of this idea. Larger centres can develop their municipal networks first, including their connected Smart Schools, and these can then connect to smaller communities and serve to support and encourage their transformation into Smart Schools. In this model, the larger schools would serve as resource centres for less connected schools in their geographic area, i.e. the governorate or part thereof and beyond. Incentives can be a part of this endeavour, including national achievement awards recognizing progress at the municipal, institutional as well as individual levels.

The role of the MCIT working with a select number of municipalities, as well as with the Ministry of Education and local school commissions, and parent-teacher associations would be to develop this municipal network concept, and along with it, the Smart School/EEI School model. More important, the MCIT and private sector partners, as well as other government counterparts, would be responsible for developing the business case and then for developing the business plan and model for realizing this idea in a select number of test or pilot communities. As more actors are engaged, more venues for funding these initiatives may become apparent.

The municipal network brings many potential benefits. The idea motivates governments, municipalities and private sector operators to think of how being connected to broadband can create value and enhance community life and development.

2. Explore lessons from the IT@School Project in Kerala State, India

The Indian state of Kerala has been implementing the IT@School Project[86] since 2001 and has achieved some success in the process, having been short-listed in 2010 by the Stockholm Challenge award.[87] While smaller in scale than the Egypt-wide SSN and EEI projects, the IT@School Project shares similarities. First of all, it is a large scale project that includes many schools and it is government driven.

One of the characteristics of the Kerala project is that it encourages the schools to work together and to compete in achieving greater use of ICTs. In the Kerala example, ICTs are used not only for connectivity and ICT learning, but "to enhance the intellectual capability of teachers on the one hand and the curricular comprehension of the students on the other by providing ICT enabled education to 6 million students every year."[88] The objective of the project is 1) to provide education about ICTs, i.e. Information Technology Education, and 2) to use ICTs to enable the learning process itself, i.e. "ICT enabled education" as well as embedding ICTs in the education and learning process, and to do this over the three phases of the project. The first phase of the project, i.e. Information Technology Education, has been completed and the second phase on "ICT enabled education" has been initiated. The project now covers 12,000 schools in the state, and an estimated six million students and 200,000 teachers.

As in Egypt, funding requirements for the project are daunting. The Government of Kerala has obtained funding to meet the hardware requirements of schools from a variety of sources, including the development funds of local self government institutions, local area development funds of the Members of Parliament (MP) and of the Members of the State Legislative Assembly (MLA), as well as funds available with the Parent-Teacher Associations.

The project is a long-term engagement and proceeds in steps. Its focus is not only on teaching how to use ICTs (how to use and operate hardware and software as well as programming), but aims also to enhance and facilitate learning by using ICTs. All educational delivery is done using ICTs and includes classroom technologies as well as instructional design and delivery. The project operates using open source (i.e. freely available) software (Linux/Ubuntu), and encourages the free use and therefore free and wide distribution of content. By extension, this encourages content development.

The project has developed e-text books, PDF versions of textbooks and handbooks, a resource DVD for teachers, as well as other educational content. A SchoolWiki has also been developed.[89] It seeks

[86] Government of Kerala, Dept. of General Education. 2010. Welcome to IT @ school. Accessed 20101203. http://www.itschool.gov.in/

[87] Stockholm Challenge. 2010. Winners in the education category. Dec. 1, 2010. http://www.stockholmchallenge.org/challenge-2010/education

[88] Stockholm Challenge. 2010. IT@School Project - programme for ICT interventions in schools in Kerala, India. Dec. 1, 2010. http://www.stockholmchallenge.org/project/2010/itschool-project-programme-ict-interventions-schools-kerala-india

[89] http://www.schoolwiki.in

to empower teachers, to make them IT champions and to encourage them to implement ICT learning. The project has brought broadband Internet access to all high schools and educational offices. A satellite based educational system has been put into place that uses India's educational satellite EDUSAT and an educational channel has been launched: IT@School VICTERS (Virtual Classroom Technology on Edusat for Rural Schools). VICTERS is telecast 17 hours a day and includes in-house as well as international content. The channel has agreements with institutions such as the BBC, Deutsche Welle and others.

3. Experiment with distance learning for adult and lifelong learning

A strong lifelong learning program may enhance the use of IT Clubs and other community access facilities (CAFs) such as cyber cafes. Such a program could start by focusing on skills that are most sought according to demand studies among working people as well as employers in general, including SMEs. The Ministry of Education and the Ministry of Higher Education working in collaboration with the MCIT and the ministry responsible for manpower and training should be responsible for these programs.

This could strengthen the ICT capabilities of blue collar workers initially, and encourage people with less formal education to take up ICT literacy classes, as well as complete the requirements for entry level jobs. Distance education could also offer ICDL training to participants.

Distance learning could encourage computer use and Internet uptake and contribute to meeting demands for content in the form of educational materials.

While the Egyptian E-Learning University (EELU) was established in 2008 to provide distance learning to students, doing so for adult learners seeking to develop and/or enhance their skills would be an important service. It could contribute to more widespread ICT literacy in the population as well as the development of relevant e-content (chapter V).

The design and implementation of such a program could benefit from the experience of institutions that have already successfully implemented distance learning programs, institutions such as the Open University in the United Kingdom. The Egyptian Government (or an appropriate agency) could solicit their expertise in assessing the potential for distance learning and develop a pilot project to further implement this idea with adult learners.

4. Integrate ICT into teaching and learning in an institutionalized manner

Integration of ICT into teaching and learning activities should become more widespread. One observer suggested that it is undertaken more because of 'survival anxiety' among school teachers rather than on clear institutional goals of integrating technology in pedagogical practices.[90] A comprehensive assessment of what it takes for schools as an entire entity, rather than simply individual teachers, to integrate technology and get ready for the required change should be undertaken to obtain a basis for drawing up detailed action plans. These plans should also include actions related to the development of relevant digital content (see chapter V).

5. Review the EEI's efforts at integrating ICT skills in curricula

An impact analysis of the EEI's efforts at integrating ICT skills in the curricula of the faculties of education, law and business should be undertaken when the pilot phase draws to a close.

6. Assess the potential of virtualization technologies and use of cloud computing

Infrastructure costs associated with the Smart Schools Network and related initiatives are prohibitive when extended to the whole of the country. It is unlikely that local authorities or communities on their own will be able to sustain the costs of this facility. Significant assistance from other sources, especially from the Government, will be needed unless private sector partners could step in to roll out the technical components of the Smart Schools Network to over 52,000 schools throughout the country.

One novel solution that could be explored involves the use of virtualization technologies to reduce the number of central processing units (CPUs) servicing school labs. In this case, one virtualized PC or ultra-thin client device can be turned into 10 independent workstations at a cost of about $50 per seat. These devices are easy to ship and install, require minimal maintenance, and use only a single watt of electric-

[90] Nasrallah, A. N. 2009. Contemplating a Theory of Change for the Effective Use of ICT in Egyptian State Schools. Pre-university Track Outcome Evaluation. June 2009. MCIT. 38 pp.

ity per seat. Server virtualization is now a well-known technology, and desktop virtualization is also growing.

Egypt shares the challenge of bringing modern tools such as PCs and the Internet to schools with many countries. Brazil, for example, is also seeking to computerize thousands of schools throughout the country and is considering the use of virtualization technologies. In Brazil, a Canadian company that produces virtual desktop solutions has announced it will be helping over 5,500 communities provide 356,800 virtual desktop solutions for schools in these communities.[91] NComputing, another provider of desktop virtualization solutions, reports having sold over 2 million seats of its virtual desktops in 140 countries.[92] InfoDev has been researching the question[93] and UNECA has been exploring the use of virtual desktops for African schools with the assistance of NComputing.[94] A pilot project has already been completed in Burkina Faso and others are ongoing. Egypt may consider this technology as well to computerize schools and the educational system.

Along with server virtualization, cloud based service provisioning is another increasingly important alternative for school commissions, governments and others to consider.[95] Cloud based service provisioning could be used to replace facility based physical computing resources with centrally located and broadband connected servers hosting all necessary applications and data, and providing access to central processing computing resources.[96] What is required is to develop centrally located and cloud based educational servers and applications. By centralizing educational resources, including computing resources in cloud based servers, the Ministry of Education and the Ministry of Higher Education would also be in a position to make plans to save and conserve considerable amounts of energy that would otherwise be used to power PCs and peripherals in schools. The data centres that power cloud based services could be located in places where the cost of energy is lower and the availability of energy is much greater than in Egypt. In times of energy shortfall, e.g. in the summer months, the country is subject to power outages.

Many multinational ICT companies such as Google, Amazon, Microsoft, Salesforce and many others are increasingly cloud based and/or offer increasingly popular cloud based services. Cloud computing is an ever growing computing platform of global dimensions.

In Ethiopia, cloud computing is already used in the educational system. Based on the Microsoft Azure cloud platform,[97] the Government of Ethiopia is rolling out a solution that will allow teachers to download curricula, keep track of academic records and transfer student data securely without having to build a support system involving hardware and client software.[98] Over 200,000 teachers have been provided with laptop computers for this purpose.

Along with the cloud based central servers, the Ministry of Education and the local communities would need to provide schools with broadband connections to these central servers which host the applications, the data and other educational resources and services. PCs could be replaced by terminals and keyboards and the requisite Internet connection equipment. The need for school based servers would be greatly reduced, if not eliminated.

7. Enhance private sector involvement in the provision of training and education using ICTs at the local and community level

The MCIT should assess the market potential for e-education and consider the business case for offering such services under a PPP arrangement if required. ICT-based lifelong learning services should continue to be encouraged and developed in the way that IT Clubs (such as the one mentioned above in Mansoura) are presently doing.

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[91] Userful. 2009. PRESS RELEASE: Userful and ThinNetworks Announce the World's Largest Desktop Virtualization Deployment - 356,800 Green Workstations. February 17, 2009. http://www2.userful.com/company/linux-desktop-virtualization

[92] IT.TMCNET.COM. 2009. NComputing Sells Over Two Million Virtual Desktops Seats, Releases USB Virtual Desktop. By R. J. Singh Chaudhary. October 15, 2009. http://it.tmcnet.com/topics/it/articles/66701-ncomputing-sells-over-two-million-virtual-desktops-seats.htm

[93] Kelly, T. 2008. Desktop virtualization as means of providing low-cost computers for schools. InfoDev, October 7, 2008. http://www.infodev.org/en/Article.275.html

[94] DesktopLinux.Com & eWeek. 2009. Virtual Linux desktops tapped by UN. E. Brown, May 29, 2009. http://www.desktoplinux.com/news/NS5460318693.html

[95] Subramanian, K. 2009. How Cloud Computing Can Help School Education? Jul. 30, 2009. http://www.cloudave.com/1790/how-cloud-computing-can-help-school-education/

[96] Microsoft. 2011. Cloud computing for education. Accessed 20110617. http://www.microsoft.com/education/solutions/cloudcomputing.aspx

[97] Ibid.

[98] Pian Pian, S. 2009. Microsoft cloud computing gets down to earth. Jul. 13, 2009. http://seattletimes.nwsource.com/html/microsoft/2009458942_microsoftazure13.html

The Government may also need to adapt the policy and legal environment to help privatize and grow on-line service delivery. Many different models can be considered, including the IT Clubs and others. It may be necessary for the Government (through the MCIT and ITIDA) to consider models whereby a mix of learning and other public services are offered. Using local service centres including community access facilities of all sorts (cybercafés, IT Clubs, schools, libraries and post offices) to provide a gamut of services in the public and commercial realm may stand greater chance of being financially sustainable and reaching large numbers of Egyptians.

The Government should explore in detail what services are most likely to best meet the needs and circumstances of Egyptians in different parts of the country. One option is to encourage the private sector and to develop appropriate PPP models for the delivery of these services. The private sector as well as NGOs and grassroots organizations need to be involved in assessing the opportunity and in developing an appropriate response.

By stating that private sector operators can have a role to play in the service delivery, the Government may encourage and engage private entrepreneurs in making investments and sharing skills and expertise that can assist the Government in providing on-line services.

The Government may also consider developing standards for teaching done outside the public education establishment, and certifying private sector and/or community operated ICT schools and training institutes offering these services. Certification can be an effective way of influencing content and helping to target training to better meet the needs of the private sector and of the Government.

Closer collaboration with other branches of government such as the Ministry of State for Administrative Development would also be important. Collaboration and integration of Government service delivery may be achieved more easily at the level of a municipality.

8. Establish clear and measurable targets

As in other areas of this Review, the Government should in the next strategy identify quantifiable and realistic targets related to the use of ICTs in the educational sector in coordination with the Ministry of Education. These may, for example, relate to the following core ICT indicators developed by the Partnership on Measuring ICT for Development, which are already being collected in Egypt.

- Proportion of schools with a radio used for educational purposes.
- Proportion of schools with a television set used for educational purposes.
- Proportion of schools with a telephone communication facility.
- Learners-to-computer ratio in schools with computer-assisted instruction.
- Proportion of schools with Internet access (by type of access).
- Proportion of learners who have access to the Internet at school.
- Proportion of learners enrolled at the post-secondary level in ICT-related fields.
- Proportion of ICT-qualified teachers in schools.
- Proportion of schools using virtualization technologies
- Proportion of schools linked to centrally located and cloud based educational servers and applications

CHAPTER V. E-CONTENT DEVELOPMENT

Enhancing the availability of relevant content in Arabic on the Internet and other forms of ICTs (such as mobile devices) is of central importance to promote greater uptake of ICTs in Egypt. At the same time, the development of such content also represents a growth opportunity, as much of it could potentially be generated locally for the Egyptian market and beyond. The expansion of the "e-content industry" would therefore not only help to reduce the digital divide between English and Arab speakers but also provide employment and export opportunities.

E-content involves various forms of digital media content and other applications needed to access, view and, in some cases, interact on-line. It may include content related to such diverse areas as e-culture, e-commerce, e-agriculture, e-government (including e-procurement) among others. Whereas targeted beneficiaries and users of such content will differ, content development in all areas can support the strengthening of the e-content industry. Production of e-content can be done by both the public and private sector, and often in partnership.

This chapter provides an assessment of selected initiatives put in place by the MCIT and its affiliates, other Ministries and other stakeholders. It identifies opportunities and challenges that need to be addressed to ensure the development of relevant e-content, and makes specific recommendations. But before discussing the main achievements, challenges and recommendations, it begins with a brief review of Arabic e-content in Egypt and other parts of the Arab world.

A. The state of Arabic e-content in Egypt and the Arab world

There are around 56 million Arab Internet users in the Arab world, but only one per cent of the content on-line is in Arabic. According to Google, the number of Arabic Internet users in the Middle East and North Africa is expected to grow by nearly 50 per cent over the next three years, from 56 million to 82 million by 2013. Arabic is only the seventh-most used language on the web. For example, the Arabic language portal of Wikipedia carried 120,000 pages compared with 2 million pages in Catalan – despite a much larger number of Arabic users.[99] At the same time, Arabic was the fastest-growing Internet language; from 2000 to 2010; the number of Arabic speaking Internet users rose from a low level by 2,501 per cent.[100]

According to Alexa, the top 10 Arabic language web sites in September 2010 were google.com and askjeeves.com (table V.1). The "Top Web sites in Egypt" include several English language sites.[101] According to the Alexa on-line service, the most popular ones are Google Egypt, Facebook and YouTube.

Table V.1. Top 10 Web sites in Arabic[102]

Rank	Website	URL
1	Google	google.com
2	Ask	askjeeves.com
3	جو جل السعودية	google.com.sa
4	Maktoob.com Inc.	maktoob.com
5	Kooora - كووورة	kooora.com
6	و جل الإ مارات العربية المتحدة	google.ae
7	ماي ايجي	myegy.com
8	MSN Arabia	arabic.arabia.msn.com
9	RIA Novosti	ar.rian.ru
10	إجابات جو جل	ejabat.google.com/ejabat

Source: Alexa.com (Sept. 2010)

Arab Internet users are gradually relying more on the Internet for their news, videos, social interactions and more. The main issue remains the unavailability of broadband access. The media industry, driven largely by Egypt and Saudi Arabia, will be expanding because of broadband growth.[103]

Growing numbers of Arab users are using social networking sites. "*Social networking site Facebook has also added an Arabic-language interface and gained 3.5 million Arabic-speaking users in a year, representing 23 per cent of the total 15 million Facebook users in the Mena region. Some 70 per cent of these are*

[99] Locke, S. 2010. *The push for Arabic content on-line*. MEED. Issue No 28 9-15 July 2010. http://www.meed.com/sectors/telecoms-and-it/telecoms/the-push-for-arabic-content-on-line/3007704.article

[100] Internet World Stats. 2010. *Internet world users by language. Top 10 Languages*. June 10, 2010. http://www.Internetworldstats.com/stats7.htm.

[101] Alexa.com. 2010. *Top 100 sites in Egypt*. http://www.alexa.com/topsites/countries/EG.

[102] Alexa. 2010. *Top sites in Arabic*. http://www.alexa.com/topsites/category/Top/World/Arabic Accessed 20100908.

[103] http://www.startuparabia.com/2010/02/arab-world-current-state-of-the-Internet-future-growth/

based in just five countries – Egypt, Morocco, Tunisia, Saudi Arabia and the UAE. Egypt and Saudi Arabia's communities have seen the strongest growth in the past year, with each adding 1.1 million Arabic-language users. North African countries Algeria, Morocco and Tunisia account for 3.7 million French-speaking Facebook users, equivalent to nearly 25 per cent of all Mena users".[104]

Until recently, there was no single or dominant Arabic language search engine. Google has launched one such search engine and there are now several others available or in development in Egypt. Because Google is the most popular website in Egypt, it is likely that the Google Arabic language search engine is also the most used.

When it comes to existing Arabic on-line content, little appears to be relevant to the average Egyptian, for several reasons. One problem is that there are not enough users on-line creating content and not enough content in Arabic to push broader Internet adoption.[105] According to Wael Ghonim, Google's marketing manager for the MENA region "*There is a lack of high-quality, well-structured websites managed by companies creating digital content for Arabic-speaking users*". Much of the content comes from machine translated sources. According to this same source, "*there is a lack of original, localized, high-quality content*".[106] The creation of Arab language domain names may help to improve this situation (see below).

Another problem is linked to the young age of MENA users. About 20-25 per cent of users in the region are completely new to the Web and a third of them are under the age of 18.[107] The fractured nature of the Arab language content market is a further reason. Each country has its own language characteristics, and these have to be taken into consideration when designing national portals and websites.

An added complication in the case of Arabic content is the lack of specialized Arabic virtual communities, like agricultural, handicrafts, entrepreneurs and other communities, as well as the lack of collaborative content generation platforms. Many scientific communities are used to communicating in and publishing their work in the English language because of its wider reach. Science and research citation indices and services work with Roman character scripts and not with Arabic scripts.

Penetration of mobile telephone services is generally high in the region and smartphone uptake is growing. However, Arabic content accessible on wireless devices is limited. While more than 300,000 applications have been developed for smartphones such as the iPhone, Blackberry or Android, only a handful of these have been developed for Arabic language users.

B. Main achievements

E-content development in Egypt, as in the rest of the Arab region, is still emerging. Among its priorities, the NICTS mentioned the development of a high value Arabic content industry and required Arabic applications. The objectives are to support universities, research centres and companies in developing research and development capabilities in support of digital content and to encourage the creation of local community digital content. Another objective is to create an environment conducive to the sustainable production of Arabic on-line digital content.

According to interviews with the MCIT, the current focus of the Government with regard to fostering digital content is related to the following areas.[108]

- Community/social content
- Natural and human heritage content
- E-government content, including land registration
- Literature (e-books)
- Content relevant to the private sector, especially SMEs
- Educational content, and
- Content related to tourism

The NICTS did not establish a clear set of objectives for each of these areas. The Review found that most progress has been made in regard to content for education, business and culture. Content is being produced by the public as well as the private sector, sometimes in partnership. While the main driver for new content is the demand for different kinds of information and services, governments can help "create" demand by taking various supply-side initiatives that raise the awareness among potential users. Based on

[104] Locke, S. 2010. *The push for Arabic content on-line*. MEED. Issue No 28 9-15 July 2010. http://www.meed.com/sectors/telecoms-and-it/telecoms/the-push-for-arabic-content-on-line/3007704.article
[105] Ibid.
[106] Ibid.
[107] Ibid.

[108] There are other areas which are not captured as they go beyond the scope of the Review.

the initial work of the MCIT on content development, the number of "hits" recorded by Egyptian e-content rich websites is increasing, both from inside and outside of Egypt.

Among the main achievements to date are the Arabic e-Content for Books and Software Initiative, mobile content development, cultural and educational content development, e-government content, e-commerce content, content for the general public, and the use of Arabic domain names.[109]

1. The Arabic e-Content for Books and Software Initiative: promoting digitized literature

The Arabic e-Content for Books and Software Initiative is a partnership between the MCIT, the Egyptian Publishers Union and the E-Learning and Business Applications Union. Under this initiative, the focus of the Government's efforts has been on encouraging publishing houses to digitize their content. After a lukewarm initial response, publishers have begun to see opportunities from content digitization. The MCIT has encouraged publishers of Arab content to publish on-line and has given them incentives to do so. The MCIT has also overcome concerns of the publishers regarding intellectual property rights (IPR). The MCIT has partnered with the NGO "E-Labs" to develop a business model that would encourage publishers to publish their books on-line. A digital platform has been developed allowing digital rights management (DRM) to secure and protect their intellectual property. As a result, at least 70 publishers now participate in an initiative aimed at making digitized content available for on-line delivery.

2. Natural, human, cultural heritage content

The Center for Documentation of Cultural and Natural Heritage (CULTNAT), with the financial support of the MCIT, has developed the following 14 projects since 2001. These projects have been executed in partnership with the Ministry of Culture, Ministry of Endowments, the Ministry of Foreign Affairs, the Ministry of Agriculture and Land Reclamation, the Egyptian Council of Ministers, Egyptian parliament association, Egyptian governorates, the General Organization of the National Library and Archives of Egypt, Arab Ministers of Communications and Information Technology, Arab Ministers of Culture, as well as enterprises and organizations from Arab countries.

[109] See http://www.mcit.gov.eg/ICT_e-Content_1.aspx.

The projects aim to promote Egypt's cultural heritage on specific web portals using state-of-the-art technology, high-resolution and three-dimensional images, third generation search engines and interactive maps, available in several languages. Those projects include the following:

- Eternal Egypt (2001-ongoing): www.eternalegypt.org is concerned with Egyptian civilization through history, covering events, characters, museums, objects, as well as historical sites.
- Luxor Heritage Center (2005 - 2007): The state-of-the-art center inaugurated in 2007, comprises a panorama of culture (CULTURAMA), 3D Show Hall and a public library.
- The digitization of the National Archives of Egypt (2005 - 2009): This project is unprecedented both locally and in the Arab region. It aims to sort, index and describe the contents of the National Archives including more than 100 million documents and create a database of about 25 million records. The Arab Federation for Libraries and Information offered its Appreciation Award for the distinct project in Libraries and Information Centers in 2009 to this project.
- The Historical Maps and Arabic Papyri at the National Library of Egypt (2005 -2008) comprises two projects: 1) the Cartographic Collection of the National Library of Egypt with a database of over 10,000 maps, dating to different historic periods; and 2) the Arabic Papyri at the National Library of Egypt, which harbors a unique wealth of rare Arabic papyri documents, of which 3,500 folios were digitized.
- The Documentation of Egypt's Presidential Palaces: a database on the architectural and social history of magnificent palaces. A special emphasis was given to the palaces, artifacts, historical photographs and sketches.
- The Information and Technological Infrastructure of Cairo Governorate (2005 -2008): its objective is to develop the information systems and the technological infrastructure of Cairo Governorate, in order to include the heritage of Cairo in the decision-making process, and to promote the exchange of information between the Governorate's information center and other departments such as the housing and utilities. In the framework of this cooperation, CULTNAT shared all information related to Cairo's

architectural heritage, for the implementation of two projects: "Cairo's street signs" and "Cairo's landmarks".

- The Memory of the Arab World (2007-2011): www.memoryarabworld.net aims to use the latest information technology techniques to save the overall memory of the heritage of the Arab world. Content from 19 Arab countries in the following themes is collected: the Manuscripts Heritage, the Architectural Heritage, the Arts Heritage, the Folklore Heritage and the Shared Memory. Among other outputs, a database for this heritage containing more than 5,200 data fields was created.
- Arabic Periodicals Archive in the National Library of Egypt (2007-2010) to ensure the preservation of newspapers, facilitating the search, retrieval and printing for the researchers.
- Heritage of the Egyptian Ministry of Endowments (2008 -2011) contains three projects: 1) a collection of Islamic manuscripts from the Central Library of the Sayyeda Zeinab Mosque; 2) a database of 10,000 architectural drawings (such as mosques, Islamic cultural centres and residential buildings; and 3) the masterpieces of Islamic architecture classified as monuments. Publications of these projects: including books, CDs and web-publishing, covered various subjects, scientific and rare Islamic manuscripts and architectural heritage.
- Cairo's Historical Buildings (2008 -2010), which aims to document and digitize plans of historical buildings that contributed to the social and urban development of the city of Cairo.
- Historical Botanical Gardens and Horse Races in Egypt (2009 -2016) project aims to document the historical background as well as diverse and rare plants.
- SHARI' AL MUIZ'S "Centre for Cultural Heritage and Sustainable Development" (2010 -2011): Under the umbrella of UNESCO, FEDA (Friends of the Environment Development Association), CULTNAT is currently establishing a center in an outlet in the historic city to give the visitor an informative experience regarding the city, and to promote a sustainable business model for applying ICT for heritage concepts.
- Digitization of the historical archives of the Council of Ministers (2010-2011): after the success of the digitization of the National Archives project, a database containing 60,000 records and scanning a number of 400,000 pages.
- Egyptian Parliament Association (EPA) project: the project aims to digitize minutes of the people's assembly meetings (approximately 1,000,000 pages).

3. News content

To encourage news departments of the Arab news network, including newspapers like *El Ahram*, to provide news services on-line, the focus of the Government's efforts has been to encourage newspapers to go on-line. Newspapers play a key role in the development of Arabic language content on the Internet, accounting for an estimated 40 per cent of its content.[110] As in other Arab countries, Egyptians have been slow to turn to the Internet for news. One reason is that there is an insufficient number of Arabic language new websites. This government initiative should help create incentives for enterprises in marketing and advertising to develop news services. A large and expanding archive of these documents exists on microfiche and the MCIT is working with Google to turn them into readable and searchable text.

Interest among newspaper publishers is increasing. They are beginning to realize that on-line news is an inevitable trend and that they need to get on the bandwagon to adapt to, and take advantage of, future market opportunities. Given that news on-line can be accessed by Arabic viewers in locations beyond Egypt's borders, successful new publishers may offer a wider market for potential advertisers.

The content and especially the news and other archives that *El Ahram* and other publishers create should be of interest to news syndicating agencies and information aggregators across the Arab world and beyond. These archives may also provide the business basis for *El Ahram* and other Arabic language publishers to launch their own news aggregation and syndication services, instead of selling them to foreign and non-Arabic speaking information and news services. Private enterprises (such as Google and Microsoft)[111] may furthermore be interested in this knowledge base

[110] Temis, S.A. 2010. *The SAMAR Project by French Business Consortium 'Cap Digital': a Platform for Managing Arabic Language Multimedia Information*. New York, March 16, 2010. http://www.temis.com/?id=75&selt=14

[111] Sharp, A. 2010. *Microsoft, Google eye Arabic web growth potential*. April 24, 2010. Thomson Reuters. http://www.ibtimes.com/articles/20798/20100424/microsoft-google-eye-arabic-web-growth-potential.htm

in order to help extend the reach of their on-line search services and search engines.

While the initiative with El Ahram is noteworthy, the El Ahram Web site (http://www.ahram.org.eg) has not yet made it to the top 10 of Arabic or Egyptian language websites. According to Alexa.com, the El Ahram site is ranked 65th in Egypt. More than half of all visitors to the El Ahram site are from Egypt. In the framework of the e-content initiative, a Memorandum of Understanding was signed by the MCIT and Al-Ahram Foundation aiming at developing the Al-Ahram portal, since advertising is one of the main revenue sources for traditional newspapers. In the last five years, the on-line media led to a remarkable decrease in the number of printed newspapers' readers; by this cooperation three projects were started with classified ads, mobile access and Internet radio.

Also, the MCIT has partnered with the News Sector of the Egyptian Radio and Television Union (ERTU) to build a news portal "www.egynews.net" to deliver up-to-date local, regional and international news in Arabic. The Portal provides Internet users with a variety of information and interactive services such as news articles, Internet user comments, voting, live streaming, on-line seminars, alerts and market reports. The average number of portal visitors per day has climbed from 6,000 visitors/day in December 2008 to 50,000 visitors/day in February 2011.

4. Mobile content development

Mobile Internet and smartphone use is growing rapidly. Planning for the time when mobile broadband services and smartphones are much more popular than at present will help establish the incumbents in this market, which stretches beyond Egypt to the rest of the Arab world. Egypt and some Gulf States (Abu Dhabi) are preparing to take advantage of these opportunities.[112]

In June 2010, ITIDA in partnership with Vodafone Egypt launched a "MobileAppsAcademy" in the search for developers and entrepreneurs to develop innovative mobile applications for the growing smartphone market in the MENA region.[113] This initiative aims to prepare Egyptian developers to compete for this market.[114] The MobileAppsAcademy offers a variety of services and advantages, including access to training, facilities, business start-up advice, and funding, in exchange for entrepreneurs sharing their ideas and opportunities for creating mobile applications. The focus is on creating content that is "*relevant to the Middle East region*".[115]

ITIDA and its partners are not the only Arab organizations to see the opportunity for what has been characterized as a mobile application development market worth US$ 6.2 billion worldwide in 2010 and projected to grow to US$ 29.5 billion by 2013.[116] Private entrepreneurs are also entering the market. For example, Kotob Arabia[117] is a Cairo based on-line publisher of more than 4,000 Arabic language e-books.[118] It believes that, given the high levels of mobile phone diffusion in Egypt and the region, combined with the high price of digital e-book readers and their inability to read Arabic scripts from right to left, the market is ripe for a mobile platform that meets the needs of Arabic language speakers.

5. E-content related to education

Various public institutes and private companies as well as 17 universities in Egypt are engaged in the development of e-content, including animations, for educational purposes. A unified university library catalogue (containing at present over four million bibliographic records, including all theses), using customized software, is being created and compiled into a digital library. Efforts are also underway within the EEI, assisted by others including the private sector, to create an e-learning platform to support the delivery of learning experiences, especially for the youth. NTI has planned to publish ICT technical material on-line free of charge and to make this available to Arab youth in Egypt and

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[112] See AppsArabia. 2010. *Welcome. Calling all app developers!* http://www.appsarabia.com/en/, and twofour54 ibtikar. 2010. We help you turn your creative ideas into reality. http://ibtikar.twofour54.com/en.

[113] MobileAppsAcademy. 2010. http://www.mobileappsacademy.com/

[114] Meddah, M.M. 2010. *ITIDA And Vodafone Egypt Launch MobileAppsAcademy For Egyptian Mobile Developers.* StartUpArabia, June 119, 2010. http://www.startuparabia.com/2010/06/itida-and-vodafone-egypt-launch-mobileappsacademy-for-egyptian-mobile-developers/

[115] MobileAppsAcademy. 2010. *What's in it for you?* http://www.mobileappsacademy.com/Program%20info-Q1.html

[116] Gartner, 2010. *Gartner Says Consumers Will Spend $6.2 Billion in Mobile Application Stores in 2010*. 18 January, 2010. Press release. Gartner Newsroom. http://www.gartner.com/it/page.jsp?id=1282413

[117] KotobArabia. 2009. *Welcome to Kotob Arabia e-Library Web Site!.* http://www.kotobarabia.com/

[118] Meddah, M. M. 2009. *Kotob Arabia Bets On Mobile Fueling Arab e-Book Revolution*. StartUpArabia.com Sept. 13, 2009. http://www.startuparabia.com/2009/09/kotob-arabia-bets-on-mobile-fueling-arab-e-book-revolution/

other Arab countries. The Egyptian E-Learning University (EELU) is developing content for adult learners.

Partnerships with international companies or organizations have resulted in 350 E-learning centres (with CISCO), 70 e-courses, and 100 testing centres in universities, with UNESCO assuring quality control.

6. Content related to tourism

In the promotion of its tourist resources, the MCIT, in cooperation with the Luxor government, created a new formal website for Luxor [www.luxoregypt.org]. The site was consolidated with a library of Luxor city photos, history of Luxor city, culture, investments, development and its local festivals, maps, and safari trips on the Nile.

A sound and light portal [www.soundandlight.com.eg] was created to allow visitors to choose shows and book tickets, buy souvenirs and pay through the Internet. It contains photo galleries for the various archaeological projects and a database for heritage films.

7. E-government content

The development of e-government content is evolving rapidly as part of an effort by the Ministry of State for Administrative Development to enhance public service delivery. One initiative aims to extend e-government across the country via more than 500 Government service centres.[119] These centres aim to help citizens submit information on-line or obtain forms that subsequently can be completed at home and mailed to the relevant authority. According to the Ministry of State for Administrative Development, it is considering possibilities to commercialize the business model and/or to sustain its operation by charging user fees.

Some automatic service centres have an experiment where citizens make demands for information and/or services, and then come back later to collect the information or forms, or have the service requested otherwise fulfilled.

Other initiatives have made official documents, such as the official Gazette and court rulings, available on-line and have computerized the judicial process. The Ministry of State for Administrative Development is also developing a portal for e-procurement, which will eventually enable[120] supplier registration, publication of government tenders, on-line tendering and centralized procurement of common goods. The portal could potentially be used in all Government organizations.

8. Content of relevance to the general public

Efforts to encourage content development through the IT Clubs and otherwise at the local and community level are ongoing in partnerships with NGOs. For example, IT Clubs have been contributing local content on their websites for the past few years. Their "community development portals" have been developed in several communities. Portals for agricultural information and for SMEs have also been created. A recent survey shows that IT Clubs have had success in reaching people in both urban and rural settings, providing them with training and other skills that respondents stated were useful in helping them to obtain access to better employment opportunities. However, a common challenge with web-based platforms is to reach potential users who may otherwise not be using the Internet. In such cases, it may be useful to explore also mobile solutions for delivering information and services to the public. Egypt is assisting entrepreneurs in developing mobile applications for this increasingly important market.

9. Creation of Arabic language Web domains

With the agreement of the ICANN authorizing the creation of non Roman character Web names, Egypt became the first country in the world to launch an Arabic domain name.[121] This is no doubt a major achievement that should open new ways to expand e-services, boost the number of on-line users and enable Internet services to penetrate new market segments by eliminating language barriers. In the interview with NTRA, companies expressed a great interest.

By allowing the localization of domain names using Arabic scripts, the reach of the Internet should increase. Arabic language speakers will have greater access to content in local languages and of local relevance. Companies and governments will be able to reach larger segments of the market and of the public. This should allow the creation of local Internet domain name markets. It is also expected that search engines will focus more on localized searches.[122] There will be

[119] Vodafone is establishing 2,000 more service centres.
[120] Abdelwahad, 2009. Personal communication.

[121] International Business Times. 2010. *Egypt launches first Arabic domain name – ministry*. May 6, 2010. http://www.ibtimes.com/articles/22605/20100506/egypt-launches-first-arabic-domain-name-ministry.htm
[122] Desai, A. 2009. *Impact of ICANN's decision to allow domain names in local languages*. GigaThoughts., Nov. 20, 2009. http://www.gigathoughts.com/technology/impact-of-

more domain names to choose from and local branding will be made easier.[123]

C. Challenges

In the area of content development, Egypt faces similar challenges as many other developing countries. Key bottlenecks include:

- Low PC penetration and use of computers by companies and citizens;
- Low broadband uptake and penetration needed to use media-rich e-content;
- Lack of trust in on-line services and payment systems;
- Lack of reliable service fulfillment for e-commerce (on-line buying and selling);
- Low levels of ICT penetration along with limited availability of e-banking and related services that limit the diffusion of e-commerce and of relevant content for consumers;
- Lack of general awareness of the need for developing e-content, although some organizations in the public and private sector are conscious of the need;
- Lack of necessary skills in the workforce to adapt content into electronic form and media convergence, such as web developers and personnel in creating and presenting good content; and
- Low levels of literacy.

For example, limited use of e-commerce has several explanations. It is partly the result of low levels of Internet use among both individuals and enterprises. For example, in 2009, only 21.6 per cent of enterprises with more than ten employees had their own website.[124] Encouraging companies (including SMEs) to establish their own websites with Arabic domain names should help drive the creation of relevant local content and the adoption of ICTs and of the Internet by Egyptian SMEs. At the same time, the lack of information, services and applications in Arabic also contributes to limiting the use of e-commerce. Until banking reaches more people and Egyptians move away from a cash-based economy to a monetized economy, e-commerce will be slow to take hold. On-line marketplaces and on-line banking and related initiatives are developing, but are not yet much used. E-commerce content in the form of on-line malls and shopping centres is still poorly developed.

D. Recommendations

The Government of Egypt has made considerable progress in several areas with a view to enhancing digital content in Arabic. Nevertheless, there is a significant untapped potential. There is a clear market opportunity for Egypt to become a hub of such content development, serving not only the domestic market but the entire Arab speaking world. The initiatives described above to enhance content development, including content for mobile applications, and to create Arabic language Web domain names are not sufficient to reach the majority of Egyptians. The impact of the introduction of Arabic script Web domains remains to be assessed over the longer term, but will likely be positive.

Working in partnership with other stakeholders, the Government should seize this opportunity to become a regional hub for Arabic language content. Public-private partnerships, including relevant ministries, companies, NGOs and beneficiaries are important in this context. Whether new, high-value e-content will lead to greater use of ICTs depends on the relevance of the content, accessibility (which is related to applications development) and involvement of beneficiaries in content development.

Enhancing the availability of relevant content in Arabic on the Internet and other forms of ICTs (such as mobile devices) is important to promote greater uptake of ICTs in Egypt. In addition, the development of such content represents a growth opportunity. The expansion of the "e-content industry" would not only help to reduce the digital divide between English and Arabic speakers but also provide employment and export opportunities. Another significant market opportunity is that of enhancing the availability of, and access to, government services on-line.

Against this background, this Review proposes that the Government adopt a content development strategy that: 1) is demand-driven; 2) reflects the extent to which intended users have access to different ICTs; 3) provides incentives for the private sector to engage in content development to make use of ICTs; 4) encourages all parts of government to set a positive example; and 5) reflects an integrated and cohesive approach that is consistent with, and an integral part of, infrastructure

icann%E2%80%99s-decision-to-allow-domain-names-in-local-languages.html

[123] Al-Shagra, A. F. 2010. *5 reasons Arabic Top Level Domains Will be Good for Arabs*. May 7, 2010. TNW Middle East. http://thenextweb.com/me/2010/05/07/5-reasons-arabic-top-level-domains-good-business/

[124] The share of enterprises with less than 50 employees was 10 per cent, and for those with more than 250 employees 65 per cent (MCIT data).

development strategies as well as other content development strategies, such as e-government and e-commerce. In each of these areas, clear and measurable targets should be set and measured periodically.

1. Develop strategies to reflect user demand

Egypt's future strategies aimed at boosting e-content development should be based on careful analysis of the potential demand. In this context, it is essential to distinguish between content aimed at the general public, enterprises in different industries and of different size, and specific sectors (health, education, culture). It may be necessary for the Government to undertake market or demand studies at the national and local levels to better understand the need and priorities for on-line information and services of Egyptian companies and citizens at large. Invariably, priority is for content about:

- *Livelihoods*: jobs, employment, investment opportunities, business opportunities, buying and selling (news about markets, products and services), and tourism.
- *Education and learning*: including self-paced learning, as well as professional training and learning. Information about educational opportunities, and about schooling.
- *Health*: family and child health as well as public health issues in general are of prime concern. In many countries, access to health care is limited, especially for women (maternal and child health), and health information portals can have an important role to play.
- *Government services*: any service that actually disburses cash to retirees or as part of incentive programs (cash for children, for newlyweds and the like) is a priority. Other services can also be in great demand: land registration, tax, fee and utility bill payments.
- *News*: especially information from the Government and from news agencies and services. Information of a local nature is most relevant, especially in poorer communities.
- *Entertainment and social interaction*: social networking is growing exponentially, including in the MENA region.[125]
- *Content development for enterprises*: should be based upon an understanding of the specific requirements of the target enterprises. Reaching beyond the requirements of large enterprises — which are more ICT-intensive — to micro- and small-enterprises is not straightforward. It requires awareness of their particular needs and circumstances. Such assessments could be undertaken in partnership with business associations or chambers of commerce.

In some countries (e.g. Botswana, China, Kyrgyzstan), assessments of community based drivers of ICT use have been undertaken. In these cases, teams travelled to underserved communities to determine the interest in, and capacity to pay for, certain services. The teams were able to identify information and services to which the Internet could contribute.[126] Such assessments are important also as a basis for attracting the attention and engagement of the private sector. By showing the market potential, the Government may catalyze a process that results in new content production.

In a similar fashion, the Government could undertake surveys to determine what kind of government services – at the national, regional or local level – potential users would value the most. The results of such assessments would provide a basis for the Government to set content development priorities.

2. Develop content for mobile applications

Content development for mobile phones is starting to emerge, but it will be some time before applications are readily available. It will take even longer before the majority of Egyptians can access wireless broadband services to take advantage of these services using widely available (i.e. inexpensive) smartphones. Without a large consumer driven market, application development will suffer.

Along with content development, the Government needs to encourage the development of lower cost smartphones and continue to encourage the diffusion of broadband in general and wireless broadband in particular. Without infrastructure and devices to take advantage of wireless broadband services, applica-

[125] Locke, S. 2010. *The push for Arabic content on-line*. MEED. Issue No 28 9-15 July 2010. http://www.meed.com/sectors/telecoms-and-it/telecoms/the-push-for-arabic-content-on-line/3007704.article

[126] Government of Botswana. 2004-2005. Maitlamo national ICT strategy and implementation plan. Included community based assessment of development and information needs. Labelle, R. et al. 2010. *ICTs for Poverty Reduction. Report of needs assessment mission. Laishui, Huoshan & Shangcheng*. UNDP China. PowerPoint presentation, 45 slides, 20010517. Great Village International Consultants Inc. The Aylmer Group. . 2007. *Kyrgyz Republic. EBRD Universal Access Strategy Project*. TCS ID: 15493. *Final Report*. Great Village International Consultants Inc. The Aylmer Group. December 21, 2007.

tion development will focus exclusively on the needs of the rich and of the business community. While these markets are important, evidence from other parts of the world suggests that it is consumer demand which is driving application development for market leaders such as the iPhone and Android devices.

The Government could set up a task force involving mobile operators and international mobile content developers to look into ways and/or advise policy makers on ways to speed up progress in boosting mobile applications and services in Arabic. It should be in the interest of the private sector to undertake market research with a view to better understand the priorities for developing such content.

In this context, Egypt may consider the experience of Singapore and Dubai. The Government of Singapore has launched a project entitled "Go mobile with Government".[127] It has developed specific mobile government services, including SMS alerts targeted to the general public, employers, businesses, national service men, motorists and individuals with special needs. This could be applied both to e-government and to the delivery of information and services for/by the business community. The Dubai Portal On-line offers a promising m-government experience in the Arab World. Dubai eGovernment has created mobile solutions including two mobile payment gateways, a dedicated mobile portal and a mobile SMS gateway.[128]

With respect to businesses, the Government of Egypt could leverage the experience of Orascom, which has been involved in various mobile-based service projects around the world. Orascom has been part of the consortium developing the system. Another example is the helpline developed in Bangladesh with the help of Banglalink, a subsidiary of Orascom (box V.1). This project started with a careful assessment of client needs before deciding on what services to offer, partly by the partnership between different stakeholders.

In many countries around the world, the efficiency and reach of markets has improved as a result of the diffusion of mobile devices. Farmers, fishermen and small scale producers can now obtain market information directly and over wider areas and market locations to give them a better understanding of the options for buying and selling agricultural and other goods and services. Wireless services can help eliminate the intermediary from the market place, thus increasing market efficiency and leading to better prices for producers and consumers.[129] In Uganda, a model for using mobile telephony to provide benefits to local enterprises has been developed.[130] The CELAC (Collecting and Exchanging Local Agricultural Content) project, for example, helps farmers organize their production and distribution using information provided over mobile phones as well as other ICT tools.

[127] For examples of SMS alerts, see http://www.ecitizen.gov.sg/mobile/index.html.
[128] See http://www.dubai.ae/en.portal.
[129] UNCTAD, Information Economy Report 2010.
[130] UNCTAD, Information Economy Report, 2007-2008, pp. 248 and 258.

Box V.1. Jigyasha 7676 – the mobile helpline for farmers in Blagladesh

In 2009, "Jigyasha 7676" of Banglalink – the second largest mobile operator in Bangladesh and a subsidiary of the Egyptian company, Orascom Telecom – won the GSM Association's Asia Mobile Award in the category for Best Mobile Enterprise Application Product or Service. Jigyasha 7676 is a Helpline which provides information and advisory services to small famers in Bangladesh. The service is an outcome of collaboration with Katalyst, an NGO. While Katalyst saw the need to improve the performance of farmers, Banglalink identified an opportunity to expand its market share and reach new customers. Katalyst was responsible for developing a sustainable business model among the various actors of this initiative, and Banglalink provided the network infrastructure and promotion to make it available to users.

Before launching the helpline, several actions were taken, including a careful market assessment to determine the feasibility of the service. Extensive promotion was also carried out to raise awareness of its availability. Anybody having a Banglalink connection can call and seek responses to queries from a database which has content related to 67 agricultural sub-sectors. The database is regularly updated with validated content. This material is integrated in a content management system which is delivered through a call centre. The response has been positive. At the end of 2009, some 100,000 calls were received on average every month, with a high rate of stated customer satisfaction.

Source: UNCTAD, Information Economy Report 2010.

3. Create incentives for the private sector to engage in content development

The Government can take various steps to make it more attractive for the private sector to invest in content development projects. This involves reducing the risk for such investment and creating an environment that is supportive of private initiatives in this area. Undertaking market research studies to determine the demand for content has already been discussed above. Based on international experience, three other actions could be considered: 1) creating a legal environment that supports the use of e-commerce; 2) expanding access to existing e-payment solutions and implementing the "Cashless Society" program that goes beyond Government of Egypt beneficiaries and pension earners, continuing with the work in finance, specifically completing existing Finance Ministry automation projects (budget automation, end of year reporting, and the like); and 3) generating incentives for the development of company websites in Arabic.

Developing business models for PPPs to produce and make available on-line services could be a way of accelerating the development of on-line content relevant to the needs and priorities of various users. PPPs have been used to developed, test, market and operate e-government services in other jurisdictions around the world. The Merx e-procurement application discussed below (box V.3) was developed and is operated as a PPP. The Government of Canada in this instance did not spend any money to develop the e-procurement application. The investment and risks were assumed by the private sector operator that won the contract to deliver the services.

The Government of Egypt could undertake a review of how PPPs have been used around the world for content creation in the form of e-government services. The Government already has the experience of PPPs, not least in infrastructure projects, for which purpose the Public Private Partnership Central Unit exists.[131] Modifications to the law for PPPs implemented in July 2010 are likely to lead to more PPP projects for infrastructure development.[132] In this context, the MCIT could benefit from close collaboration with the Ministry of Finance and other ministries that have the relevant expertise.

PPP models can be applied to large as well as small projects. Examples of PPPs for delivering e-government services to rural dwellers in India, for example, could be considered in Egypt.[133]

a. Create an enabling legal environment

An important consideration in promoting the use of on-line or mobile transactions, and thereby to make it more attractive for the private sector to engage in content development for such activities, is to enhance trust in the system among its users. Laws and regulations in this area need to address the security of identities, networks and capacities against fraud, customer privacy and informed consent, data access and use, and prevention of money laundering and corruption, among other issues. Alternative dispute resolution mechanisms, built into transfer and collection systems of mobile money platforms, are additional elements required for building trust in new transaction mechanisms.

Egypt has already adopted different legal and regulatory measures to this end, including the adoption of the E-Signature Law in 2004. In January 2010, the Egyptian Root-Certification Authority (CA) was also launched. ITIDA is acting as a supervisory body for electronic signature, operating the Public Key Infrastructure (PKI) Root CA and the E-Signature CA Licensing Unit. The Egyptian Root CA also provides cross recognition across Egypt and to other Root CAs in different nations.

The recognition of electronic documents can increase public confidence in e-commerce, but it is not a comprehensive solution. Egyptians, like e-consumers elsewhere, fear the risk of identity theft and invasion of privacy that on-line transactions pose. Currently, all Egyptian encrypted information is based on PKI technology, of which ITIDA has administrative control, including the ability to sanction anyone who abuses the technology or violates its confidential nature. However,

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[131] Public Private Partnership Central Unit, 2008. http://www.pppcentralunit.mof.gov.eg/pppcusite/content/home/default

[132] All Business. 2010. *Regulatory Teething Problems Mire PPPs' First Steps*. From LexisNexis, Aug. 13, 2010. http://www.allbusiness.com/company-activities-management/company-strategy/14925910-1.html

[133] Subhash Bhatnagar, *e-Government: From Vision to Implementation - A Practical Guide with Case studies* (New Delhi: Sage Publications, 2004), 79. World Bank. 2001. *Bhoomi: On-line Delivery of Land Titles in Karnataka, India*. http://go.worldbank.org/8C55S1BDK0. Labelle, R. 2009. *Module 8 - Options for Funding ICT for Development*. UN Asian and Pacific Training Centre for Information and Communication Technology for Development, ESCAP, Bangkok, Thailand, http://www.unapcict.org/academy/academy-modules/english/Academy-Module8-web.pdf/view.

neither identity theft nor privacy concerns have so far been addressed by the Egyptian legislature. Legislators are working on a draft law addressing on-line security.

In order to complement the Law on electronic signature (2004), Egypt should adapt or adopt the UNICTRAL Electronic Communications Convention concluded in 2005, which aims at enhancing legal certainty and commercial predictability where electronic communications are used in relation to international contracts. The Convention currently has 18 signatories, including China, the Philippines, the Republic of Korea and Singapore.

b. Develop e-payment solutions

The development of e-payment services is key to achieving the growth of e-commerce and m-commerce and therefore indirectly also to the creation of stronger incentives for the private sector to engage in related content development. The Ministry of Finance has advanced projects in regard to e-payment with the large banks of Egypt. E-payment and m-payment solutions should thus be a priority for the Government in the next strategy. E-payment and fulfillment services required for e-commerce and on-line shopping are being offered in Egypt, including door-to-door delivery services. The Government should seek to conclude the work regarding on-line payments and put in place a legislative framework for the development of electronic payment, including through mobile phones.

Given the high level of mobile penetration in Egypt, mobile financial services have great potential. The scope for mobile money services depends significantly on the regulatory frameworks for both telecommunications and financial services. Governments need, for example, to ensure that telecoms businesses are entitled to offer transaction management either alone or in partnership with conventional banks.

Financial services regulation is – rightly – based on strong precautionary principles, designed to protect against fraud and other criminal activity. Such regulatory changes are complex and challenging but – as experience in Kenya shows (box V.2) – can be overcome, with potentially substantial value in improved transaction flows. In December 2010, M-Pesa in Kenya counted as many as 13 million customers and more than 23,000 agents at which it was possible to cash in or out. Indeed, as individual customers become acquainted with mobile money they tend to remit smaller amounts with greater frequency. Mobile money can improve the allocation of savings across households and businesses by facilitating the transfer of small amounts of money when needed and thus lead to more efficient investment decisions. Although in many cases, the functionality of the services is directed mainly to monetary transfers for personal remittance, this is likely to change as mobile providers develop new value-added services for the enterprise sector. According to the GSM Association, a mobile money deployment, Masary, was launched in Egypt in 2010 to facilitate airtime top-up and international airtime transfer.[134]

[134] See https://www.wirelessintelligence.com/mobile-money/.

Box V.2. M-Pesa and regulatory developments in Kenya

Kenyan regulators have allowed M-Pesa to develop mobile money services in spite of the fact that the implementing mobile operator, Safaricom, does not have a banking license. The Central Bank of Kenya receives monthly statistical reports and requires M-Pesa to seek its approval before launching new functionality or products. While mobile money and payment services delivered by M-Pesa are relatively new, they are merely new means of payment. These are governed by prevailing laws (such as the law of contract), which continue to apply. However, to facilitate the development of such services, a draft National Payment Systems Bill has been prepared to integrate payments executed through electronic means and recent amendments in 2009 to the Kenya Information and Communications Act have brought legal recognition to electronic transactions, hence legitimizing such transactions before courts of law.

M-Pesa services are available in other countries of the region and as such, those services will benefit from the efforts of Partner States to harmonize cyber legislation. In this respect, a "Framework for Cyberlaw", prepared with UNCTAD assistance, was adopted in May 2010 and will facilitate the development of such services by regulating key legal issues such as electronic transactions, electronic signatures and authentication, data protection and privacy, consumer protection and computer crime.

Source: UNCTAD, Information Economy Report 2010.

The success of the e-dinar project in Tunisia[135] is another example of the implementation of a basic e-payment system that has helped monetize the Tunisian economy, developed the banking and financial services sector, and resulted in the creation and diffusion of relevant Internet content. The Tunisian Postal authority has been responsible for moving its clients to e-banking and e-payment systems. The postal authority in Tunisia continuously innovates and develops new e-products and tests these in the Tunisian market, adopting those that appeal to the consumer and summarily rejecting those that are not successful.

c. Create incentives for companies to develop websites in Arabic

In order to foster content development by SMEs, the Government could build awareness and show the importance of e-content and m-content. In addition, it should also induce SMEs to create their own websites, especially with Arabic content. In this context, the Government should consider using some kind of incentive scheme. In Tunisia, for example, export-oriented companies have been offered subsidies to cover 70 per cent of their website development costs.[136]

The Government should also: 1) encourage the development of e-commerce platforms for businesses and encourage B2B, B2G, G2G and G2B transactions; 2) promote on-line shopping in Arabic and for Egyptian goods and services and 3) tackle the key issue of consumer trust as a cornerstone of a successful e-commerce policy. This could be done in partnership with foreign companies that have established such platforms in other languages, such as the companies that have established the Merx platform in Canada, Koneps in the Republic of Korea, or ChileCompra (box V.3).

Better still, the Government should be in touch with the agencies that are responsible for these e-commerce platforms to determine for themselves how they have been successful or not, and how these models can be improved upon and with what type of expertise. The involvement of Egyptian counterparts to help adapt the service to local needs would turn this into a business development or even a PPP project. The Government could play a catalytic role in this context by seeking to match these different players with each other while helping to create the right policy environment for this on-line service to succeed. The Government could also help to test the various business models and technologies involved, thus promoting research and development into practical ICT applications for the Egyptian, Arab and possibly other markets.

4. Use e-government as an example to showcase the potential of e-content and m-content

The MCIT has an advocacy role in e-government development and should continue to support the Ministry of State for Administrative Development and other ministries and their agencies in making available information and services via their websites and also through mobile applications. Given that the Government is an important player with regard to Internet use in Egypt, its actions have an important effect in terms of raising awareness. By encouraging the various organizations under government control to speed up the development of e-government services, and by encouraging them to work in partnership with the private sector in developing appropriate solutions, it can both improve the level of services to various stakeholders and stimulate more content development among enterprises.

a. Establish a top-level government portal

The Government should continue to digitize government archives, data and content across all levels of government (national, governorate, local) to facilitate access for the population at large. The much improved e-government portal of the Government[137] appears to have limited visibility, according to Alexa.com.[138] Visitors are predominantly college educated and in the 18-24 years age group.

A top level portal is the main entry point for the Government of Egypt, also known as the top level website of the Government. All other government websites or pages should be linked to it and branded consistently with the common look and feel that the Government establishes. A good example of common look and feel for government websites is given by the Government of Canada entry portal,[139] which has a consistent graphic profile throughout all of the government agencies and portals so that visitors always know they are at an official site of Canada. The Government of Egypt portal Web page (http://www.egypt.gov.eg/arabic/default.aspx) has an on-line presentation that is different from the presentation of other Egyptian ministries. In fact, using the drop down list of URLs for the Govern-

[135] La Poste tunisiennes. 2010. *E-DINAR. Votre carte polyvalente pour payer sur Internet en toute securite*. http://e-dinar.poste.tn/fr/. National Digital Certification Agency, Tunisia. 2010. *E-commerce. The e-dinar: the Tunisian Post*. http://www.certification.tn/index.php?id=139

[136] World Economic Forum, 2009, The Global Information Technology Report 2009-2010.

[137] http://www.egypt.gov.eg/english/default.aspx

[138] Alexa. 2010. *Egypt.gov.eg.* http://www.alexa.com/siteinfo/egypt.gov.eg. Accessed 20100913.

[139] Government of Canada. 2010. *Canada – The true North strong and free*. http://canada.gc.ca/home.html

ment ministries and agencies (http://www.egypt.gov.eg/english/guide/directory.aspx), and navigating to the Web pages of ministries, it is clear that few have a presentation that is identical in style. The content will, of course, change from ministry to ministry, but for branding purposes, the style should ideally be identical so that a visitor knows immediately that he or she is viewing an official Government of Egypt web site.

The website of the Government of Singapore can also serve as inspiration.[140] It is a first-level portal under which all other Government portals and websites reside. It enables the public and businesses to locate Government information and services on the web through a top-level directory and search function.[141]

To improve access to the e-government portal, the Government of Egypt needs to enhance access to ICT infrastructure and access facilities at the local and community levels. The recommendations made under infrastructure (chapter II) to support the creation of municipal networks as platforms for the creation and delivery of locally generated and nationally available content and services apply. In other parts of the world, municipal networks have been demonstrated to stimulate economic and social development and also cultural development and the arts.[142] An integrated approach should be taken to deliver all of these services, irrespective of government responsibility. The e-government portal needs more visibility among other market sectors, and more focused market surveys could help determine priorities and identify what limits or enhances traffic to Egyptian websites.

b. Use e-procurement as an incentive for companies to go on-line

E-procurement could have a positive impact on economic development and the computerization of the business sector in general, including SMEs. Electronic procurement is significant because it is one of the most important drivers of on-line uptake among the population, and in the private sector especially. People and businesses will learn to go on-line and use e-procurement services to get information about employment opportunities, to buy and sell, to gain access to market information, and the like.

Experience from Chile and Canada (box V.3) have demonstrated that an e-procurement system backed up by strong policies on procurement can save government money and increase the quality of the goods and services procured, and at the same time promote ICT uptake among SMEs and help to level the playing field in public procurement so that more companies, not just large firms, benefit.

To be successful in Egypt, however, content needs to be available in Arabic. E-procurement rules are changing, requiring all Government ministries to place tenders and job advertisements on-line. Moreover, the Government should allow economic operators to answer procurement notices electronically – in Arabic.

[140] See http://www.gov.sg/government/web/content/govsg/classic/home.
[141] Al-Omari H., *E-Government in Jordan: A Comparative Analysis*, Journal of Computer Science 2 (11), 2006, p.848, available on-line at http://www.scipub.org/fulltext/jcs/jcs211846-852.pdf
[142] See the publication Broadband Properties for examples of do's and don'ts in the USA with reviews of developments around the world.

Box V.3. Benefits of e-Procurement in Chile and Canada[143]

Chile Compra

By 2008, 900 public agencies were trading more than US$ 5 billion and conducting almost half a million tendering processes over the Internet each year. This generated more than 1.6 million purchase orders, which greatly improved conditions of efficiency and transparency. Businesses have also gained better access to this market, and the number of suppliers doing business with the State has tripled. More than 82,000 businesses place bids and/or are awarded contracts with the State each year. Micro-, small- and medium-sized businesses are the ones that have benefited the most from this new marketplace. Finally, the systems managed by Chile Compra saves around US$ 150 million in public expenditure each year.

Canada Merx

The Government of Canada has moved all public procurement on-line to the so-called Merx procurement system. This system has led to savings of about CAD 6 million a year in photocopying, mail and courier fees; reduced the cost of projects by about 10 per cent across the board, while enhancing the quality of submissions by facilitating access to opportunities because of a larger number of suppliers bidding. Furthermore, the approach has encouraged the private sector to become more competitive and has helped to make opportunities more available to all firms, irrespective of size. The Merx system has been so successful, that the Government funds the subscription cost of any Canadian firm – the advantages of having more subscribers competing to provide goods and services outweighing the cost of subsidizing these services.

Source: UNCTAD.

[143] Chile Compra. 2008. ChileCompra, the Public Procurement Bureau facilitates access to the public sector. http://www.chilecompra.cl/english/whatischilecompra.html

5. Establish a single authority or consultative group for on-line content

There are several government authorities responsible for overseeing and/or developing on-line content. The Ministry of State for Administrative Development is responsible for transforming government using on-line services. The Ministry of Finance likely has a role to play in ensuring that the appropriate financial policies and regulations are in place to regulate e-commerce and on-line buying and selling. For the end user, the priority is to find information that is well organized and readily available, along with services that meet their needs in a timely, fair and equitable way wherever they may be physically located. This requires a comprehensive and demand-driven approach and close collaboration among the public and private sector stakeholders involved, as well as the beneficiaries themselves, i.e. the Egyptian public.

The Government and the various consumer and business associations should meet to discuss this issue and help provide support for the various and apparently disparate efforts that are now taking place in order to create a vibrant Egyptian on-line community.

6. Establish clear and measurable targets

The next strategy should contain a set of indicators and benchmarks for measuring progress of digitization efforts of local, Arabic content. Indicators of interest may include:

- Number of Arabic language Web sites in the .eg domain or using the Arabic top domain name and the popularity of Egyptian domains as measured by Web analytics, such as those provided by companies like Alexa.
- Number of companies involved in developing e-content or m-content.
- Number of employees involved in developing e-content or m-content.
- Percentage of government institutions with a web presence.
- Percentage of government institutions offering different kinds of on-line services.
- Number of Egyptian companies selling on-line to government institutions.

CHAPTER VI. ASSESSMENT OF EFFORTS TO PROMOTE AN EXPORT-ORIENTED ICT SECTOR

In the NICTS, the Government identified the development of the ICT-enabled services sector as a central component in its work to promote innovation and the ICT sector. The strategy highlighted, in particular, business process outsourcing (BPO) and information technology outsourcing (ITO) as markets offering opportunities for Egypt. Specific priorities to achieve this objective included:

- development of a coherent long-term strategy to promote ICT-enabled services offshoring and outsourcing in Egypt;
- building of niche strengths for the ICT-enabled service sector;
- promotion of investment in ICT-enabled services, including through FDI incentives;
- strengthened legislation and regulation related to ICT-enabled services;
- improved infrastructure and attractive zones and technology parks; and
- promotion of an entrepreneurial culture in the ICT sector and the enhancement of its global competitiveness, including through incubators.

In view of global trends related to the offshoring of services, the Government should in its next ICT strategy continue to devise policies to develop Egypt as a strategic location for ICT-enabled services. In fact, few locations in the world can provide an equally diverse coverage of markets and language areas. For the coming years, the main challenge will be to identify the specific niches in which Egypt can excel, and to ensure that the availability of human resources, the quality of infrastructure and the regulatory framework are conducive to realizing the country's full potential in the evolving global market.

A. Main achievements

Since the NICTS was launched in 2006, Egypt has had significant success in establishing itself as a recognized location for BPO services. In A.T. Kearney's Global Services Location Index, Egypt climbed from 12th position in 2007 to 6th in 2009 (figure VI.1), and by 2011 it had reached 4th place.[144] Other reports confirm this trend. For example, one consultancy firm noted that "*Of all the countries in the Middle East, Egypt has the strongest position in the outsourcing market*".[145] In an assessment of offshoring locations on the African continent, Everest Research Institute included Egypt among the leading destinations, together with Mauritius, Morocco and South Africa.[146] Moreover, in June 2010, Egypt was named "*Offshoring destination of the year*" by the European Outsourcing Association.[147]

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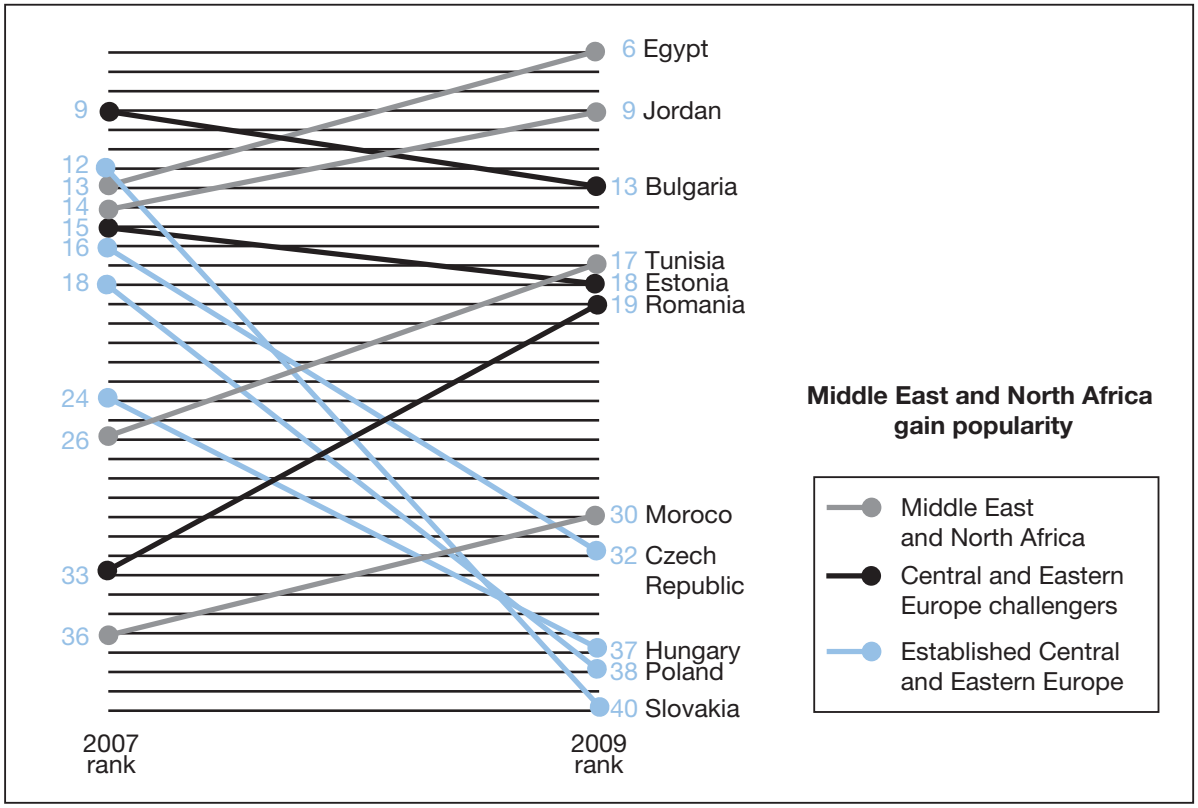
[144] A.T. Kearney. 2009. The shifting geography of offshoring. *Global Services Location Index*. ATKearney. Chicago. For 2011 data, see http://www.atkearney.com/index.php/Publications/global-services-location-index-gsli.html.

[145] Yankee Group. 2008. *Can Middle Eastern countries fulfill the "Eastern" promise*. Yankee Group. 16 pp.

[146] Everest Research Institute 2010. *Curtain raiser: offshoring to Africa*, Global Location Insights, September.

[147] PR Newswire. 2010. *Egypt Named Offshoring Destination of the Year at the Inaugural European Outsourcing Association Awards.Brussels*, June 29, 2010. http://www.prnewswire.com/news-releases/egypt-named-offshoring-destination-of-the-year-at-the-inaugural-european-outsourcing-association-awards-97399109.html

Figure VI.1. Regional rankings and changes - Global services location index 2007-2009



Source: A.T. Kearney, 2009

Egypt's main strengths in this context are its geographic location (same time zone as, and proximity to, Europe), relatively low costs of doing business, a proactive and supportive business environment, an active and well financed program to support the offshoring industry, and a young, well trained and multilingual work force. Another asset has long been strong support from the highest political level. This has helped to ensure good coordination between different players involved in promoting the sector, notably the MCIT, ITIDA, the Smart Village and GAFI.

As a result of the policies implemented under the NICTS, the MCIT is on track to extend state-of-the-art infrastructure and technology parks beyond the Smart Village with the new park in Damietta and the call center park in Maadi (see also chapter II). Some of the main achievements under NICTS to date are summarized below.

1. Creation of a supportive business environment

The general business environment has become more attractive in several respects. First, both corporate tax and personal income tax rates have come down significantly. Second, import tariffs have been reduced from an average of 14.6 per cent to 6.2 per cent and customs procedures have been streamlined. Third, the banking sector has been restructured and consolidated, and the role of the Central Bank has been strengthened. Fourth, anti-money laundering regulations in line with international standards have been instated and the protection of intellectual property has become more stringent.

In terms of promotional measures, the Government can provide rent subsidies to foreign investors for an initial period of up to two years. It can also subsidize staff salaries and training.

Other relevant legislative and regulatory changes include the deregulation of the telecommunications sector in compliance with the WTO GATS and ABT (chapter II). ICT companies interviewed for the present Review raised no significant issues with the way the sector was regulated. Companies agree that Egypt is a good destination for business, in part because of the strong support from the Government, the large num-

ber of students graduating every year and the diverse language skills of Egyptian job seekers.[148]

2. Promotion of investment in ICT-enabled services

Government policies to promote Egypt as a key destination for ICT-enabled services have largely been successful. In the past few years, Egypt has attracted several multinational companies to this sector, including EDS, Oracle, Teleperformance, Vodafone, Wipro and Xceed. The number of foreign companies that are establishing a presence in Egypt continues to rise, as does the total number of direct employees in ICT (see figure VI.2). According to the MCIT, the number of ICT companies increased to 3,934 at the end of Q4 2010, of which 78 per cent were IT companies, 14 per cent ICT-enabled services companies and 8 per cent telecommunications companies. The number of ICT operating companies in Q4 2010 was 13 per cent higher than in Q4 2009. As of December 2010, there were 204,960 employees working in the ICT sector, including in Egypt Post.[149]

More than 15,000 export-oriented direct and over 45,000 indirect jobs are supported by the ITO and BPO offshoring industries, according to ITIDA. Most of these are related to IT centres, followed by BPO/call centres. The remaining jobs are in technical support, engineering or R&D centres.

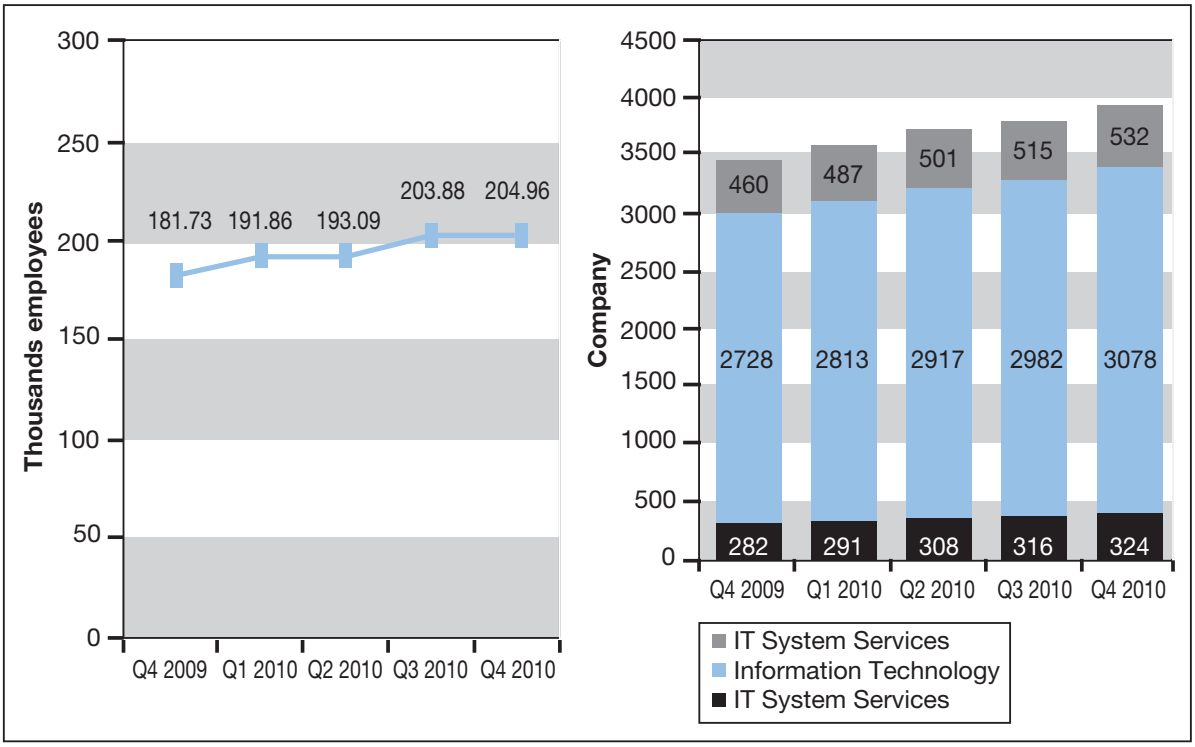
The value of ICT-enabled services has grown to more than $800 million and the Government's target of $1.1 billion by 2010 was expected to be met.[150] One study projected that the BPO sector would grow at a 20 per

[148] Reuters. 2010. *Languages, alliances key to IBM Egypt BPO offering*. Interview of IBM executive D. Brooks in charge of IBM's BPO business in Egypt by A. Sharp. July 28, 2010. http://af.reuters.com/article/egyptNews/idAFLDE66R0MS20100728?pageNumber=1&virtualBrandChannel=0

[149] MCIT 2011, Information and Communications Technology Indicators Bulletin. December 2010. Quarterly Issue.

[150] The Government of Egypt is considering a new methodology to calculate the value of ICT-enabled services.

Figure VI.2. Number of ICT companies and number of directly employed staff in the ICT sector

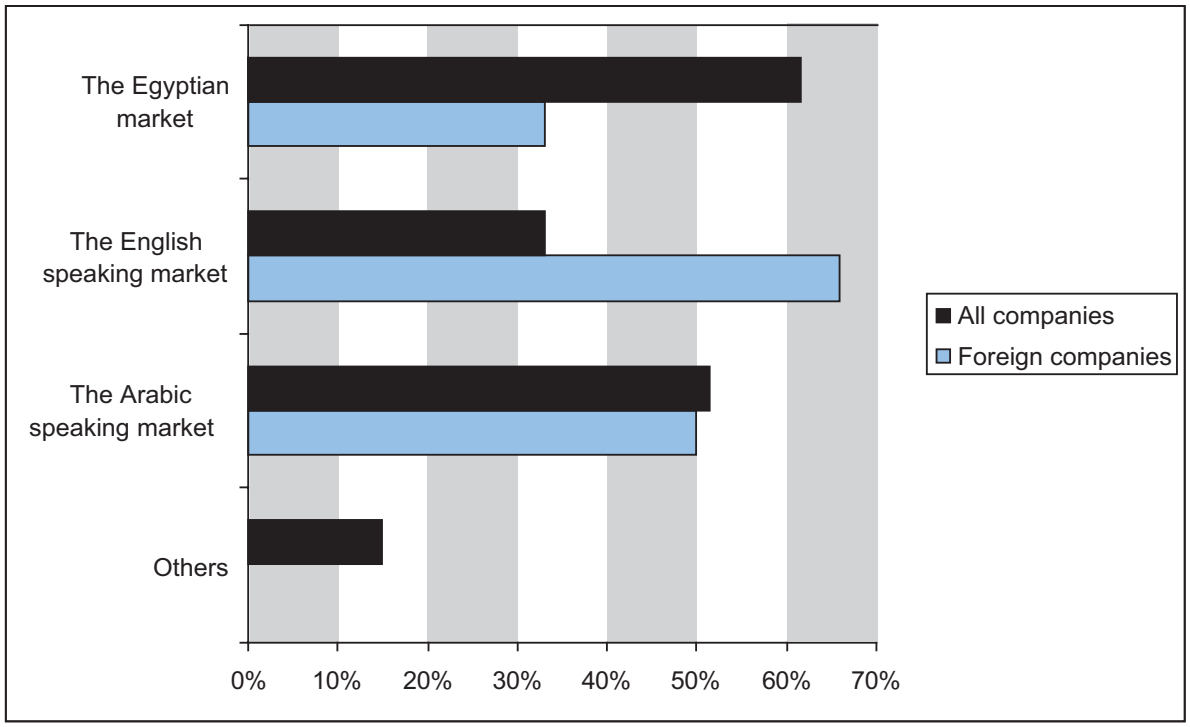


Source: MCIT 2011, Information and Communications Technology Indicators Bulletin. December 2010. Quarterly Issue.

cent compound annual growth rate to reach $1.3 billion by the end of 2010.[151]

According to the UNCTAD on-line survey (box I.1) conducted for this Review, domestic ICT companies primarily sell in the local market, while foreign companies mainly target English-speaking markets abroad (figure VI.3). International companies are more likely to use their operations in Egypt as part of their global outsourcing network. Various companies also indicated that they are using Egypt as a platform to reach Arabic-speaking, French-speaking and German-speaking markets. For example, Xceed's contact center in Egypt supports customers in their respective local language in France, the United States, the United Kingdom, Italy, Spain, Belgium, Luxembourg, Germany, Portugal, Greece and the Gulf.

Figure VI.3. Main geographic markets served by ICT companies in Egypt



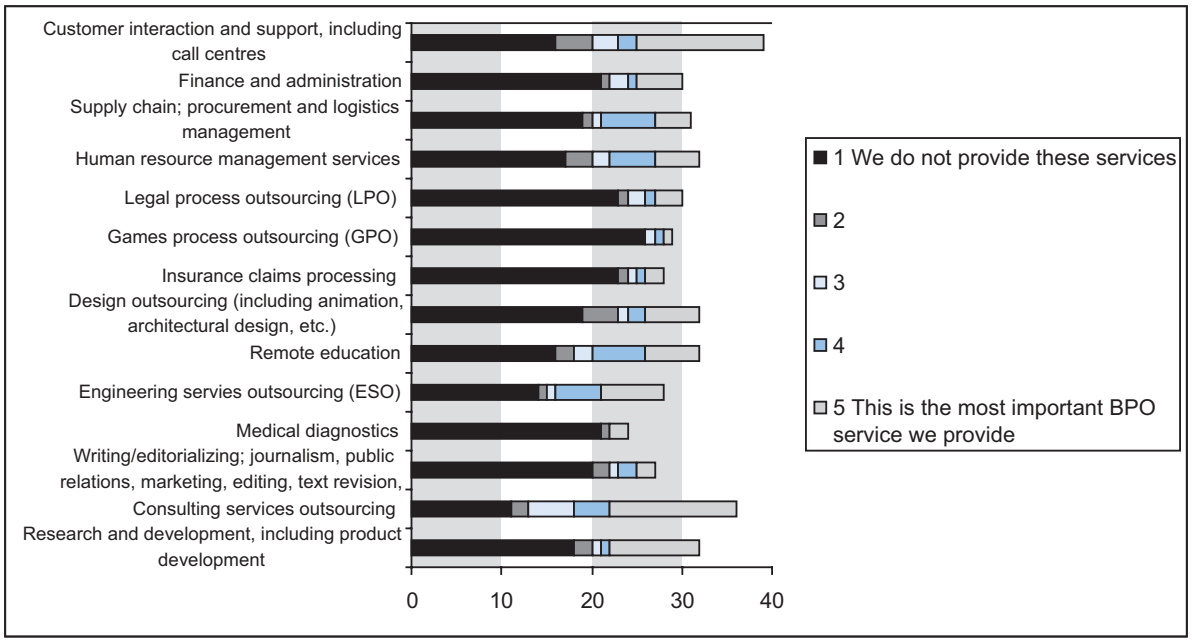
Source: UNCTAD on-line survey.

At present, contact centre services are one of the most important segments of the ICT-enabled services market in Egypt. A recent survey by Datamonitor covering 200 international companies saw Egypt claim 4th place as a preferred location for contact services behind the Czech Republic, Chile and India.[152] According to the results of the UNCTAD on-line survey of firms offering ICT-enabled services in Egypt (figure IV.4), consulting services were the most important service outsourced by the firms who participated in the survey, followed closely by customer contact centre services.

[151] Oxford Business Group. 2010. *Telecoms & IT*. Chapter in "The report. Egypt 2010".

[152] Ibid.

Figure IV.4. Business processes provided in the ICT-enabled services sector in Egypt[153]



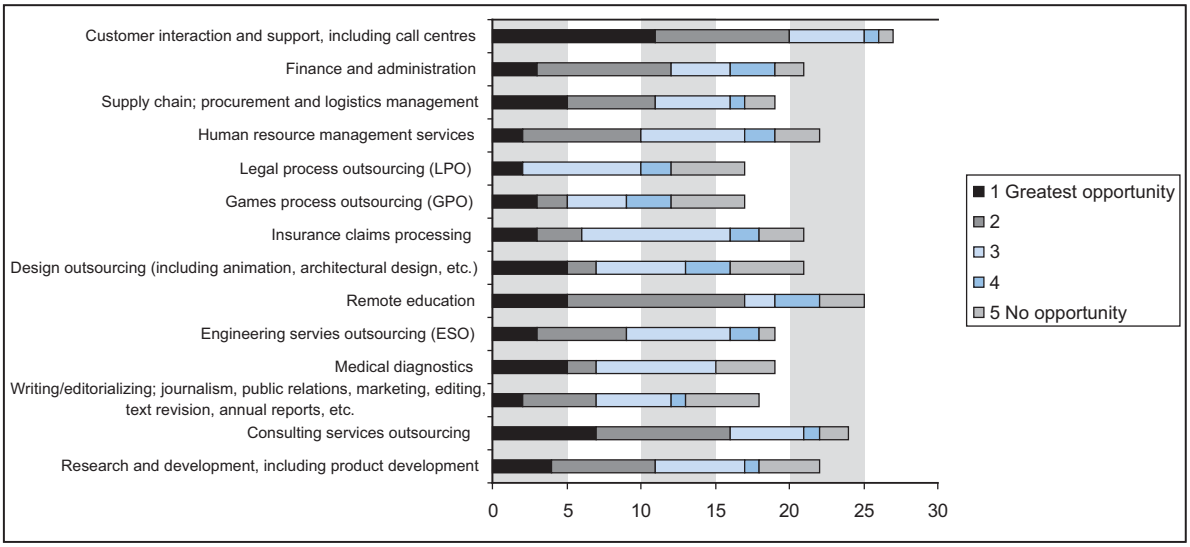
Source: UNCTAD on-line survey.
Note: The "x" axis is for the number of respondents answering the question asked.

Ten (31 per cent) of the 32 ICT companies working in the outsourcing sector in Egypt that completed the survey reported that customer interaction and support services, including call centres, were the most important services provided. However, knowledge-process outsourcing (KPO) services (consulting services - 12 firms), R&D including product development (9 firms), design outsourcing (6 firms), as well as engineering services (5 firms), were also frequently listed.

When asked which business processes had the greatest growth prospects, the response count ("x" axis), was highest for customer interaction services including call centres (figure VI.5) - (11 responses) followed by consulting services (7), supply chain: procurement and logistics services (5); and medical diagnostics (5).

[153] UNCTAD on-line survey of outsourcing firms in Egypt.

Figure VI.5. BPO segments with strongest growth prospects



Source: UNCTAD on-line survey.

Note: The "x" axis is for the number of respondents answering the question asked.

Employment creation is a key policy objective. Consequently, the focus has so far been primarily on labour intensive outsourcing services at the lower end of the value chain and with relatively low entry level conditions for employees. However, Egypt will have to move ultimately towards the higher end of the value chain, i.e. KPO. These services are more profitable and provide important opportunities to entrepreneurs. They can also give Egyptian researchers and innovators an opportunity to prove their mettle and contribute to making Egypt an international centre for technological research and development.

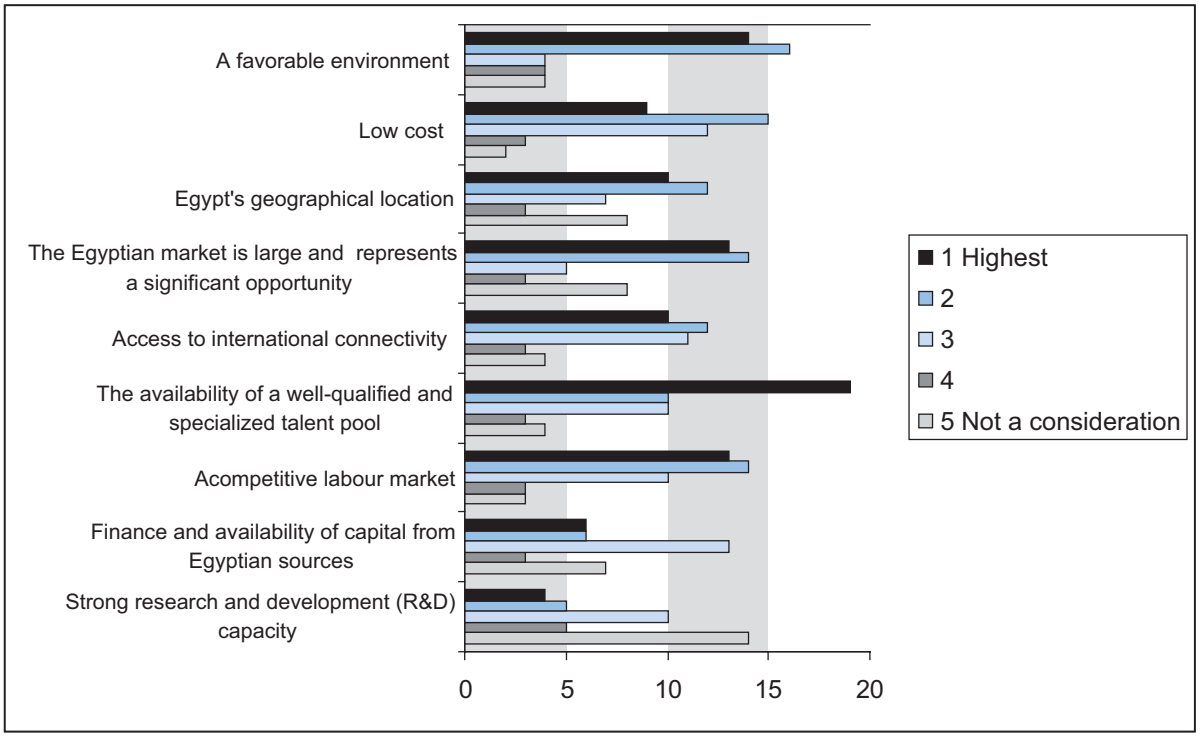
The long-term strategy of ITIDA identifies the following priority areas:

- Multilingual voice and non-voice BPO (customer support, account management, telemarketing, finance and accounting, HR processing, back-office operations, rules-based decision making);
- World-class ITO and technical support (technical support, application development and maintenance, business application implementation, remote infrastructure management, and 'Arabization' of software); and
- Emerging engineering and R&D services (R&D for embedded systems, applied research, prototype development and technology).

3. Building a skilled workforce

According to 26 of 38 respondents to the on-line survey administered by UNCTAD, one of the main reasons investors in the ICT sector come to Egypt is to take advantage of the "availability of a well-qualified and specialized talent pool" (figure VI.6). In response to the same question, 24 respondents indicated that the favourable business environment and a competitive labour market were the most important reasons. Other factors that influenced investors favorably included the large Egyptian market, low costs, Egypt's favourable geographic location and good access to international connectivity.

Figure VI.6. Reasons for investing in the ICT sector in Egypt



Source: UNCTAD on-line survey.

Note: The "x" axis is for the number of respondents answering the question asked.

A number of capacity-building initiatives have been strengthened to meet the demand for skilled labour in the ICT industry (see also chapter III). Over 300,000 university graduates are produced each year in Egyptian universities, and of these about 80,000 graduate with technical and scientific skills.[154] Because the job market is relatively small, competition for jobs in the technical sector and in outsourcing is fierce. Over the longer term, Egypt is a very enticing destination for foreign as well as local investors.[155]

4. Development of technology parks related to ICT-enabled services

Most ICT enterprises in Egypt are located in the Smart Village. It has received a strong endorsement from companies that have chosen to establish themselves there. With capacity for 80,000 employees, dedicated broadband infrastructure (chapter II), reliable and secure energy facilities, and modern and purpose-built real estate, this technology park has been instrumental in attracting foreign businesses. The Government is also pushing ahead with the construction of additional parks. Once completed by 2012, the Maadi Business Park[156] will comprise around 40 buildings exclusively dedicated to call center operations. It is slated to provide jobs for between 50,000 and 100,000 people when fully operational, with facilitates accommodating 40,000 call center seats.

B. Challenges

1. Global market situation

The global market for services offshoring is expected to grow quickly in the coming years. It is also set to change in several ways. A recent assessment of its long-term prospects predicted that as much as 80 per cent of its incremental revenue until 2020 will come

[154] Oxford Business Group. 2010. *Telecoms & IT*. Chapter in "The report. Egypt 2010". pp 147 – 162.

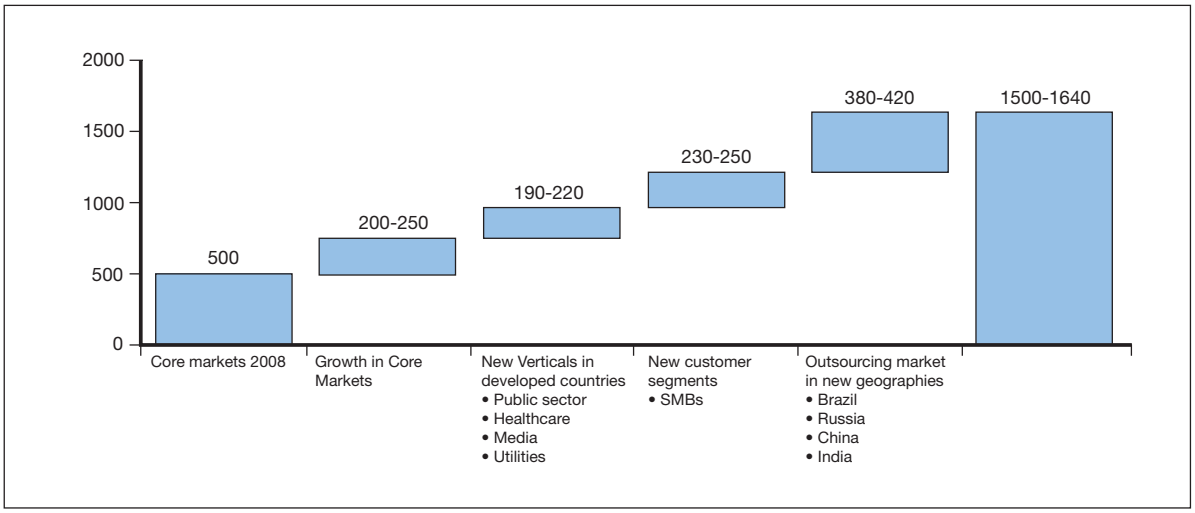
[155] Reuters. 2010. *Languages, alliances key to IBM Egypt BPO offering*. Interview of IBM executive D. Brooks in charge of IBM's BPO business in Egypt by A. Sharp. July 28, 2010. http://af.reuters.com/article/egyptNews/idAFLDE66R0MS20100728?pageNumber=1&virtualBrandChannel=0

[156] Business today.com. 2009. *Maadi Outsourcing Hub. With Maadi Technology Village to open this summer, outsourcing in Egypt is about to get a boost*. September 2009.

from new industries (such as the public sector, health care, media and utilities), customers (especially SMEs) and countries (Nasscom and McKinsey; figure VI.7). As the economic cycle improves, a surge in ITO and BPO services exports is foreseen, with opportunities for emerging locations such as Egypt.

The Government needs to remain vigilant in the face of the global market slowdown and the fear of a double dip recession, which may dampen the demand for contact centre services and other ICT outsourcing services. Many of Egypt's contact centre services serve customers in Europe and the USA.

Figure VI.7. Total addressable market for global sourcing and domestic outsourcing, 2020 ($ billion)



Source: Nasscom, Perspective 2020: Transforma Business, Transform India, April 2009.

2. Expand beyond low value outsourcing services

The MCIT recognizes the importance of developing services with higher added value because they would allow companies to take advantage of the increasingly skilled and plentiful IT related graduates and technicians in this area. Egypt is furthermore aiming to develop a niche in the emerging engineering and R&D services market to take advantage of the large numbers of multilingual graduates in engineering and the sciences.[157] The MCIT is supporting this push with a determined effort to promote innovation, research and development, and collaboration between the private sector and academia in Egypt.[158] However, according to Datamonitor "*Egypt lacks experience in managing complex high level BPO and ITO work*".[159]

The most recent edition of the Innovation Index published by INSEAD[160] places Egypt in 74th position out of 132 ranked countries. Among the indicators measured in this Index, Egypt occupies the 122nd rank for quality of the education system. The quality of the scientific research institutions is ranked at 100 and the quality of management schools at 113. On the other hand, the index reports a strong innovation environment in the private sector, a rank of 53 for company spending in research and development, a rank of 28 for the innovation environment in firms and a high rank of 29 for FDI and technology transfer. The state of cluster development is also encouraging at 40. However, for university-industry collaboration, as well as for knowledge creation, Egypt is ranked 95th. For knowledge application, Egypt performs better (39th) and with regard to the growth rate of labour productivity, Egypt is ranked 20th.

[157] ITIDA. 2009. Egypt on. Destination Egypt: Value proposition.
[158] Chaudhary, R. S. 2010. *ITIDA of Egypt to Showcase Information Technology Innovations*. August 26, 2010. SmartGrid News. http://smart-grid.tmcnet.com/news/2010/08/26/4977438.htm
[159] Datamonitor. 2009. *Global Delivery Locations - Focus on Egypt (Analyst Insight)*. BFTC2326/ Published 03/2009.

[160] INSEAD and the Confederation of Indian Industry. 2010. *Global innovation index 2009-2010*. INSEAD, 456 pp. http://www.globalinnovationindex.org/gii/main/home.cfm

3. Protect intellectual property rights

In discussions with representatives of large ICT multinationals, the issue of intellectual property rights (IPR) was identified as an ongoing concern. Faster progress on this issue would make it more attractive for some companies to move towards a higher level of engagement and investment, as well as increase the willingness to allocate research and innovation to Egypt. At the time of this discussion, the software piracy level in Egypt was estimated at 59 per cent, with lower rates in the Government but considerably higher levels among SMEs and consumers.[161]

4. Enhance ICT uptake among SMEs

For a country to fully benefit from the information revolution, all sectors of the economy and all levels of society need to be involved and benefit.[162] ICT uptake among SMEs needs to be strengthened for Egypt to be able to service the offshoring market more broadly. SMEs are more interested in information technologies than in communications technologies.[163] According to one study, the "*Costs of equipments, of training and amortization, low level of education, and of English-language knowledge within the personnel represent major obstacles for ICT investment in the business sector*".[164]

Focusing for the most part on the ICT-enabled services market may increase the risk of a two-tier business environment emerging in Egypt, as has been the case in other countries. In Malaysia, for example, the Multimedia Super Corridor (MSC) was established to offer a purpose built area with modern amenities, including high speed access to the Internet through dedicated fiber-optic cables, along with incentives and tax breaks to attract world class investors in the ICT sector and beyond. The MSC led to a widening gap between companies inside and those outside the dedicated area. This was finally resolved by allowing some of the benefits of the MSC to extend beyond the physical confines of the Corridor (see also chapter II).

Without access to modern business practices and technologies, SMEs cannot readily compete internationally and cannot take part in the outsourcing activities that the Government is promoting. Opportunities for local firms to provide services to firms established in the Smart Village or in the Maadi Business Park also appear to be somewhat limited resulting from their lack of sophistication and modern business capacity and lack of integration with export-oriented outsourcing businesses.

5. Address rising costs at the Smart Village

Notwithstanding the success of the Smart Village, some trends have raised concerns among investors. Costs are going up at rapid pace; rents have reportedly risen from $15 to about $30 per square meter over the past two years. According to some investors interviewed, these rates are now as high as in Europe and higher than in the United States. To some companies, the trend is worrying since there does not seem to be any underlying reason for the increases, making it difficult to plan, justify and adjust to these new realities. Utility costs are also rising fast. There is also a need for more business class hotels and executive suites for visitors near the Smart Village. The lack of executive class apartment hotels limits companies' ability to receive visiting scholars and experts for extended stays.

C. Recommendations

Against this background, the MCIT should continue to promote Egypt as a strategic destination for the offshoring of different services. The recommendations presented below seek to address the main challenges identified above and to build on the strengths of the country.

1. Continue to provide adequate infrastructure to the ICT-enabled services sector

The Government needs to continue to ensure the supply of adequate infrastructure (notably broadband and power) and human resources (tailored to the needs of the industry). For example, the lack of bandwidth outside of the Smart Village and of the Maadi Business Park needs to be addressed (chapter II). In addition,

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[161] BSA and IDC. 2009. *Sixth annual BSA-IDC global software piracy study*. IDC. 24 pp. http://global.bsa.org/globalpiracy2008/. BSA. 2010. Global Software Piracy Study. Seventh Annual BSA and IDC Global Software Piracy. http://portal.bsa.org/globalpiracy2009/index.html Study.

[162] Accenture, Markle Foundation and UNDP. 2001. *Creating a development dynamic. Final report of the Digital Opportunity Initiative*. April 2001. New York, 86 pp. http://www.markle.org/downloadable_assets/doifinalreport.pdf.

[163] El-Demery, N. 2009. *ICT Diffusion in Egypt: Market Dynamism and Public Policies*. Développement des Recherches Économiques -Euro-Méditerranéennes (DREEM), May 2009. http://gdri.dreem.free.fr/wp-content/g13-noha-el-demery-egypt-ict-diffusion.pdf.

[164] El-Demery, N. 2009. *ICT Diffusion in Egypt: Market Dynamism and Public Policies*. Développement des Recherches Économiques -Euro-Méditerranéennes (DREEM), May 2009. http://gdri.dreem.free.fr/wp-content/g13-noha-el-demery-egypt-ict-diffusion.pdf.

the Government must make sure that the regulatory framework is conducive to specific types of ITO/BPO activities that it chooses to target in the next strategy.

To allow the sector to grow, opportunities for locations outside major urban areas (such as Cairo and Alexandria) to gain beneficial access to network infrastructure and services need to be encouraged. The piloting and testing of PPP-based municipal broadband models for facilitating network expansion and the development of local e-content and services, including e-commerce and e-government solutions and platforms need to be encouraged (chapter II). This is important not only for BPO and ITO but also for local businesses in general.

2. Continue to crack down on software piracy and strengthen the protection of intellectual property rights and private data

One area that requires ongoing support is the protection of IPRs. Private sector representatives requested efforts to ensure that IPRs are secured for foreign investors as well as local content providers. The development of a digital rights management (DRM) agreement with the publishing sector may be a model that can be generalized to other situations (see chapter V).

The rule of law and the legal environment in the area of IPRs need to be further strengthened. Insufficient legal protection may reduce the willingness of companies to set up data centres and other BPO and KPO activities in Egypt. These issues are especially important if, as stated in the NICTS, Egypt wants to attract companies operating data centres to its shores. There must be safeguards in place that guarantee privacy, and the security and integrity of data, especially when information comes from foreign sources. IPRs, on this basis, can become a “make or break” issue for some investors.

While these issues are already being discussed in Egypt, it is important to proceed at a faster pace. Actions should take place now to ensure that Egypt does not lose out to traditional centres in Europe and North America, where IPR and data privacy legislation and enforcement are stronger. Fast progress may require that data centre operators and other stakeholders come together to deal with relevant outstanding issues related to IPR protection.

The Government may also make further efforts at raising awareness at all levels of the disadvantages and criminal nature of software piracy and increasing prosecutions to secure investors’ confidence and get the message out that piracy will not be tolerated.

3. Promote higher value outsourcing services

The MCIT, ITIDA and GAFI should work together to develop and promote higher value outsourcing services such as KPO, ITO and technical support, application development, business application implementation, remote infrastructure management, and the ‘Arabization’ of software.

To do this, there is a need to track the markets and demand for these higher end services. It may be easier to attract first tier companies working in this space, starting with market sectors where Egypt has specialized personnel.

There is also a need to encourage innovating companies and researchers to come to Egypt. Egypt has to take the necessary steps to make it easy for firms, research centres and others, to allow foreign researchers and experts to come to the country for extended stays and even take residence in order to create the right learning environment for high level research and development to take place.

4. Diversify outsourcing markets

Most of Egypt’s ICT-enabled services are currently focused on the United States and European markets. The Government needs to continue to monitor market developments in those countries and regions very closely.

At the same time, the MCIT and ITIDA, in collaboration with the various ICT associations in Egypt should seek to diversify the service offerings to other, fast-growing parts of the world, in particular to emerging economies such as Brazil, India, Indonesia, Malaysia, the Russian Federation and Singapore. These destinations, some of which have been relatively less affected by the financial crisis are likely to evolve into key future markets for offshoring. Egypt should explore how best it can cater to the needs of enterprises in these countries by offering language and other relevant skills for the European and African time zone.

A joint strategy should be developed by ITIDA, GAFI and other Government marketing initiatives, including the commercial attaché service (or its equivalent in the Egyptian foreign service).

Moreover, in order for Egypt to become a more important player in the global offshoring market, a detailed feasibility study should identify:

- In what areas the growth potential is the most promising;
- In which of these areas is Egypt positioned to do well;
- What policy measures are needed to enhance specific strengths in the selected areas and to remove potential bottlenecks?

It is beyond the scope of this ICT Policy Review to undertake such a detailed analysis, which requires an in-depth examination of potential investors as well as competing destinations. The ultimate result of such an assessment should enable the Government to benchmark Egypt's position against relevant alternative locations. But in order for such an exercise to be worthwhile, the benchmarking has to be undertaken at a high level of disaggregation. UNCTAD could assist the MCIT in defining the terms of reference for such a study, which should ultimately be performed by market intermediaries with easy access to the main private sector players in the industry.

The result of the feasibility study should enable the Government to prioritize among various possible initiatives aimed at developing human resources and domestic enterprise capabilities.

5. Promote stronger involvement of domestic SMEs in the ICT sector

Potential contributions from SMEs should be considered in the next strategy from both the supply side (as producers of ICT goods and services) and the demand side (as users of ICTs).

In terms of the supply side, SMEs represent an important vehicle in order for Egypt to succeed in growing the ICT sector. They should play a key role in the exports of ICT services, complementing foreign-owned exporters. They should also assume a key role in the production of relevant content in Arabic, which is of great importance in order to speed the uptake of ICT use in the enterprise sector, as well as to establish Egypt as a regional hub.

In terms of the demand side, Egypt should make sustained efforts at fostering greater ICT use among small- and micro-enterprises. Current levels are very low, with regard to both PCs and the Internet. For example, less than half of all enterprises with up to 49 employees use computers.

SMEs need to be able to make beneficial use of ICTs in their business practices and the Government should take steps to raise awareness of the advantages of ICTs in the workplace, by promoting training and capacity building of SMEs and by providing incentives for SMEs to computerize and thus modernize their operations.

The Government may highlight examples and best practices from within the country to raise awareness and encourage the adoption of ICTs. Various other policy incentives, such as facilitating credit for computerizing business operations, can be put into place in a way similar to existing programs to encourage households to acquire PCs and access the Internet. In this context, the Government could build on projects that are being, or have been, undertaken by the ICT Trust Fund and/or in collaboration with partners such as the USAID or the International Development Research Centre (IDRC) of Canada.

To provide the appropriate incentives for SMEs in Egypt to adopt ICTs, strategists in the MCIT working in close collaboration with other ministries responsible for SMEs, as well as representatives of SMEs in particular and of the private sector in general, need to acquire a clear understanding of the characteristics of SMEs and other businesses in the country. A demand-based response, complemented by supply-side policies, is needed. It is important to consider the needs of the many diverse businesses in Egypt that do not presently use ICTs, as well as those that hold the greatest promise for helping to create a stronger economic and employment basis.

6. Provide on-line platforms for all Government procurement

One way to encourage more uptake of ICTs among SMEs is to move gradually to an open and transparent procurement system and to legislate that all Government procurement will be communicated and transacted using an e-procurement platform (see also chapter V). Such on-line systems enhance market efficiency, decrease rent seeking behavior among bureaucracies and governments, while at the same time streamlining procurement and generating value for Government, suppliers and ultimately, the public at large.

What does this have to do with strengthening and promoting the ICT sector? It helps to build, extend and strengthen the ICT ecosystem in Egypt. It does this by encouraging established businesses on the margins of the ICT industry or even beyond, including the informal sector and those who do not and will not benefit from the support of the MCIT and other branches of

government, to pay attention and to adopt and adapt ICTs for their specific business purposes.

It will encourage all branches of government to go on-line and adopt e-government and it will promote e-commerce. Together these applications have the potential to transform Egypt into an economy in which ICT use is more widespread. It will also encourage innovation and entrepreneurship by opening new venues for investment and business beyond the BPO/ITeS sectors.

By making it mandatory for the Government to procure all business electronically, through a procurement platform that is consistent with current best practice and the needs and circumstances of the Government of Egypt, the private sector will be encouraged to adopt e-business solutions. The Government of Canada, for example, moved all public procurement on-line to the Merx procurement system with positive results, and in Chile the e-procurement system, ChileCompra has had a positive impact on business (chapter V). Another good example of an e-procurement implementation is that of the Korea On-line E-procurement System (KONEPS), which was introduced by the central procurement agency and is used by all public organizations, including central and local governments and other public organizations. "*Since its introduction in 2001, KONEPS has become one of the world's largest e-commerce markets, with total transactions of $34 billion in 2007, when 92 per cent of all bidding was done electronically*."[165]

7. Establish clear and measurable targets

Egypt has already made clear some of its economic targets for the ICT sector. Reaching 1.1 Billion US$ in value was one of the objectives that has been achieved. Some of the indicators to measure performance in meeting agreed upon targets under this heading include:

- Contribution of the outsourcing sector to GDP
- Number of people employed in the various sectors of the outsourcing value chain
- Number of companies established in the various techno-parks in the country
- Number of new international and local companies joining the technology parks
- Number of local start-ups created
- Number of jobs created by these firms
- Average wage per employee in the ICT sector
- Productivity of staff employed compared to competitor countries
- The extent of consultation with the private sector and especially ICT businesses. The UNCTAD survey showed that many firms were not consulted in the preparation of the NICTS. A consultation process needs to be institutionalized and operated more or less independently, probably by a marketing firm working for the MCIT/ITIDA. The indicator of performance is determined based on surveys of ICT companies and will show the extent to which companies are satisfied with the consultative process and what they feel this process has achieved
- The actual turnover of companies, a significant issue when many smaller companies are underreporting or not reporting their income in order to avoid paying taxes or tax authorities
- Number of ICT companies having adopted the Generally Accepted Accounting Principles (GAAP). In the absence of reliable figures from the tax authorities, the actual contribution of the ICT sector can only be inferred. GAAP is an important step in allowing for true accounting of the contribution of the sector to the economy of the country

Another area of measurement that needs to be improved relates to exports of IT and ICT-enabled services. Comprehensive official data on the spread and magnitude of ICT-enabled offshoring in different countries simply do not exist. The lack of consistent and reliable data makes it difficult to measure the magnitude of offshoring and limits the possibility for countries to benchmark their performance in terms of attracting ICT-enabled services (see box VI.1). Currently, international comparisons have to rely on various information and studies prepared by private consultancy firms, using different methodologies and country coverage. This lack of comparable data makes it more difficult to design and assess policies. At the seventh ITU World Telecommunication/ICT Indicators Meeting in Cairo on 3–5 March 2009, H.E. Minister Kamel, called upon the international community to work together to improve the situation.[166] UNCTAD intends to advance the work on developing better methods to capture the nature and magnitude of services offshoring, and Egypt's involvement in this process would be most valuable.

[165] Kim, Y, Kelly, T. and S. Raja. 2010. *Building broadband: Strategies and policies for the developing world*. January 2010. Case study of the Republic of Korea. Global Information and Communication Technologies (GICT) Department, World Bank. Washington, D.C. 70 pp.

[166] See UNCTAD (2009), *Information Economy Report 2009: Trends and Outlook in Turbulent Times* (New York and Geneva: United Nations), p. 76.

Box VI.1. The need for better measurement of trade in IT and ICT-enabled services

From a development perspective, trade in IT- and ICT-enabled services offers potential benefits for all parties concerned. Unsurprisingly, many governments are now seeking to design effective policies to maximize benefits and address possible adverse effects from this revolution in the tradability of services. At the same time, the formulation of such policies is greatly hampered by the severe lack of data.[167] Comprehensive official statistics on the spread and magnitude of offshoring of services in different countries do not exist. To obtain a broad picture of the phenomenon, it is necessary to rely on a multitude of different sources, none of which is ideal.

A highly aggregated estimate of the volume of communication and computer and information services can be assessed through balance of payments data. This constitutes at best a distant proxy for IT and ICT-enabled services as it includes activities such as postal services and news agency services. Moreover, according to the Manual on Statistics of Trade in Services, services that are "outsourced" should be classified to the appropriate services item. For example, services supplied by "call centres" and similar types of operation should be classified according to the type of service provided. Thus, call centres selling products should be included in trade-related services, while call centres providing computer support should be included in computing services. It is unclear, however, to what extent the collection and reporting of data is done in a similar way across countries.[168]

Whereas government statistical organizations provide the greatest promise in producing reliable and internationally comparable data, another option is to use data produced by the private sector. While these are often more detailed, the methodologies used are not well known. Trade organizations (such as Indian NASSCOM) and consulting firms are not disinterested parties, and they are often unwilling to make public the methods and assumptions by which they arrive at their results. There is therefore a need for further development of an internationally harmonized approach to capturing the size and nature of trade in IT and ICT-enabled services.

Source: UNCTAD.

[167] Ibid.
[168] See UN Statistical Commission (2010). *Manual on Statistics of International Trade in Services 2010* (MSITS 2010), (Geneva, Luxembourg, New York, Paris, Washington, D.C., 2010).

CHAPTER VII. SUMMARY AND MAIN RECOMMENDATIONS

This Review has documented the considerable progress made in Egypt with regard to building an inclusive information society and economy. Because of, among others contributions, the strong commitment from the highest level of the Government, Egypt has seen marked improvements in terms of, for example, ICT infrastructure, the availability of trained human resources, exports of IT- and ICT-enabled services and promotion of digital content. Another milestone has been the launch of the world's first Arabic-script web domain. The National ICT Strategy formulated in 2006 has served an important function as a guiding tool for the Government's overall efforts in the ICT area.

The next strategy must be considered against the background of the ambitious goal set by the Government to make Egypt a frontrunner in the information and knowledge society. It is essential that the new strategy builds on achievements already made, addresses the areas in which progress has been less pronounced, as well as keeps up with the continuous technological and market changes in the global ICT landscape.

With a view to supporting the Government in this quest, and in light of the analysis presented above, this concluding chapter summarizes the main recommendations emerging from the Review. The following nine points should be seen as generic recommendations that can be applied to several of the policy areas discussed in previous chapters. Due attention to these areas should help to realize the untapped potential in the Egyptian ICT landscape and maximize the development impact. The recommendations should be seen as complementing those emerging in other targeted studies commissioned by the Government, for example, related to promoting innovation, broadband deployment and ICT-enabled services exports.

1. Make policies more demand-driven

In order to make sure that the next national ICT strategy sets the appropriate priorities and uses the most efficient means to reach the development goals identified, it is essential to make strategies and policies as demand-driven as possible. This is of particular importance as ICT markets and technology are in a constant state of flux. In several of the previous chapters, examples have been provided on how to induce more demand-side considerations.

In the case of broadband deployment, there is a need for *demand and market studies* to determine the ability of communities, and of residents in those communities, to pay. These should serve as inputs to infrastructure plans and help to understand the development impacts of new service provision in formerly underserved areas. They should also help identify the priority needs of Egyptian consumers and businesses in terms of information and services, and to determine the extent to which this demand can be met using the Internet. The resulting outcome of the studies should be integrated into the national broadband strategy.

In terms of meeting the changing needs of the ICT industry, it is similarly recommended that the Government undertake *regular surveys of ICT companies, teachers, instructors and students* to understand their evolving needs and challenges. This can be achieved using on-line tools, especially to assess student, staff and graduate satisfaction with training and job prospects. ITIDA already undertakes surveys among ICT firms and maintains ongoing communication with them. However, there is a need to obtain hard data to enable the educational system and the programs of the MCIT in the educational and learning sector to be adapted and scaled accordingly.

In a similar fashion, Egypt's future strategies aimed at boosting e-content development should also be based on careful analysis of the potential demand, distinguishing between content aimed at the general public, enterprises in different industries and of different size, and specific sectors (health, education, culture). Market or demand studies at the national and local levels can help to understand the needs and priorities for on-line information and services of the different intended users.

Finally, there is a need to track the markets and demand for higher-end ICT-enabled services. In order for Egypt to become a more important player in the global offshoring market, a detailed feasibility study should seek to identify in what areas the growth potential is the most promising, in which of these areas Egypt is positioned to do well, and what policy measures are needed to enhance specific strengths in the selected

areas, as well as to remove potential bottlenecks. The results of such a study should enable the Government to prioritize among various possible initiatives to promote exports of IT and ICT-enabled services.

2. Make ICT policies more inclusive

In order to bring Egypt to the forefront in leveraging ICTs for development, it is very important to extend the reach of access to and benefits from ICTs. This means, among other things, enhancing infrastructure coverage in underserved areas, promoting greater use of ICTs among enterprises that are located outside the technology parks, and finding ways to reach Arabic-speaking users. The Review makes several concrete recommendations to this end.

In terms of reaching underserved areas, the new broadband strategy should be well integrated with the universal access strategy (UAS), promoting a combination of market-based incentives and government subsidies. The UAS should set the stage to encourage public and private sector organizations at all levels, including municipalities, to exploit existing broadband infrastructure. The Government may choose to encourage municipalities to take the lead in planning, building, owning and operating their own municipal broadband networks while leveraging the expertise of telecom operators.

Voice service delivered through the Internet (VoIP) is important inasmuch as it builds a better case for broadband access in rural areas. VoIP with access to international gateways could be a key driver of broadband connectivity in underserved areas. However, given that the cost of mobile telephony is relatively low in Egypt, a comparative analysis should be undertaken to determine the economic feasibility of this opportunity. Closely linked with VoIP is access to Wi-Fi as a way of propagating network access. Mesh networks at the local and community level can be a relatively easy way to propagate network access in underserved communities.

Given the much higher penetration rates for mobile telephony than for other ICTs in Egypt, it is important to pay adequate attention to the provision of services and content development using mobile platforms. The Government could set up a task force involving mobile operators and international mobile content developers to look into ways and/or advise policy makers on ways to speed up progress in terms of boosting mobile applications and services in Arabic.

Potential contributions from SMEs should be considered in the next strategy from both the supply side (as producers of ICT goods and services) and the demand side (as users of ICTs). SMEs represent an important vehicle in order for Egypt to succeed in growing the ICT sector. They should play a key role in the exports of ICT services and in the production of relevant content in Arabic. Egypt should also make sustained efforts at fostering greater ICT use among smaller enterprises. The Government should take steps to raise awareness of the advantages of ICTs in the workplace, by promoting training and capacity building and by providing incentives for SMEs to computerize and thus modernize their operations. Again, a response reflecting actual needs and demands is essential in this context.

3. Work in partnership with the private sector

The Government already has considerable experience in partnering with the private sector in various areas of the ICT strategy. Nonetheless, there is still room for further improvement.

The next strategy should continue to encourage broadband deployment and look at business models that encourage the private sector to invest in fiber deployment and in the provision of network services. PPP-based models should be considered for the construction and operation of broadband networks and for the creation of public services on-line. At the municipal level, collaboration between municipalities and private sector operators can be organized on a PPP basis or otherwise. To allow this to happen, further deregulation would be required.

Responses to the UNCTAD survey and interviews proposed that the private sector should become more directly involved in the Government's training programs and should also develop its own training activities and programs. The MCIT should also assess the market potential for e-education and consider the business case for offering such services under a PPP arrangement. The private sector, NGOs and grassroots organizations need to be involved in assessing opportunities in this area and in developing an appropriate response. By stating that private sector operators can have a role to play in the service delivery, the Government may encourage and engage private entrepreneurs in making investments and sharing skills and expertise that can assist the Government in providing on-line services.

The Government can furthermore take steps to make it more attractive for the private sector to invest in content development projects. This involves reducing the risk for such investment and creating an environment that is supportive of private initiatives in this area. Key actions include determining the demand for different kinds of digital content, creating a legal environment that supports the use of e-commerce, introducing e-payment solutions, and creating incentives for the development of company websites in Arabic.

4. Move towards exports of higher value-added services

The MCIT recognizes the importance of developing services with higher added value since they would allow companies to take advantage of the increasingly skilled and plentiful IT-related graduates and technicians in this area. Egypt is furthermore aiming to develop a niche in the emerging engineering and R&D services market to take advantage of the large numbers of multilingual graduates in engineering and the sciences.

In the next few years, the MCIT, ITIDA and GAFI should work together to develop and promote higher value outsourcing services such as KPO, ITO and technical support, application development, business application implementation, remote infrastructure management, and the 'Arabization' of software. This will require tracking of markets and demand for such services. Innovating companies and researchers should be encouraged to come to Egypt. In this context, the Government may need to enhance its efforts at raising awareness at all levels of the disadvantages and criminal nature of software piracy and increase prosecutions to secure investor confidence. Targeted efforts will also be needed to ensure a sufficient supply of adequately trained staff for the higher-value services.

5. Leverage foreign skills and expertise

In order to allow Egypt to speed up its expansion into services of higher value added, as well as to promote innovations, the Government should design a targeted strategy to leverage foreign skills and expertise. This is an important way of complementing domestic efforts at building the skills needed by an expanding ICT sector.

This Review has highlighted the untapped potential represented by Egyptian experts in the diaspora and the need to encourage brain circulation. The Government can do more to help bridge the gap between government organizations and diaspora communities, for example, by enhancing communication and information sharing with the diaspora communities through the use of modern, well designed and targeted messages and services mediated by web-based and on-line information sharing platforms. The MCIT and ITIDA could launch a dedicated effort to target the Egyptian Diaspora with links to the ICT sector.

Along with efforts to attract world class Egyptian experts, the Government should seek to attract other international expertise. The MCIT may develop a targeted strategy together with ITIDA and GAFI to remove barriers to attracting greater inflows of foreign experts or visiting scholars related to the ICT sector.

6. Strengthen coordination among government entities

Several different ministries, agencies and public corporations are operating in the ICT field. They need to work more closely together on the NICTS issues of tomorrow to make the overall efforts of the Government as effective as possible. This Review has identified several areas in which such collaboration could be strengthened.

In promoting the use of PPPs, the MCIT and other ministries involved in the ICT strategy could benefit from close collaboration with the Public Private Partnership Central Unit and the Ministry of Finance, which have the relevant expertise. Similarly, to provide the appropriate incentives for SMEs in Egypt to adopt ICTs, strategists in the MCIT need to work closely with ministries responsible for SMEs.

The MCIT has an advocacy role in e-government development and should continue to support the Ministry of State for Administrative Development and other ministries and their agencies in making available information and services via their websites, and also through mobile applications. The Government's actions can have an important effect in terms of raising awareness. By encouraging organizations under government control to speed up the development of e-government services, and by encouraging them to work in partnership with the private sector in developing appropriate solutions, it can both improve the level of services to various stakeholders and stimulate more content development among enterprises. The Government should continue to digitize government archives, data and content across all levels of government (national, governorate, local) to facilitate access for the population at large.

There are several government authorities responsible for overseeing and/or developing on-line content. The Ministry of State for Administrative Development is responsible for transforming government use of on-line services. The Ministry of Finance likely has a role to play in ensuring that the appropriate financial policies and regulations are in place to regulate e-commerce and on-line buying and selling. A comprehensive and demand-driven approach is needed, as well as close collaboration among the public and private sector stakeholders involved. The Government and the various consumer and business associations should meet to discuss this issue and to help provide support for the various and apparently disparate efforts that are now taking place, in order to create a vibrant Egyptian on-line community.

7. Make use of the latest technology

Staying abreast of technological change is highly demanding for any government, especially in an area as dynamic as the ICT sector. Innovation in the ICT sector takes place at the speed of the Internet. Of particular significance are rapidly advancing innovations in 4G technologies, Web 2.0, IPv6, ultrafast broadband and next generation networks in general, smartphones and related applications, pervasive computing, wireless sensor networks. Green ICT and related clean technologies (cleantech), especially smart grids, smart buildings and smart transportation/logistics, Green Growth, as well as the development of new outsourcing services, are also highly relevant.

For this, the Government must continue to network with the international agencies working on these issues, the private sector especially and academic community. The ICT Policy Review has noted certain technological solutions that would be worth exploring in the next ICT strategy.

In the educational field, infrastructure costs associated with extending the Smart Schools Network and related initiatives to the entire country were found to be prohibitively high. One novel solution involves the use of virtualization technologies to reduce the number of central processing units (CPUs) servicing school labs, where one virtualized PC, or ultra-thin client device, can thus be turned into 10 independent workstations at a cost of about $50 per seat. Egypt may consider this technology, for example to computerize schools and other parts of the educational system.

The MCIT is already developing a Green IT strategy. As part of this, it could consider how smart energy technologies as well as alternative power technologies (solar, wind, and others.) can assist in reducing the energy and carbon footprint of the ICT sector (PCs and network resources), as well as how to use ICTs to enable energy efficiency and limit greenhouse gas emissions in other sectors. The Smart Village is the natural place to demonstrate these technologies.

Egypt needs to be aware of and seize the opportunities for taking part in the global research and development activities on issues such as energy efficient technologies, and for adapting existing research and development initiatives such as those in nanotechnology, which is an important area of research and development for green ICTs, as an opportunity that the Green Growth trend represents. The clean energy market will grow to an estimated US$ 200 billion in 2010. Egypt needs to be at the table to take advantage of this opportunity.[169]

8. Set quantifiable targets and continue to monitor progress

There needs to be a detailed implementation plan for the execution of the next NICTS. In the plan, the Government should set measurable targets and indicators of performance and track and report on these regularly to all stakeholders involved. The implementation, or action, plan can and should change over time in response to government policies and priorities, but also in response to the rapidly changing technology development and innovation environment.

This Review has proposed a set of indicators for each policy area. It is up to the Government to choose which of these it thinks are best harmonized with its overall development objectives. The Government must also try to arrive at a realistic but ambitious goal in each area, and make active use of the chosen benchmarks when assessing performance. Ideally, the choice of indicators should reflect discussions with relevant stakeholders in order to ensure that targets are shared to the greatest extent possible across society.

This Review has also noted the need for impact assessment of certain initiatives that have been already implemented. In the case of the SECC, investments have been made in the areas of software and IT services. In order to establish the return on these investments, it would be appropriate to measure the impact

[169] Pew Charitable Trusts. 2010. *Pew Study: China Leads G-20 Members in Clean Energy Finance and Investment*. http://www.pewglobalwarming.org/cleanenergyeconomy/pr_24mar2010.html.

of the training based on, for example, the increase in the level of product exports of companies whose staff has benefited from the training. Specific on-line survey instruments could be developed and applied to this end. It would similarly be useful to undertake an impact analysis of the EEI's efforts at integrating ICT skills in the curricula of the faculties of education, law and business when the pilot phase draws to a close.

9. Establish a long-term vision

In its next ICT strategy, the Government of Egypt should outline a longer term vision, beyond 2014. While rapid changes of the technological landscape make it difficult to identify the concrete initiatives over a period longer than 3-4 years, it is important to identify the medium- to long-term strategic objectives. Some efforts – such as expanding the availability of skills – take time to realize. It is therefore desirable that the Government specifies the direction in which it wants Egypt to go for the longer term. Such a guiding framework should allow for adjustments in policies when needed, but set clear targets to be achieved by different points in time. The ICT strategy should also include budgetary estimates for relevant initiatives, as well as a framework of processes to guide the institutional implementation of the strategy, taking into account the need to coordinate the various contributions by relevant stakeholders.

ANNEX VII.1: List of people interviewed during UNCTAD missions (May 2009 and January 2010)

I. PUBLIC SECTOR BODIES

Ministry of Communications and Information Technology

- Tarek Kamel, Minister
- Hoda Baraka, First Deputy to the Minister
- Mahmoud El-Gowini, Senior Advisor to the Minister for Communication Policy
- Tarek El-Sadamy, Senior Advisor to the Minister for Technology Policies
- Ekram F. Abdel Gawad, Senior Advisor to the Minister for HRD & Training
- Ashraf Mashhour, Director of e-Readiness Development Sector
- Ahmed G El-Mekkawy, Manager of International Organizations Unit
- Ali El Hefnawy, Smart Village
- Gamal M. Aly, Chairman, Software Engineering Competence Center (SECC)
- Sherine S. Faragallah, Senior Business Development Specialist, SECC
- Abeer A. Khedr, Business Development Unit Manager, SECC
- Reem Salah Morsi, Deputy, Bilateral Affairs and UN Specialized Agencies
- Nevine Abouelkheir, UN Specialized Agencies Affairs Manager
- Samah Aziz Atia, Deputy, European and Foreign Affairs
- Hesham El Deeb, Supervisor for IT Infrastructure Division
- Zeinab Omran, ICT4D Senior Researcher
- Nevine M.Tewfik, Director, Cyber Peace Initiative
- Nagwa Ebrahim El-Shenawy, Information Center Director
- Nancy Badr, Head of International Organizations Unit
- Safa Mostafa Abdel Hamid El Said, Senior Economic Researcher, International Organizations Unit

Ministry of Economic Development

- Ashraf El-Araby, Head and Supervisor, Minister's Technical Office

Ministry of Finance

- Ahmad Salem ElBaz, Advisor to the Minister & Head of Government e-Payment & Collection Unit
- Maged Elgendy, Gov-CA Director
- Haithem Trabreek, Consultant
- Mohamed el Salhawy, First Under Secretary, Head of Administration Affairs
- Galal Ibrahim Abo El-Fotouh, Counsellor for Customs Affairs
- Atef El Feki, Advisor for IT

Ministry of Higher Education

- Mohamed A. Sheirah, Advisor, Egyptian Minister of Higher Education for Education Programs and Systems Enhancement
- Safwat Salem, Supervisor, Minister's Office

Ministry of State for Administrative Development

- Ashraf H. Abdelwahab, Deputy to the Minister

Ministry of Tourism

- Adla Ragab, Economic Advisor to the Minister

Ministry of Trade and Industry

- Samiha Fawzy, First Assistant to the Minister
- Mona Taema El Garf, Lead Economist, Minister's Office

Central Agency for Public Mobilization and Statistics (CAMPAS)

- Bahy Eldin Mortagy, Head of IT Sector
- Ashraf Badr, Consultant for Statistics and Supervisor, MCIT Project

General Authority for Investment and Free Zone (GAFI)

- Naveen El Shafei, Vice Chairman

Information Technology Industry Development Agency (ITIDA)

- Hazem Y. Abdelazim, Chief Executive Officer
- Sherif Hashem, Executive Vice President
- Hani El-Kolaly, Manager, Organization Support Department
- Sherine El Sherif, Senior Projects Coordinator
- Amin Khaireldin, Strategy Advisor and Board Member
- Mohamed Salama, ITAC Manager
- Sherif Hazem, Information Security Systems Consultant, Root CA Manager
- Noha El Sheikh, Senior International Business Developer
- Ahmed Laiali, Technology Incubation Program Manager
- Mohammad Shahabuddin, Advisory Program Manager
- Sally Metwally Mohammad, Dept. Manager, Research & innovation Support Division

Information Technology Institute (ITI)

- Mohamed Salem, Chairman of the ITI
- Riham Moawad, ITI Deputy, Business Development
- Samia Moussa, Chairman Assistant for International Relations
- Raham A. A. Fahmi, Strategic Development Manager
- Heba Saleh, ITI Deputy, Projects

National Telecommunications Institute (NTI)

- Ahmed El Sherbini, NTI Director & Deputy Minister, MCIT
- Eman Saad Mahamed, Assistant Project Manage, NTI/ICT Trust Fund – UNDP
- Nairouz Talaat Omar, Senior International Relationships Coordinator

National Telecom Regulatory Authority (NTRA)

- Olfat Abd El Monsef, Vice President Policies & Research and Development
- Ahmed El Sherbini, NTRA Board Member
- Tarekl A. Latif, Manager, Access Networks Planning
- Christine Arida, Director Telecom Services and Planning
- Mostafa Abdelwahed, Vice President, Operations
- Manal Ismail, Director, International Technical Cooperation

Smart Village Egypt

- Ali El Hefnawy, Chairman
- Mona Francis, Guests Relations Manager
- Ahmed Naim, Marketing and Sales Director
- Mohamed Abdel Wahab, Executive Manager, Maadi Park

Telecom Egypt

- Mohamed Elnawawy, Vice President, Corporate Strategy
- Amany Nabil Nasr, General Manager, Regulatory Affairs

II. UNIVERSITIES

Ain Shams University

- Mohamed Hashem Abd El-Aziz, Head of Information Systems Department
- M.Essam Khalifa, Dean of Faculty of Computer and Information Science
- El-Sayed M. El-Horbaty, Professor of Computer Science
- Safwat Helmy Hamad, Scientific Computing Department
- Nagwa Lotfy Badr, Lecturer, Department of Information Systems

Cairo University

- Samir Shaheen, Professor of Computer Engineering, Computer Engineering Department

Nile University

- Tarek M. Khalil, President and Provost
- Hazem Ezzat, Vice President for Research

III. PRIVATE SECTOR

Alcatel-Lucent

- Phillipe Chomel de Jarnieu, Deputy Vice President, Middle East

Advanced Computer Technology

- Nabil El Sharkawi, Senior Consultant

alKhawarizmy Language Software

- Hossam Mahgoub, President and CEO

Allied Soft

- Mohamed Reda, Chairman and Chair, ITEC

CAD/CAM and SignageSystems

- T. Elrashidy, Managing Director

Cisco

- Hosein F. Badran, Senior Consulting Engineer, Middle East & Africa

e-Finance

- Haithem Trabeek, Strategic and Business Planning Manager

Egyptian Contact Center Operator (ECCO)

- Ahmed Hassabo, Business Development Account Manager (Off-shoring)

Eitesal

- Walid Gad

GNSE Group

- Hossam El Gamal, Managing Director
- Mohamed Abdel El Moniem, E-Security and Channels Manager

HP

- Ahmed Samy, Country Managing Director

IBM

- Rodolfo Ambrosetti, Director, Cairo Technology Development Center
- Dina Galal, Government Programs Executive

Info Arab

- Alaa S. Al-Agamawi, Group Chairman & CEO

IT Synergy

- Vincenzo Puliatti, Chairman

Microsoft

- Tarek Elabbady, Director
- Ayman Abdellatif, Public Sector Manager

NCR

- Magdi Abdel Sayed, Managing Director, Africa Direct

Orange

- Ahmad Naguib, Managing Director, Equant Egypt, SAE

Regional IT Solutions

- Karim Sameh, Managing Director

Steadfast Alliance

- Khaled Aziz, Managing Director MENA

Summit Holding

- Magda El Sabee, Chairman and CEO, and Chair, ICT Committee, American Chamber of Commerce

Tele-Med

- Wael Abdel-Aal, CEO

United OFOQ

- Essam Al-Kalza, CEO

Valeo

- Wael Abouelmaaty, General Manager
- Nermeen Farouk, Office Manager

Vodafone

- Ehab Serry, Senior Manager, Professional Services

IV. INTERNATIONAL AGENCIES

International Telecommunication Union (ITU)

- Nefertiti Ali, Principal Advisor
- Myriam Naguib, Administrative Assistant

United Nations Development Program (UNDP)

- Sherif El Tokali, Assistant Resident Representative
- Khalid M. Abdelwahed, Executive Manager, Evaluation and Monitoring Unit
- Kamal Seddik, Project Manager, Egyptian Education Initiative Schools
- Mohamed Bayoumi, Environment Specialist
- Mounir Tabet, Country Director

V. OTHERS

Center for Documentation of Cultural and Natural Heritage

- Fathi Saleh, Director

Regional Information Technology and Software Engineering Center (RITSEC)

- Moatassem Billah Kaddah, Executive Director