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NATIONAL PROFILE OF THE INFORMATION SOCIETY IN THE UNITED ARAB EMIRATES

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LIST OF ABBREVIATIONS

aeCERT	UAE Computer Emergency Response Team
AII	Arab Innovation Index
AUS	American University of Sharjah
BSI	British Standards Institution
CERT	Centre for Excellence for Applied Research and Training
DIC	Dubai Internet City
DIFC	Dubai International Financial Centre
DSO	Dubai Silicon Oasis
eHDF	eHosting DataFort
EIDA	The Emirates Identity Authority
EIM	Emirates Internet and Multimedia
EMI	Emirates Media Incorporated
FOG	The Fiber Optic Gulf
FNOC	The FLAG Network Operations Centre
GCC	Gulf Co-operation Council
GFH	Gulf Finance House
ICT	Information and Communication Technology
IDB	Islamic Development Bank Group
IDN	Internationalized Domain Names
IFIC	Iran Foreign Investment Corporation
ISI	Information Society Index
IT	Information Technology
MOFI	Ministry of Finance and Industry
MoH	Ministry of Health
NGN	Next Generation Network
NAP	Network Access Point
PPP	Public Private Partnerships
RTA	Road and Transportation Authority
SMBs	Small and Medium Businesses
TECOM	Technology E-Commerce & Media Free zone
TRA	Telecommunications Regulatory Authority
VoIP	Voice over Internet Protocol
WHO	The World Health Organization

Introduction

Information and Communication Technology (ICT) development has been an important ingredient in the growth strategy of the GCC countries, in general, and the UAE, in particular. As a region, the countries delivered impressive results in the Network Readiness Index (NRI) of the Global Information Technology Report 2010-20011. The report indicates that nearly all countries in the region made it within the top half of the NRI, showing an increasing tendency in leveraging ICT to improve economic development and increase global competitiveness. Among the GCC countries, the UAE ranks tops the list, with a worldwide ranking of 24th, followed by Qatar which ranks 25th worldwide.

The UAE has led the region's strong performance in the NRI, topping the 138 country-list in Mobile Network Coverage. It also ranks second worldwide in Government Success in ICT Promotion and fourth worldwide in ICT Use and Government Efficiency[1]. The NRI measures the capacity of an economy to fully leverage ICT for increased competitiveness and development.

The United Arab Emirates (UAE) is a union of seven sovereign sheikhdoms, formed when the British withdrew from the Gulf in 1971. With a relatively small area (83,600 sq km), the population has reached 5.148 million as estimated by the CIA Factbook in July 2011. The UAE's per capita GDP is on par with those of some West European nations ($49,600 in 2010)[2].

The national government is a federation with specified powers delegated to the UAE government and other powers reserved to member Emirates, which explains the huge difference in accepting and utilizing ICTs in the different emirates. Dubai, followed by Abu Dhabi, is considered the most advanced of the seven Emirates. The Gross Domestic Product reached US$ 301.9 billion in 2010[3].

The UAE is one of the most technologically sophisticated countries in the Middle East. At the heart of the growing information technology market, the UAE IT sector grew from US$ 6.9 billion in 2003, US$ 9.5 billion in 2005, to more than US$ 11.4 billion in 2008; this figure is expected to rise to US$ 14.8 billion by the end of 2011, according to research conducted by economic and financial analysts Global Insight[4]. In addition, the impact of the telecom sector in contributing to the UAE's GDP is increasing and has reached 5.3% in 2010[5].

The country has achieved significant accomplishments in building the foundations for an information/knowledge-based society. By providing an enabling legal and regulatory framework combined with the existence of national data and an advanced communications infrastructure, important progress has been made in diversifying the economy away from full dependence on petroleum exports. This has stimulated commercial success among a wide variety of businesses, including global, regional, local SMEs, and locally based international companies such as Etisalat, Du, the Thuraya Satellite Telecommunications, well-capitalized indigenous government supported telecommunication companies, and world-class free trade zones.

For three years in a row, the UAE has been identified as the regional ICT hub among the GCC countries; but Qatar has made significant strides, in this respect, in recent years. The Dubai Technology E-Commerce & Media Freezone (TECOM), which was established in 2000, is home to hundreds of global companies that

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[1] The Global Information Technology Report 2010-2011; p. 294.
[2] CIA Factbook 2011, https://www.cia.gov/library/publications/the-world-factbook/geos/ae.html.
[3] CIA Factbook 2011, https://www.cia.gov/library/publications/the-world-factbook/geos/ae.html.
[4] Gulf News, The UAE Will Spend $15 billion on IT by 2012; September 20th, 2008, http://archive.gulfnews.com/indepth/gitex2008/more_stories/10246514.html.
[5] Telecoms sector contributes 5.3% to UAE's GDP in 2010; http://www.itp.net/584465-telecoms-sector-contributes-53-to-uaes-gdp-tra.

serve technology, media and knowledge industries. TECOM is also home to Dubai Internet City, Dubai Media City, and Dubai Knowledge Village. The Global Competitiveness Report 2010-2011[6] issued by the World Economic Forum ranked the UAE 25th in the world for competitiveness. The country was included, for the second year, in the third and most advanced stage of "Innovation-driven economies", which includes the most advanced countries, classified on the basis of their adoption of factors that promote innovation in economic development. The technological readiness, which is a sub-component of the Global Competitiveness Index, measures firm-level technology absorption, laws relating to ICT, foreign direct investment (FDI) and technology transfer, mobile telephone subscribers and Internet users and personal computers. The 2010 Arab Competitiveness Report identifies the UAE as an innovation-driven economy (the only Arab country in this category) placed alongside countries such as Germany, South Korea, the United Kingdom and the United States[7].

While the country has slipped two places on the overall index (from 23rd in 2009-2010) in The Global Competitiveness Report 2010-2011, the UAE improved its ranking across a number of pillars of the Growth Competitiveness Index (GCI), with a more stable macroeconomic environment and a better assessment of the quality of the educational system. The country's institutional environment remains a competitive advantage, characterized by an excellent infrastructure (3rd), high public trust in politicians (8th), and technological adaption (2nd).

The UAE enjoys a competitive economy due to maintaining a business-friendly environment coupled with good infrastructure and internationally competitive labor cost. The introduction of competition into the UAE telecommunications market and the continued demand for additional services by a sophisticated domestic and expatriate market, will continue to grow the market for ICT products and services. During this economic and financial crisis, telecommunication companies in the UAE are likely to represent a source of growth for the country. Etisalat, the UAE state-controlled telecommunications provider, is cash-rich and is actively looking to expand its services and make acquisitions. Telecoms operators enjoy "stickier" demand than most consumer service providers and Etisalat's relative domination of its home market, the second-largest Arab economy, means that it is likely to continue being a 'cash cow'.

The UAE's infrastructure and indigenous companies are world-class, implementing the latest technology and services. In addition to commercial activities, considerable success has been made in integrating information and communication technologies into governmental processes. Most government ministries have an interactive on-line presence, and a national initiative is under way to increase the number and scope of services available on-line. These efforts have resulted in the UAE being ranked highest among all ESCWA member countries in e-Government readiness by the United Nations[8], and the third highest on the 2011 Global Innovation Index published by INSEAD[9]. The United Arab Emirates, alongside Qatar, continues to lead the Middle East's information and communication technology (ICT) readiness index.

[6] WEF, Global Competitiveness Report 2010-2011.
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2010-11.pdf
[7] Arab Competitiveness Report, 2010. http://www3.weforum.org/docs/WEF_GCR_ArabWorldReview_2010_EN.pdf
[8] e-Government Readiness Index, http://data.govloop.com/Government/UN-e-government-Readiness-Index-Rankings/vw6u-mtht; United Nations, 2010.
[9] Global Innovation Index, 2011. INSEAD.
http://www.globalinnovationindex.org/gii/GII%20COMPLETE_PRINTWEB.pdf

I. THE ROLE OF THE GOVERNMENT AND ALL STAKEHOLDERS

A. NATIONAL INFORMATION SOCIETY POLICIES AND E-STRATEGIES

Internet came to the UAE in the year 1995 and there has been no looking back since. Even though the UAE ranking on the e-readiness index fell 17 notches from 32nd in 2008 to 49th in 2010, the way in which usage of ICT tools are promoted in the country is commendable, thanks to the many governmental initiatives. In the latest United Nations survey on e-Government 2010, the country achieved the 49th rank for e-Readiness amongst UN member countries across the world. Among GCC member countries, the UAE ranked second to Bahrain in terms of Web measurement, a rating of the online presence of national websites and selected ministries including health, education, welfare, labor and finance; especially at the federal level. While an explicit national plan of action for building the Information Society has been published only in 2005[10], the ongoing commitment of UAE to developing a robust ICT sector is clear. Many international indicators point to UAE accomplishments in this regard, in addition to the many initiatives undertaken by the federal government to boost ICT infusion and diffusion in the country. The United Arab Emirates has taken a quantum leap during the past 19 years in the direction of liberalizing its economy and diversifying it away from the oil-based sector. The Networked Readiness Index, a joint project by INSEAD and the World Economic Forum, which evaluates the relative level of ICT development in 138 countries, ranked the UAE 24[th,] with a score of 4.8 out of 6. Sound economic management has contributed to stabilizing the macroeconomic environment and strengthening public institutions. The UAE has embarked on a number of multibillion-dollar technology-based projects, notably the Dubai Media City, Dubai Internet City, and Knowledge Village, with the aim of creating innovation clusters. The country is up two positions to 24th, up three places from its ranking in 2008-2009, almost closing the gap with Israel. As already mentioned, the government's push for ICT diffusion, infusion, and usage, has been impressive in recent years, as reflected by the country's 9th and 16th position in the government readiness and usage Index categories, respectively. The country realizes its largest improvement from 2007 in the environment component, going up seven places to 32nd in this dimension. The business environment is assessed as being quite ICT conducive (24th), with an impressive 1st and 2nd place for the extent and effect of taxation and for total tax rate, respectively, with little 'red tape' (5th for the burden of government regulation).The challenge for the country in increasing its innovation potential in the years to come has to do with the quality of its higher education and research systems, which is assessed as being fairly poor and does not seem to provide local businesses with a sufficiently large qualified labor pool (75th for the availability of scientists and engineers)[11].

In a parallel mode, the various Emirates have been developing their own ICT strategies; noticeable among them is the Emirate of Abu Dhabi, Abu Dhabi whose e-strategy was developed and has been maintained by Abu Dhabi Information and Systems Centre (ADSIC) in Abu Dhabi. ADSIC crafted the Abu Dhabi e-strategy that supports the e-government vision. The e-strategy looks after and caters for the different dimensions of the E-R-U Framework environment, readiness, and usage implications. The strategy depicts Abu Dhabi as a service oriented government which focuses on providing high class government services. The strategy has been developed through six different steps; crafting the vision for a service-oriented government, formulating the service-oriented government strategy, adopting the service-oriented government strategy, assessing the current situation, defining strategic initiatives in the various sectors and finally developing a comprehensive implementation plan. The implementation plan has been rolled out in 4 different phases since 2006 in order to ensure and maintain efficiency in managing the various recommended projects and initiatives within every phase[12].

Remaining areas of concern are educational accomplishment, in particular at the primary and secondary levels. These need to be dealt with on a priority basis by decision makers. This is being somehow addressed at the individual Emirate levels; Etisalat expects Abu Dhabi, for instance, to be fully connected by fibre optic

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[10] "2006-2010: General Policy for ICT in the UAE;" http://www1.american.edu/carmel/jp2450a/2.htm
[11] The Global Information Technology Report, 2010-2011, INSEAD.
[12] www.Adsic.abudhabi.ae .

cables this year and hopes to have 90 per cent of UAE homes online by the end of 2011. On the other hand, data is definitely increasing, and while it represents 20 per cent of Etisalat's revenues currently, it is expected to represent 50 percent, during the 2009-2012 time-frame.

In 2011, the Index of Economic Freedom, a joint project by the Heritage Foundation and the Wall Street Journal, ranked the UAE 47th worldwide, 6th among Arab states after Bahrain (10th), Qatar (27th), Oman (34th), Jordan (38th), and Israel (43rd)[13]. This index measures how well a country scores on a list of 50 variables divided into 10 areas of economic freedom. These include trade policy, banking regulations, fiscal burden, foreign investment codes, monetary policy, and black market. The various measures and incentives created by the government have helped the country move steadily and consistently into the direction of an information/knowledge based society. The 2011 Index of Economic Freedom shows that the UAE has moved up in ranking in two categories: (1) Monetary Freedom and (2) Freedom from Corruption.

The UAE consistently ranks very highly when measured by the criteria provided in documents such as the WSIS plan of action, the UNDP human development report, and the information society index (ISI). While the UAE's present development is not specifically tuned to the metrics provided in these documents, their achievements in areas such as telephone and mobile penetration, personal computers and Internet diffusion and infusion and societal integration of ICT, perform very well under these indicators of achievement. The UAE tops the world in Mobile Penetration Rate (200 %) and is striving to be the first country in the world to achieve 100 percent broadband penetration, by 2012[14]. The latest achievement of the UAE is its high ranking by the GE Innovation Optimism Index (second to Saudi Arabia). This index is an evaluation of how new thinking and applications can improve the quality of life. This first-of-its-kind index outlines a new landscape for innovation in the 21st century, placing an increased premium on addressing local needs, marshaling the creativity of individuals and smaller organizations, and forging strategic partnerships[15].

The UAE also ranks very high among the Arab countries on: high-speed monthly broadband subscription, the lowest cost of broadband, the availability of government online services, and secure Internet servers. It ranked third in the total broadband and Internet subscribers rate. Internationally, the UAE ranks first worldwide for low cost mobile telephone calls (along with Egypt, Italy and Hong Kong)[16], and on residential monthly telephone subscriptions. These achievements on the regional and international levels in the ICT sector are a result of the competitive market environment, international best practices, solid regulatory systems, and governance.

B. PUBLIC/PRIVATE PARTNERSHIP (PPP) OR MULTI-SECTORAL PARTNERSHIP (MSP)

Based on a legislative mandate provided at the federal level in resolution number 631/1, the UAE is pursuing a deliberate path to incorporate ICT in government services. This plan originally called for approximately 90% of government services to be available by telephone (including fixed and mobile lines) and Internet services by the end of 2007. This goal has been achieved according to plan. Commercial partners who assisted in the implementation of these efforts include Oracle and Microsoft. A number of public private partnerships (PPP) initiatives have been undertaken by the government and various private sector entities such as HP, Microsoft and Intel; the latest is Intel Teach to the Future Initiative with the Abu Dhabi Government; Intel® Teach to the Future is a worldwide effort to help both experienced teachers and Pre-Service teachers integrate technology into instruction to develop students' higher-level thinking skills and enhance learning. Teachers participating in this initiative receive extensive training and resources which help them promote the use of effective technology in the classroom. The training provides new approaches to align lessons with educational learning goals and standards. In addition, the program integrates the use of Web page design, the Internet, and student projects as a medium to powerful learning. The pilot program in

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[13] Heritage Foundation/Wall Street Journal, the Index of Economic Freedom, 2011.
[14] http://www.inewsone.com/2011/05/17/uae-aims-at-100-percent-broadband-penetration-by-2012/51234.
[15] UAE Business Leaders Endorse the Power of Innovation, Khaleej Times, Feb. 3rd, 2011.
[16] http://www.itu.int/net/itunews/issues/2011/04/43.aspx

the UAE commenced in Abu Dhabi Education Zone in September 2006, it was evaluated in 2007-early 2008 and began implementation in spring 2008.

Another PPP initiative is Ankabut, where Zayed University is a counterpart of Internet2. Through Ankabut, Zayed University caters for regional research needs, offers improvements on how to conduct research and engage in teaching and learning. It also provides a venue for collaboration and sharing of experiences and resources[17].

C. ROLE OF NON GOVERNMENTAL ORGANIZATIONS

Non Governmental Organizations working to help diffuse ICT in the UAE are almost non existent. However, a number of public sector entities are involved in concrete projects moving the UAE closer to maturity as an information/knowledge based society. Most of these projects are centered on educational institutions and governmental sectors such as: the K-12 educational system of public schooling (Intel Teach to the Future Initiative); higher colleges of technology, Cisco initiative at a number of universities (UAE university and American University of Sharjah); Microsoft initiative with the computer literacy driving license (University of Sharjah); and the Oracle Educational initiative (American University of Sharjah).

A pilot project PPP initiative was launched in Abu Dhabi in September 2006, where the Abu Dhabi Education Council partners together with private international education companies such as the Center for British Teachers for Education (CfBT), Intered/Sabis, Mosaica and Nord Anglia. All operators are required to abide by curriculum standards designed by Tafe Global, the New South Wales department of Education and Training. Introducing ICT is part of the project requirement. ICT training is required for all teachers, students, and administrators under this project. It started with grades K-5, rolled-out in Middle School grades in 2007, and Grades 10-12 in 2008. Still the Emirate needs to have an inspection body to check if every student, teacher, and administrator is doing enough to incorporate ICT into their activities. The Implementation and assessment of this project is ongoing; the most recent initiative (May 2011) is the initiation of "Teacher Satisfaction Survey", launched for the first time in the UAE in an effort to assess teachers' satisfaction and identify areas for improvements[18].

II. ICT INFRASTRUCTURE

  A. Infrastructure

While the federal Government has not drawn up a comprehensive national strategy for its information society until 2008, very advanced strategies have been in place and have been implemented at the local (Emirate) level, particularly in Dubai and Abu Dhabi. The UAE has a modern telecommunications infrastructure, especially when compared to other countries in the region. It has frequently been referred to as the "most wired" state in the Middle East[19]. UAE residents have relatively unhindered access to all modes of communications that Western, advanced nations do. However, discrepancies do still exist between populations living in the cities and those living in rural areas; however, local governments are trying to narrow the gap by enacting training and development programs in rural areas. One example of this is the various educational and training programs undertaken in 2008 and 2009 by the Emirate of Sharjah in areas such as Kalba and Dhaid. Another example is the establishment of a Satellite Campus for the University of Sharjah in some of rural areas.

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[17] Zayed University and Internet2,: WSIS Stocktaking and Partnerships
http://www.itu.int/wsis/stocktaking/plugin/documents.asp?project=1302839305&lang=en
[18] ADEC Launches Teacher Satisfaction Survey, Khaleej Times, May 16th, 2011.
[19] http://www1.american.edu/carmel/lr2962a/infra.html.

The telecommunications infrastructure has been owned and operated as a monopoly by Etisalat until 2006[20], when Du[21], a new competitor, came into the market. After years of generating excess revenues and returns via national monopoly, Etisalat is currently faced with a competitive operating environment for the first time. Whilst the UAE Federal Government owns a majority stake (60%) of Etisalat, individual UAE nationals own 40% of the company. The Corporation is ranked by the Financial Times as one of the top 500 companies in the world in terms of market capitalization and the sixth largest in the Middle East. In its recent ranking the Financial Times ranks Etisalat 411 among the Financial Times' top 500 Corporations, down from its ranking of 322 in 2010 and 140 in 2008[22]. In 2000, Etisalat initiated a subsidiary ISP called Emirates Internet and Multimedia (EIM). Since then, Etisalat created e-Company, which resells all Internet and data transport services. Furthermore, and because of the impressive infrastructure capacity of the UAE, several other regional ISPs purchase communication services from the Etisalat Network.

Abu Dhabi, the capital of the UAE, will become the world's first fully connected capital with etisalat's eLite, the advanced optical fibre communication network, based on the fibre to the home (FTTH) technology. This project was completed in 2009, and in 18 December 2009, Etisalat officially launched Network in Abu Dhabi. The new network will be able to provide double-play services bundling broadband internet and fixed telephony to the 665,000 households that are currently connected to it. In the future Etisalat plans to offer high speed internet at download speeds of up to 100Mbps over the network, as well as a video-on-demand (VoD) service and high definition (HD) TV. With the completion of FTTH, Etisalat claims that Abu Dhabi will become the world's first 100% FTTH-connected capital. The company is also in the process of connecting Dubai and Sharjah to the eLife network and plans to connect all of the UAE's households by the end of 2011[23]. Coming after Japan, South Korea and Hong Kong the UAE is ranked fourth in the world with 32 percent of the country's households and businesses connected to fiber optic systems[24].

The regulatory body of ICT in the UAE is the Telecommunications Regulatory Authority (TRA) which was established according to UAE Law by Decree No. 3 of 2003 – Telecommunications Law. The main objectives of the TRA may be summarized as ensuring adequacy of telecommunications services throughout the UAE; achieving enhancement of services, both in terms of quality and variety; ensuring quality of service and adherence to terms of licenses by licensees; encouraging telecommunications and IT services within the UAE; promoting and enhancing the telecommunications sector within the UAE; promoting and developing the telecommunications sector in the UAE by training, development and the establishment of relevant training institutions; resolving any disputes between the licensed operators; establishing and implementing a regulatory and policy framework; promoting new technologies; ensuring that the UAE becomes the regional ICT hub; developing the country's human capital; and encouraging ICT research and development.

The UAE has a comparatively high telephone penetration rate. The number of fixed-line telephone connections increased from 1,236,900 lines in 2005 to 1,479,500 in 2010, which represents a penetration of 19.7 lines per 100 inhabitants. The UAE also boasts one of the highest rates of mobile line distribution in the ESCWA region and the world, where penetration in the mobile market surpassed 10,926,000 lines or close to 200 percent in 2010, leaving little room for operators to take further advantage of the market[25]. However, this is not the end of growth; future growth in mobile subscriptions will come from a growing population and an increasing number of expatriates. High quality Internet services are available, featuring ADSL, ISDN, Frame relay, ATM, leased line, and satellite options. Basic dial-up service costs US$ 0.486 per minute for peak

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[20] http:// www.etisalat.ae
[21] http://www.du.ae/en/default
[22] 2011 FT Global 500, http://media.ft.com/cms/33558890-98d4-11e0-bd66-00144feab49a.pdf.
[23] Etisalat Officially Launches FTTH Network in Abu Dhabi,
http://www.telegeography.com/products/commsupdate/articles/2009/12/18/etisalat-officially-launches-ftth-network-in-abu-dhabi/
[24] Etisalat continues investment in Fiber Optic cable network in the UAE, March 6, 2011;
http://www.fiberopticmania.com/2011/03/etisalat-continues-investment-in-fiber.html
[25] 2010 ITU Statistics, www.ITU.org

usage and US$ 0.27 for off-peak usage. The Internet services available have enabled the growth of the information/knowledge society in the UAE. The internet penetration rate was 78 percent in 2010[26].

In January 2008, Etisalat announced the completion of the first phase of its Fiber-to-the-Home (FTTH) deployment, which will eventually cover the entire country. This new fiber network will meet current customer needs more efficiently and will help to meet future requirements for ultra-high bandwidth applications, in addition to offering a significantly enhanced experience for its business and residential customers. FTTH Technology enables better service delivery in key areas such as High-Speed Internet service (HSI), bringing customers speeds of up to 60 Mbits/s, telephony, IPTV (Advanced digital TV), and other high-bandwidth online experiences such as gaming and Video On Demand (VOD). Furthermore, in line with an increase in education and business in the region, the demand for Internet services has also increased in recent years. Although dial-up subscription currently dominates the Internet market, Etisalat projects broadband subscribers to account for nearly 65% of Internet subscribers in the coming few years[27].

Further investment in the telecommunications network is a continuing priority for the national government. In 2006, expenditures of US$2.5 billion were devoted to expansion, improvement and maintenance of the infrastructure (IDC, 2006).   The UAE has been a leader in the MENA region when it comes to ICT spending. Etisalat capital expenditure in 2010 amounted to $598 while Du's capital expenditure amounted to $339 for the same year[28]. In addition, Yasat has announced that it is spending $1.4 billion on two satellites[29]. In terms of research and development, the UAE has announced recently (June 6, 2011) that it will invest $22 million in ICT R&D, some of which will be allocated to universities[30].

As part of this expansion of services, an ambitious project, inaugurated in 1998, has been implemented which aims at delivering voice, high-speed data, and broadcast television to consumers through a single cable-based modality. The Fiber Optic Gulf (FOG) project consists of a 1,300-kilometer long fiber optic cable link between UAE, Qatar, Kuwait and Bahrain. FOG links the UAE to Kuwait via Qatar and Bahrain, and it has a transmission capacity of 10 Gbps (billions of bits per second) per fiber pair. Together with SDH technology, this will enable the system to accommodate enormous volumes of traffic, making broadband ISDN, Internet, Video-On-Demand and other new services a possibility. The Fiber Optic Link Around the Globe Cable System (FLAG) project connects Europe to South Asia via UAE. The FLAG Network Operations Centre (FNOC) is set up in Fujairah, which positions it in the midpoint of the cable system. The other cables that connect the UAE are South East Asia –Middle East – Western Europe 3 and 4 cable systems (SEA-ME-WE3 and SEA-ME-WE4). The total length of the SEA-ME-WE3 and SEA-ME-WE4 cables is approximately 39,000 km and 20,000 km respectively, while their capacities are 40 Gbps and 1280 Gbps[31].

Etisalat serves over 7.5 million mobile customers in the UAE as of the second quarter of 2011[32]. In 2008, Etisalat announced revenues of US$ 8.73 billion and net profits of US$ 2.08 billion (Etisalat Yearbook, 2010). The company also offers fixed line services over the next generation network (NGN), and has been migrating sections of its users onto the advanced network. By establishing NGN, Etisalat will be able to offer voice, video, and data over one single source, enabling true Triple-Play functionality, SMS 2 Fax & SMS 2 e-mail is a unique and convenient way to send SMS text messages to a fax number and to an e-mail address.

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[26] ibid

[27] Etisalat touts FTTH.(FTTX), January 2008. http://www.highbeam.com/doc/1G1-174194759.html

[28] Etisalat and DU Annual Repots for 2010.

[29] Yahsat to launch UAE's first satellite broadband system, http://www.khaleejtimes.com/biz/inside.asp?xfile=/data/uaebusiness/2011/February/uaebusiness_February5.xml&section=uaebusiness

[30] UAE will Invest In ICT R&D, http://al-shorfa.com/cocoon/meii/xhtml/en_GB/newsbriefs/meii/newsbriefs/2011/06/17/newsbrief-07

[31] www.seamewe4.com

[32] Etisalat Revenues down 1.4 %; www.GlobalInsight.com

The facility allows GSM customers (post-paid & prepaid) to send a text message with a maximum of 160 characters from their mobile to a fax number or to an e-mail address.

Mobile telephony has made giant strides in the UAE in a relatively short time, beating fixed-line telephony. The telecommunication sector in the UAE has undergone extensive development. At the end of 2001, there were 1.9 million GSM users indicating 62 percent penetration rate, which is comparable to the most advanced countries in the world. In 2010, the Mobile penetration rate jumped to 200 percent. Similarly, a 19.7 percent fixed line penetration rate and 78 percent Internet penetration rate place the country squarely at the top of the list, and among leading nations worldwide in telecommunications.

In 2007, Etisalat announced the Ebtikar Card System, which is a major card manufacturer and related service provider catering mainly to the needs of telecommunications operators in the local and regional markets. Its factory produces a wide variety of prepaid scratch smart memory cards, and GSM SIM cards. In April 2009, the company announced its joint-venture with Nokia-Siemens to provide convenient access to advanced mobile Internet based services in the Middle East. The UAE was the first country in the Middle East and Africa to roll out this service during the second quarter of 2009. Using this service, customers are able to enjoy advanced services like Mobile gaming and Ovi maps[33] on Etisalat's widespread and reliable network which covers the whole UAE for 2G and 2.5 G, as well as 99 per cent of populated areas for 3.5G networks. Etisalat introduced new developments in manufacturing cards and implemented the latest technology in manufacturing WASEL and GSM cards, all of which reflect Etisalat's success in offering the best services available to its customers. The new SIM card has an EEPROM memory capacity of 64 KB and it supports GSM functionality. These features make it an ideal SIM card platform to migrate from 2G to new 3G services. As the new SIM card complies with both GSM and 3G requirements, all the mobile services offered today can be accessed with this new card. The card enables the operator to offer a wide range of value added services such as m-commerce, m-banking, as well as information, entertainment, and gaming services. The 3G is a multi-application and multi-standard card supporting both ETSI and ISO standards. This makes it easy to implement different types of services on a single card. 3G cards offer an open application toolkit platform to develop new applications and services[34].

The UAE Government is also increasing all activities relating to the dissemination and spread of awareness through supporting national media and conferences. Almost all local and national daily newspapers have a dedicated section on public ICT Knowledge. However, the main problem, based on observation, is the minimal percentage of readership.

B. Initiatives/Projects for ICT infrastructure and development of new services

ICT infrastructure is remarkably developed in the UAE as evidenced by its ranking on the Information Society Index (ISI) developed by IDC; the best example of this in the UAE, is the introduction of competition in 2006 though the establishment of a new telecommunications provider called Du. As well as increasing competition in a very short space of time, this has also led to a more economically efficient telecommunications industry. In addition, major developments in the legal and regulatory environment will create a climate, which will hopefully entice and attract foreign ICT investments.

As an initiative that will promote ICT in the region, the UAE developed an ICT fund to provide targeted funding and advisory services to companies, organizations, business incubators and individuals to empower them to develop the innovation and knowledge capital of the UAE ICT sector with their research, education and entrepreneurship. The Fund promotes entrepreneurship and improves links between industry and academia to ultimately promote the involvement of UAE nationals in scientific and technology research to

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[33] Ovi Maps is the new name for the application previously known as Nokia Maps. The new version adds a number of new features including weather information, premium POIs and, in selected countries, safety camera information.
[34] Wireless New Federation, Nokia and Etisalat Collaborate to Boost Advanced Internet Based Services in the UAE, April 2009.

foster self-reliance in technology for the UAE. The ICT Fund is a new venture dedicated to advancing the sector both regionally and globally, sharing the UAE's commitment to innovation and progress in R&D projects as well as supporting education and training in the field. Two years ago (April, 2009), the ICT Development Fund signed an agreement with Khalifa University for Science, Technology and Research (KUSTAR), establishing the UAE Advanced Network for Research and Education, which the ICT Fund provides the funding for KUSTAR to manage. The UAE Advanced Network for Research and Education is a dedicated advanced network connecting academic and research institutions at speeds typically faster than commercial Internet. It facilitates research collaboration by providing access to databases and supercomputers. It is also used for teaching in rich multimedia content and high-definition video conferencing. A number of public university, college, and school sites (28) will be connected to this advanced network, consisting of the UAE University, Zayed University, Higher Colleges of Technology, KUSTAR, and Institutes of Applied Technology. In the latter stages, other public and private research institutions in the UAE will also connect to the network. Two successful initiatives have already materialized out of this network: ANKABUT and the Etisalat BT Innovation Centre (EBTIC)[35].

Injazat Technology Fund E.C. is a USD 50 million venture capital fund operating in compliance with Shari'a principles and targeting technology companies within the MENA region under the motto "From the region for the region". The Fund was initiated by the Islamic Corporation for the Development of the Private Sector (ICD), an affiliate of the Islamic Development Bank Group (IDB), and by Gulf Finance House (GFH), in partnership with Dubai Islamic Bank (DIB), Saudi Economic and Development Company (SEDCO), and Iran Foreign Investment Corporation (IFIC).

Injazat was founded on the idea that it takes teamwork, experience, strategic thinking, and resources to turn early stage ventures into solid companies. The Fund strives to add experience and expertise to invention in order to support technology companies in the regional marketplace. Injazat frequently takes active roles as the lead investor, contributing the necessary resources and management support that are vital to a young company's growth. The Fund is committed to creating strategic business partnerships, which facilitate and foster success in business. Injazat invests intellectually and financially in people with the vision and drive required to turn growth companies into accelerating companies. Injazat's portfolio includes 8 companies: AOMEBroad Link Research Ducont FZ LLC (www.ducont.com), Ejada (www.ejada.com.sa), Omnix Media Networks (www.omnix-group.com), Promedia (www.promediasystems.com), Rubicon (www.rubicon.com.jo) and Specialized Technical Services (STS) Group (www.sts.com.jo).

C.   ICT Connectivity

The UAE is a regional leader in ICT connectivity. For example, almost all schools, private and public are wired, schools and universities administer exams online, college applications and payments are done online. Possibly an area where the UAE can improve is the development of community centers. Unfortunately, these are missing and creating them would offer a great service especially to the marginalized segment of the population; mainly the expatriate communities. In addition, ubiquitous computing and wireless services are abound; in May 2007, commuters started to reserve taxis using the short message service (SMS) from their mobile phones. To facilitate the implementation of this initiative, the Road and Transportation Authority (RTA) will install small boards with location code numbers and a taxi sign on them. Another development at the RTA is the m-Parking initiative. RTA's m-Parking service is a new value-added service that will allow motorists to pay for their virtual parking permit using their Etisalat mobile phones by simply sending an SMS in a pre-defined format, thus eliminating the need to walk to the Payment Display (P/D) Machines and search for coins. The m-Parking service also alerts the motorist via an SMS prior to virtual permit expiry and if needed the motorist can extend his/her parking period from his/her office or home without having to walk to his/her vehicle. Recently (July, 2011), Twofour54 Intaj launched the Middle East and North Africa

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[35] www.kustar.ac.ae

(MENA) region's first stereoscopic 3D lab in the UAE. This is the only facility of its kind in the Middle East to offer dedicated facilities, equipment and expert support across the third dimension[36].

D. Internet Infrastructure

Investment in the telecommunications network is a continuing priority for the federal government. In 2004, a total investment of US$ 371.662 billion was made in telecommunications and in 2006, a total of US$ 2.5 billion were invested in IT related projects[37]. Emirates Internet Exchange (EMIX) – an Etisalat division – is the first Network Access Point (NAP) in the Middle East offering IP transit connectivity to ISPs in the region. EMIX is developing its network to meet the future requirements of ISPs in the region by increasing its total bandwidth to cater for customer demand when required. The Network is connected across the globe via Fiber Optic links to Europe, Far East, and USA through SEA-ME-WE-3, SEA-ME-WE-4 and FLAG cables. EMIX has recently established its 7th POP in Germany, which has hugely benefited its customers accessing the Web in general and European contents in particular. EMIX presently has Pops strategically located across the globe in Abu Dhabi, Dubai, New York, London, Amsterdam, Singapore, and Germany. It has plans to establish further Pops in Asia and America. EMIX's present backbone bandwidth is approximately 20.0 Gbps (Gigabit per second), and currently has 129 fully redundant STM-1 links on various transnational cables, linking it with various Tier-1 IP Access providers around the world. This bandwidth does not include its huge private peering links. The division is in process of activating additional links, to cater for the rising demand for Internet bandwidth.[38]

The increase in bandwidth and the upgrade of equipments which have warranted such significant investments in infrastructure, have been done with a view to ensure an unmatched quality of service and a world class Internet experience to consumers in the UAE. This capacity expansion with increased links to major global Internet hubs will benefit customers by helping to avoid disconnection to the Internet, in the event of any disruption, and ensure that traffic is re-routed to other links if disruptions occur in a particular link/path.

Arabic Domain name System (ADNS) is essential for the proliferation of Arabic content on the Internet. Being convinced that supporting the Arabic language in domain names requires researching and addressing a number of questions related to Arabic linguistics and the domain name tree structure, the UAE is participating in an important initiative in the region, the IDN (Internationalized Domain Names) initiative, especially those dealing with the testing of Arabic domain names. The United Arab Emirates Network Information Center (UAEnic)[39], the authority that manages domain name registration under the .ae domain, started working with counterparts authorities in the region (namely in Saudi Arabia, Qatar, and Oman) to develop Arabic domain names. This allows Arab Internet users to type Arabic URLs to access local web pages. Additional Arab countries have joined this initiative as well (Tunisia, Egypt, Syria and Jordan) and more countries are expected to join in the future. The proposed solutions are to be compatible with international standards and rules adopted by the IETF, and in particular the set of IDN standards as defined in RFC 3490, 3491, and 3492.

In March 2009, the UAE Ministerial Council for Services passed a proposal put forward by the Telecommunications Regulatory Authority (TRA) on the UAE domain on the internet, in Arabic (Emirat). The proposal is part of the TRA's strategy to chalk out a national plan for running and managing internet in the Arabic language. It falls in line with the new approach of the Internet Corporation for Assigned Names and Numbers (ICANN) to create equivalent domains in languages other than English.

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[36] Twofour54 Intaj launches MENA region's first stereoscopic 3D lab, July 20th, 2011.
http://www.ameinfo.com/271107.html
[37] Private Infrastructure Investment Opportunities in Islamic Countries;
http://crgp.stanford.edu/publications/working_papers/Harischandra_Orr_IDB_Country_Ranking_WP0054.pdf
[38] www.emix.ae.
[39] www.nic.ae.

The UAE domain in English is ae. The UAE domain in Arabic will contribute to increasing the number of surfers to Arabic sites and further promote and strengthen the UAE's identity. The Arabic (dotEmirat) امارات. Domain Name is expected to go live sometime during the fourth quarter of 2011[40].

III. ACCESS TO INFORMATION AND KNOWLEDGE

A. PUBLIC DOMAIN INFORMATION

The UAE government is strongly committed to raising peoples' awareness of the benefits of information and communication technologies, and of giving access to information and knowledge almost instantaneously, to all people. Individuals, organizations and communities should benefit from access to knowledge and information. As an example, the Labour Ministry has implemented the system of e-signature and e-work permits.

A prime indicator of the movement towards an information/knowledge society is the information society index (ISI). Some GCC countries have emerged as forerunners in the Arab region and are among the 50 top information technology (IT) users in the world, based on the ISI classification issued by the United States' IDC Group. In its global Information Society Index (ISI) for 2010, the World Times/IDC ISI ranks the UAE 32nd, and Saudi Arabia 47th overall out of 53 countries, by evaluating 23 indicators measuring the capacity of a nation's citizens to exchange information internally and externally. These 23 indicators are classified into four different categories: (1) Computer Infrastructure; (2) Internet Infrastructure; (3) Information Infrastructure; and, (4) Social Infrastructure (World Times and International Data Corporation, 2010). The Index measures the country's achievements in IT and related fields, the level of use and its readiness to cope with IT developments. Only four Arab countries (UAE, Kuwait, Egypt and Saudi Arabia) are listed among the top 53 countries in information technology readiness. The 53 countries included in the ISI index account for more than 98 percent of total IT investment in the world. The ISI establishes a standard by which all nations are measured according to their ability to access and absorb information and information technology. While GDP measures economic wealth, ISI measures information capacity and wealth. The ISI is designed to help countries assess their position relative to other countries and to guide companies to future market opportunities. On the ISI index, the UAE ranks 39th in Computer Infrastructure, 4th in Telecommunications, 40th on the Internet component and 46th on the social component[41].

B. ACCESS TO INFORMATION AND PUBLIC INFORMATION

The UAE is committed to transforming the society into an information/knowledge based society; as such the computer penetration rate and the Internet diffusion rate is comparable to those of developed countries in Western Europe. The federal government is also increasing all activities related to the dissemination of knowledge and the spread of awareness through supporting conferences and national media.

The e-Library, launched by the National Media Council in February 2009, is a government supported initiative, whereby its services are provided through collaboration between Dubai eGovernment and Dubai Municipality – Public Libraries section. It integrates all Dubai libraries (currently nine) and acts as a unified interface through which the user can search for publications and documents through the available databases such as Dubai Municipality, Dubai Police, Civil Defense and others. It is worth noting that, in April 2009, the Department of Health and Medical Services - Government of Dubai, also launched a Medical e-Library containing a wealth of Medical related documents and publications accessible to its staff and customers. Beginning in late October 2010, Etisalat, KUSTAR and Etisalat EBTIC began an e-Library trial within the Abu Dhabi campus. The aim of the e-Library service is to enable students and faculty members to read e-

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[40] Registration for dotEmarat domains close 31st May, May 29th, 2011. http://www.itp.net/584927-registration-for-dotemarat-domains-close-31st-may

[41] 2010 IDC/ Information Society Index, http://www.idc.com/groups/isi/main.html

resources (books and lecture notes) on any portable device such as laptops, mobiles, or e-Readers. This is a pilot case study for the UAE region with regard to adoption of such technology. The e-Library trial is completely free, including associated mobile data traffic charges[42].

In February 2009, the UAE National Media Council (NMC) launched a new online resource of books on the United Arab Emirates and related subjects. The main objective of this initiative was to make available, a greater volume of up-to-date information on the UAE to both national and international readers, free of charge and utilizing the latest e-Books technology. At the present time 'netizens' can access the 2009 UAE Yearbook in English and French editions, together with a smaller guide on the country, UAE at a Glance, and a major book on the UAE's wildlife, The Emirates - A Natural History. Arabic editions of these titles have already been uploaded to the site. Each year the National Media Council supports the publication of the UAE Yearbook; UAE at a Glance and an accompanying DVD are thus part of an ongoing program. Whilst previous books have been available for downloading as PDF files or for reading in an earlier version of an e-Book program, the introduction of the greatly improved e-Reader software has enabled a significant leap in functionality of the electronic library and opened up the possibility of creating many more e-Books on the website[43]. Despite developments on this front, more work is still needed, on providing access of this technology, to the majority of the population.

C. MULTI PURPOSE COMMUNITY PUBLIC ACCESS POINTS

Free access to the Internet is readily available in schools, universities, and public libraries However, a lot needs to be done to accomplish a high level of infusion and diffusion in this area. Some initiatives undertaken by the TRA, such as the ICT Development Fund established in 2005 are very promising. The Fund, the first of its kind in the Middle East, has the target goals of developing the ICT industry, fostering R&D, encouraging capacity building, and enhancing education and training in the field of ICT. Moreover, this initiative will sponsor and organize ICT-related events and partner with leading international R&D institutions. The Fund will be financed by payments from the primary licensed operators by the amount of 1% of their revenues. Other sources of income may include government and/or private grants, returns from ICT Fund investments, potential income from patents and other intellectual property derived from ICT Fund projects, in addition to any other sources approved by the TRA. The new agreement between the UAE Telecommunications Regulatory Authority (TRA) initiatives – and Khalifa University for Science, Technology and Research (KUSTAR), establishing the UAE Advanced Network for Research and Education; which the ICT Fund provides funding for KUSTAR to manage.

In September 2010, KUSTAR and Georgia Institute of Technology formalized their partnership, to develop cutting edge engineering-based education and research initiatives in the United Arab Emirates (UAE) and the United States[44]. This Network will facilitate practical communication and collaboration between students, researchers and institutions. It will also help educational institutions to further develop and enhance their IT infrastructure, support changing client needs through delivery of existing and new value-added services to staff, students and researchers. It will also reinforce ties with the wider education sector, while enhancing core services for the higher education sector.

D. USING DIFFERENT SOFTWARE MODELS

Many different software models are being used in the UAE, especially by private businesses. Recent experimentation with Open Source operating systems and applications has started, particularly in a number of educational institutions such as the American University of Dubai, the United Arab Emirates University and various institutions in Knowledge Village.

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[42]E-library Trial, http://kustar.ac.ae/academics/library/news/default.aspx
[43] UAE Yearbook, 2010; http://www.uaeyearbook.com/updates.php
[44] Georgia Tech and KUSTAR announce partnership, Sept. 20th, 2010. http://www.highbeam.com/doc/1G1-237537160.html

IV. ICT CAPACITY BUILDING

A. BASIC LITERACY

Over 55 percent of the population in the UAE is under the age of twenty-five, with an estimated literacy rate of 77.9 percent (CIA Fact book 2011). While there is no federal program to combat illiteracy, many local programs exist at the level of the individual Emirates. The Emirate of Sharjah has been very creative in utilizing ICT to combat illiteracy, through the use of computer based instructions and blended learning, in remote areas such as Kalba.

In general, the UAE is characterized as a "literacy abundant country". As of December 2010, the UAE attained a literacy rate of 94% for the age group 15-24, well above the world average of 87.6%. As with respect to gender parity, the UAE scored 1.07 for the age of 15 and above. The UAE does not have a formal program where ICT is used to eradicate illiteracy. However, as already mentioned in the report, many initiatives have been undertaken at the level of the various Emirates, especially in Abu Dhabi, Sharjah and Dubai[45].

B. ICT IN EDUCATION AND TRAINING

The UAE government is very serious about the incorporation of ICT into training and education. As mentioned in the previous sections, a comprehensive program to incorporate ICT into education was developed and is being implemented. While a strategy at the federal level is yet to be developed, many of the Emirates have adopted their own ICT training programs, especially in the public sector. A number of partnerships between the private and public sectors are pushing in this direction. Furthering its commitment to transform the region into a knowledge-based society, the Ministry of Education signed a cooperation pact with Microsoft Gulf in March 2009 which dictates the provision of providing schools with training, tailored curriculum development, access to the latest technologies and ability to empower schools to raise ICT literacy levels. It also enables innovative teaching with the aim of bridging the digital divide. Cooperation between the public and the private sector will help with education reform. This cooperation will also enhance the vision of strengthening schools with IT infrastructure as they coincide with the strategic objectives of the Ministry of Education, in providing all public schools with modern techniques through all educational levels, employing them in the educational process and utilizing them in management and work achievement. The three program areas under the *Partners in Learning* agreement that will help students and teachers move beyond the traditional learning models include: (1) Innovative Schools, which is mainly aimed at providing schools, governments and partners with resources, training, expertise, and technology blueprints that help create schools to better prepare students for life and work in the 21st century. (2) Innovative Teachers, which will provide teachers with tools, forums and resources that build communities of practice, support collaboration and access to quality content and challenge educators to integrate ICT into teaching and learning in a meaningful way. (3) Innovative Students, with the main objective of empowering students to use ICT in their schoolwork and learning, and email accounts for each student[46]. Earlier this year (2011) and in order to broaden digital inclusion and promote technology in education, Microsoft announced the launch of the Innovate, Teach, Inspire project in collaboration with GEMS Education, world's largest provider of K-12 education. The initial phase of the project included delivering a 'Train the Trainers' workshop to 26 master teachers in the UAE between February 2011. Through the Train the Trainer methodology, those

[45] Literacy Rates in the United Arab Emirates, http://www.tradingeconomics.com/united-arab-emirates/literacy-rate-youth-male-percent-of-males-ages-15-24-wb-data.html.

[46] Ministry of Education signs agreement with Microsoft Gulf to advance innovative learning in the UAE, March 11, 2009, http://www.ameinfo.com/188122.html.

teachers who are now certified as master trainers will be delivering the program to their peers in 26 GEMS schools in the UAE[47].

The UAE Government and the Ministry of Education are committed to promoting the use of ICT in education throughout the whole supply/value chain i.e. from K-12, to vocational, to higher education. In 2006, the author of this document was appointed by the then Minister of Education, Dr. Ali Al Sharhan, to chair a committee whose purpose was to draft an action plan to incorporate ICT in the K-12 educational system. This document was completed and delivered after two years and is currently being implemented.

In addition, many educational initiatives supported by the private sector are being implemented. Companies such as HP, Microsoft, Oracle, Cisco and Intel have been engaged in a number of initiatives aimed at increasing awareness of the use of ICT at the social and economic fronts. Many high schools as well as colleges and universities have adopted and mandated the use of Laptops by students. Al Mawakeb School in Dubai has been a pioneer in this area, mandating the use of laptops for all students in grade 9 through to 12 since 2001. UAE University in the Al Ain, Zayed University both in Dubai and Abu Dhabi and the American University of Sharjah (AUS) require all students to be equipped with laptops. In addition, many universities use iLean (Blackboard) as a learning management system (LMS) for examination and testing.

C. TRAINING PROGRAM FOR CAPACITY BUILDING IN THE USE OF ICT

A number of training programs for capacity building in the use of ICT have been developed at the various Emirates level (especially Abu Dhabi, Sharjah, and Dubai), such as the training program introduced by the Emirate of Sharjah for remote areas of Kalba and Al Thaid. A number of universities and educational institutions have been designated as training centers and testing facilities for ICDL (Zayed University and Sharjah University). As an example of emphasizing the role of ICT in education, Zayed University increased its 2010 budget spending on e-Resources from 49.39 percent in 2007 to 52.35 percent in 2010.

Vocational training outside of the traditional educational framework is also available. However, it is still fragmented. A number of public and private sector entities are developing in-house ICT training programs for their employees. Other entities still outsource this function to training institutes, which are abundant all around the country. Dubai Media for instance, have mandated that by the end of 2007, all journalists have to be computer literate and are required to submit their reports electronically. All newspapers in Dubai have mandated ICT training and computer literacy[48]. The major challenge here is identifying scarce and needed skills and developing appropriate training programs.

V. BUILDING CONFIDENCE AND SECURITY IN THE USE OF ICTS

A. USE OF ELECTRONIC TRANSACTIONS AND DOCUMENTS

Building institutional mechanisms is the best tool offered to citizens in helping increase confidence and trust in the use of ICTs. The UAE has been a pioneer in the Middle East in creating a "rule of law" to govern electronic transactions. Law No 2 of 2006 includes 29 articles. The law considers any intentional act resulting in destroying or revealing secrets or republishing personal or official information as a crime.

Anyone found hacking into an information website or system shall be punished with a jail term or fined, or both. The law also states that anyone found luring a male or female to commit adultery or prostitution through the Internet would be jailed for up to five years and fined.

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[47] Microsoft to launch Innovate, Teach, Inspire project in United Arab Emirates in collaboration with GEMS Education, March 17th, 2011; http://www.albawaba.com/microsoft-launch-innovate-teach-inspire-project-united-arab-emirates-collaboration-gems-education
[48] Private discussion of the author with media representatives.

A number of creative initiatives have been undertaken to encourage the move from paper-based to a paperless environment. An example of such an initiative is the Civil Engineering Department's (CED) Paperless Initiative of Dubai Ports, Customs and Free Zone Corporation (PCFC). The initiative was triggered when the amount of paper that was being handled had reached enormous proportions. In line with Dubai's development, workload in CED increased manifold with a corresponding increase in "paper load". One of the first steps CED took in this initiative was to have automation of core business processes in place, which would reduce the dependency on papers. As a result of this initiative, the CED implemented the following:

• E-Permit, which takes care of full document handling and workflow management associated with Building Permit applications. All drawings and other documents are received as digital
files and all correspondence between CED, Consultants and Clients are done through Internet and e-mail;
• E-Site: a PDA and GIS based system used by Site Inspectors visiting construction sites, who
receive all relevant details including location maps online on their handheld devices with no
need to carry papers;
• E-Maps, which brings a wealth of Geographic information to the desktop computers of any
authorized staff member of PCFC through a user-friendly web interface;
• E-Bidding: a new product enabling effective negotiations with bidders of large construction
projects, in addition to reducing papers, is expected to bring contract values down.
These electronic products have eliminated the use of paper within the department, the
huge amount of paper archived information that was stored in huge filing rooms have been scanned and stored in online storage systems.
Some of the direct benefits of this initiative have been:
• Reduced office space and storage space, which saves on rent;
• Reduced stationary expenditure;
• Reduced building permit approval time from 3 to 4 days to just a few minutes;
• Reduced time for project documentation from 4 days to 4 hours and comments consolidation time reduced from 21 days to 7 days.

These changes were received very well by the public; in indication of the overwhelming support, the head of the CED won the Dubai Quality Group Emirates Business Women Award for the category of Innovation.

B. ONLINE AND NETWORK SECURITY

In April, 2007, the UAE's Telecom Regulatory Authority (TRA) tasked a new group, the UAE Computer Emergency Response Team (aeCERT), with fighting cybercrime in the country, given the growing problems surrounding cybercrime in the region. aeCERT went online by the end of 2007, and a dedicated team began operation at the same time. One of the major objectives of aeCERT is prevention of Internet crime.

 aeCERT has been very active in raising awareness of IT security in the UAE. In March 2008, aeCERT launched the next part of its twelve month National Cyber-Space Security Awareness campaign. The new program focusses on raising awareness of online threats for businesses and consumers in the UAE. This new campaign consists of three education modules focused on email security, instant messaging and web browser security and will include best practices and tips for end users. The National Cyber-Space Security Awareness Campaign is a key factor in the aeCERT strategy and vision designed to help build and promote a safer and secure cyber culture within the UAE. This is made possible through educating general users, businesses and youth on matters relating to cyber safety. To further boost the confidence in the electronic commerce environment, the TRA in cooperation with the Dubai eGovernment (DEG) launched the Trustae Initiative. The Trustae initiative is in line with the UAE government's strategy plan and Federal Law No (1) of 2006 pertaining to Electronic Commerce and Transactions. It is a nationwide trust mark initiative. With Trustae

Seal, online businesses will be required to follow a strict code of conduct that provides reliable electronic transaction communications[49].

In March 2009, the Abu Dhabi Police and the UAE Telecommunications Regulatory Authority (TRA) signed a Memorandum of Understanding (MoU), where the TRA represented one of its initiatives, the UAE Computer Emergency Response Team (aeCERT). This was accredited by the Ministerial Council for Services as the National CERT of the UAE[50]. The aeCERT will provide specific services to enhance the security posture of Abu Dhabi Police IT infrastructure, through providing consultancy, education, awareness, advisory, monitoring and incident response, and research and analysis. Under such titles, the aeCERT is supposed to provide around 25 specific services divided into four stages, with no clear implementation timelines. The first stage is to assist in the development of security policies, processes, procedures and standards in promoting security awareness, coordinating national and international authorities and CERTs, issuing preliminary alerts and advisories to constituents, gathering information from constituents regarding incidents within their own operating environments, providing support for remediation and recovery, providing targeted timely and relevant information about the global threat landscape and emerging threats, and providing an enhanced level of service. As for the second stage, it is to disseminate security relevant information, host subject specific seminars, host information exchange meetings amongst communities of interest, specialist security training, deliver recommendations and best practice derived from relationships with representative bodies and associations, provide specialized security advice, maintain a database of Critical National Infrastructure Constituents and their high-level IT infrastructures internal function, and provide information relevant to risk analysis & security assessments. The third stage is to research and assess technologies, and produce quarterly and annual reports. The forth and last stage is to assist in the design and implementation of Business Continuity and Disaster Recovery Strategies, support for introduction of enhanced security technologies, act as a central point of contact during cyber attacks on the critical national infrastructure, provide a central repository of best practice standards and methodologies, provide early warning notification of threats, vulnerabilities and exploits, and issue countermeasure and response advice to mitigate high priority threats.

A number of initiatives have been taken by aeCERT in the past couple of years. in November 2010, aeCERT brought "Black Hat 40,"one of the top security conferences to Abu Dhabi which gathered some of the top leaders in the IT Security field. In addition, aeCERT launched its information security awareness campaign with Salim, a cyber security advisor[51].

C. PRIVACY AND DATA PROTECTION

Privacy is still a foreign concept in UAE culture. This is an area that has to be addressed at the federal level in order to increase trust in digital means and tools, hopefully leading to an increase in online business. In relation to this, Article 14 of Law No 3/2003 states that "The Telecommunications Regulatory Authority shall have the power to issue regulations, orders, resolutions and procedures in relation to the use of consumer information."

Some advanced initiatives have been undertaken in Dubai, moving the Emirate in the direction of meeting world standards in terms of privacy and security One example of this is the DIFC's Data Protection Law which was passed in 2008[52].

More recently, in July 2010, the TRA in its fight against hacking and spamming, published a regulatory policy titled "Unsolicited Communications Regulatory Policy". The policy has been built on the "opt-In"

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[49] www.tra.ae
[50] UAE Telecommunications Regulatory Authority, March 11th, 2009, www.tra.ae.
[51] www.salim.ae
[52] DIFC Data Protection Law; www.DIFC.ae.

approach which requires the consumers to decide on receiving any marketing communications from providers and other businesses[53].

D. COUNTERING MISUSE OF ICTs

Currently, cultural, religious and political considerations require that pornography, gambling, and drugs websites be blocked. The development of the regulatory environment and the institutional mechanisms in the UAE is testament to the continuous effort of the federal government to counter the misuse of ICT. The United Arab Emirates Computer Emergency Response Team (aeCERT) is the cyber-security coordination Center in the UAE. This is being established by the TRA as an initiative to facilitate the detection, prevention and response of cyber security incidents on the Internet. The mission of the aeCERT is to sustain a resilient and vigilant ICT infrastructure against a broader set of cyber security threats and to build a secure and safe cyber culture in the UAE. The aeCERT will: (1) enhance the cyber security law and assist in the creation of new laws; (2) enhance information security awareness across the UAE; (3) build national expertise in information security; (4) provide a central trusted point of contact for cyber security incident reporting in the UAE; and (5) establish a national center to disseminate information about threats, vulnerabilities and cyber incidents.

The 2006 Cybercrime Law, at a glance:
• Article No 3 states that anyone found breaking rules stipulated in Article No 2 of the law shall be sentenced to no less than one year in jail and/or fined no less than Dh 20,000.
• Article No 4 states that anyone found forging any document of Federal or local government shall be temporarily imprisoned and/or fined.
• Article No 5 of the law states that anyone convicted of hampering computer programs or services shall be punished with a jail term and/or a fine.

This law also defines hacking and the penalty associated with this activity. The law states that anyone found fleecing money by using the internet or any high-tech means, and anyone using data from credit cards or assuming the identity of another person will be sentenced to no less than one year and/or fined no less than Dh 30,000.

Shortly after the enactment of this law, the Ministry of Economy issued two Ministerial Decisions (114) and (406) of 2006 establishing a committee to oversee the implementation of the law. It also recommended to the Cabinet, the appointment of the TRA as the authority in charge of issuing certification services in the UAE.

IV. ENABLING ENVIRONMENT

A. LEGAL AND REGULATORY ENVIRONMENT

Until 2006, the UAE' telecommunications market had been effectively monopolized by a single state-controlled company, Etisalat. Etisalat operated all information and communications networks in the country, served all communications service users and acted as the de-facto regulatory body for telecommunications. The country was bound by commitments to the World Trade Organization (WTO) to liberalize the telecommunications sector by the end of 2005. New legislations adopted in 2004 resulted in the creation of a new "independent" regulator, the Telecommunications Regulatory Authority (TRA). A second national public telecommunications operator, Du, was established later in 2005. Du's backing came from the UAE public sector, although it was not able to begin operating until the second half of 2006. Up until the writing of this report, there are no concrete plans to liberalize other segments of the market. However, some developments can be identified, i.e. the number of new services and features is expected to increase over the next few years while market prices should shrink. Although Etisalat is still the market leader, new competitors like Du have successfully gained market share (in 2010 Du controlled 30% of the market). Du

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[53] www.tra.ae

offers voice, data, video and content services using fixed and mobile networks. At the moment Du's network covers 85% of the UAE and the rest is covered under an agreement with Etisalat. In addition, a new company called Al Yah Satellite Communications has received a license to provide satellite telecom services. With the entrance of additional operators, competition will probably increase further and prices are expected to drop as a result[54].

In May 2007, the TRA announced it is in the process of studying the legalization of activities for VoIP (Voice over Internet Protocol) operators in the country, in a phased approach. However, it was reported recently (July, 2011) that Etisalat and Du have postponed the launch of VoIP despite the grace period given by the TRA. Both the telecom operators were supposed to start operations before end-2010. In addition, both Telecomm companies and the TRA have declined to fix a date for the launch[55]. This seems to be a very complicated matter given that the legalization of VoIP will reduce the cost of international calls 40-60 percent and the revenue structure of both telecomm operators will suffer tremendously.

Law No. 1 of 2006 concerning Electronic Transactions and Commerce Law and Law No. 2 of 2006 (the Cyber Crime Law) were issued earlier in June 2006 under the decree of President His Highness Sheikh Khalifa Bin Zayed Al Nahyan. The new laws lay the foundation for legitimizing ecommerce and fighting misuse of cyberspace and new technologies. The federal laws reflect the UAE government's commitment to providing legal protection for Internet related investments and ensuring that the legal system meets the challenges of the digital economy. The new laws represent a bold initiative from the UAE government. Up to the time of twriting this report (May 2009), very few cases (one or two) were brought before the courts under these laws, and were mainly settled outside of courts. For these laws to be effective, however, it is critical for the corporate community and the various court systems in the UAE, including judges and lawyers, to be aware of their implications. Only then will these laws be effective.

The federal laws have introduced a number of international standards while at the same time extended the relevance of existing laws to the electronic domain. With the rising threat of cyber crimes, especially identity theft, it is important to raise awareness about the legal recourse that companies have in the event of any incident. The new legislation provides a sound platform on which to build the regulatory framework. It does not however, address some aspects of e-Commerce and electronic transactions such as privacy, jurisdiction, data protection, domain names and decency. The UAE government needs to promulgate more cyber laws to fill gaps in existing legislation, so that the legal system is able to meet the needs of the evolving digital economy.

The law also creates a business and regulatory environment in which technology-based, electronic commerce and Internet and media companies will be able to operate globally out of the UAE, with significant competitive advantages over local and regional competitors.

 B. DOMAIN NAME MANAGEMENT

Etisalat plays a key role in domain name management, for instance, Etisalat is hosting two mirror root name servers F and K in Dubai and Abu Dhabi. Theses servers are meant to increase the response time for domain name resolution in the UAE as well as in the region. This is a step initiated by Etisalat, to strengthen the root name server network by providing more mirror server points, to deflect malicious attacks on the foundation of the Internet.

The TRA will lead the restructuring of the UAE domain name industry and establish an independent .ae Domain Administration (.aeDA) to promote the .ae name space and transition to world's Best Practices operation for the .ae ccTLD. The .aeDA's mission is to provide secure access, stability and reliability for the domain names registered under the .ae ccTLD domain, thus ensuring their sustainable growth. The .aeDA

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[54] http://www.justlanded.com/english/Dubai/Dubai-Guide/Telephone-Internet/Introduction
[55] No VoIP in the UAE for the Foreseeable Future, July 21, 2011, Emirates 24/7.

will establish a new industry framework to redefine the roles of each involved entity and open up competition between different registrars. In supporting the growth of the .ae ccTLD, the .aeDA will make required changes to the .ae namespace. to enhance its openness and accessibility while retaining the strong cultural identity of the UAE.

In addition, Etisalat/UAEnic is co-founder of the Arabic Domain Name Project (Trial), initiated in 2004. It is also participating along with other GCC and Arab countries in testing Arabic characters in domain names. The system consists of Root name servers in Dubai and Riyadh on a trial basis. This project was initiated in steps, to enable the Arab community to access websites in their native language i.e. Arabic. It was presented to ICANN in steps, to update the root name servers with IDNs to enable worldwide accessibility.

A significant milestone in the UAE telecomm industry is the ICANN approval of the string (.emarat) as the official Arabic top level domain for the UAE. This development made the UAE one of the first four countries in the world to secure an internationalized top level domain name. This newly launched domain name will allow people whose primary language script is Arabic, to access websites using entirely Arabic characters. The new domain name registration started at the end of May 2010 and is expected to go operational sometime in the last quarter of 2011[56].

C. STANDARDIZATION OF ICT

The Arab Internet Standards Organization (InterStandards) initiative, mentioned above, is a step in the right direction. This is a pioneering Arab Initiative launched with the mission of accelerating the development of online activities by developing a set of website quality standards that are applicable to all types of websites.

InterStandards quality standards cover website design, security, content, and advertising. InterStandards is leveraged through a strategic partnership with Dubai Internet City (DIC), who will market this as a joint initiative, and eHosting DataFort, who will provide technical expertise and solutions for defining standards.

The InterStandards have five standardization modules:

1. e-Design and structure module;
2. e-Marketing module;
3. e-Media/Content module;
4. e-Security module; and
5. e-Solutions/Web coding module.

This initiative will help in the standardization of ICTs.

D. SUPPORTING MEASURES

Many institutional mechanisms are being established to help move the UAE into a knowledge based society. In terms of innovation, the UAE was ranked as the country most likely to become the region's innovation hub, by the Arab Innovation Index (AII) among other variables. This index assesses the level of entrepreneurship, diffusion of incubators, venture capital investments, government initiatives, etc.

An indicative signal of the supporting measures initiated and encouraged by the UAE government, is the recent signing of a deal between the TRA and the International Multilateral Partnership against Cyber

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[56] www.TRA.ae

Threats (Impact) Alliance in May 2009[57]. The TRA signed the deal on behalf of aeCERT. It is worth mentioning here that Impact Alliance is the official home for the Global Cyber-Security Agenda for the International Telecommunication Union (ITU). The details of the deal between IMPACT and the TRA have not been disclosed. IMPACT is a coalition of twenty-six countries that have united to form a global cyber-security group. It was founded in Kuala Lumpur May 2008.

Other initiatives include: the new UAE UEC Policy (known as the spam policy), enacted in July 2010; the launch of the SALIM campaign, to raise public awareness of Internet privacy and security issues; and the launch of the Trustae initiative, (a TRA – Dubai e-Government initiative) to increase trust and loyalty in conducting business online and in e-commerce in general[58].

VII. ICT APPLICATIONS

A. E-GOVERNMENT

Between 2004 and 2011, the UAE has made important advances in bringing its services online, for both business and individual users. Behind this evolution are two aspects fundamental for the development and success of e-government initiatives in the developing world, the political determination of UAE leaders and the availability of pertinent resources. In this section, we will cover (1) the e-Government initiative at the federal level, (2) the e- Government initiative in Dubai, and (3) the e-Government initiative in Abu Dhabi.

The UAE has been one of the leading advocates of e-Governance in the MENA region and globally, having been ranked among the world's top five countries in terms of transactional services, for the 2008 United Nations Department of Economic and Social Affairs (UNDESA) UN e-Government Survey. However, its ranking has deteriorated since the 2010 Survey due to pressure caused by the financial and economic crisis[59]. The Dubai and Abu Dhabi authorities are doing well in terms of e-Government practices and standards. However, at the Federal level, ministries, authorities and councils are lagging behind.

Of all the Emirates, Dubai is the front runner in delivering e-Government solutions. The Emirate offers a range of synergistic services, such as Dubai.ae, m-Dubai, e-Learn, Ask Dubai, e-Pay, e-4all, e-Host and e-Library. These services reach out to a large section of Dubai's population including citizens, residents, visitors and businesses contributing towards eradication of electronic illiteracy in the community. The Dubai e-Government portal (http://egov.dubai.ae) provides a single point of access for government online services offered by various departments and also provides news, events and vital information. The initiative m-Dubai provides mobile services through SMS for the public, including notification and enquiry services. This service is pivotal for making important announcements and updates to customers. The enquiry service allows customers to request information from various government departments anytime through SMS. This marks the transition from e-Governance into m-Governance.

In 2006, Gov3 was appointed by the Abu Dhabi authorities, to develop the information architecture for the Government Portal. Six government portals, including the national portals of Canada, UK, USA and Hong Kong, plus city portals of Brisbane and Vancouver, were reviewed for benchmarking purposes. Since then, the government of Abu Dhabi has been very active in developing its e-Side which aims to move more than 35 percent of all its online transactions by 2012. In 2010, only 14 percent of the transactions were done through e-Services.

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[57] TRA in Partnership with IMPACT Alliance, Khaleej Times, May 25th, 2009, http://www.khaleejtimes.com/biz/inside.asp?xfile=/data/business/2009/May/business_May980.xml&section=business.
[58] United Arab Emirates TRA Launches New Anti-Spam Regulatory Policy, July 6th, 2010. www.tra.ae
[59] United Nations Department of Economic and Social Affairs (UNDESA) UN eGovernment Survey, Geneva, Switzerland; 2008 & 2010.

Another major e-Government project in 2006 (July 11 2006), was the launch of a National ID project, with the registration of Sheikh Kahlifa the President of UAE. The main objective of this initiative was to provide both national and other UAE inhabitants with a high tech national identification card. Besides enhancing national security through the control and monitoring of traffic through UAE ports of entry, the card also serves as a reference for governmental and private sector dealings. In other words, it is a multi-purpose card which does the work of identification like a driver's license, health card, labor card and bank card. As of June 2011, two million people have registered for the card during a one year period. It is still unclear however, if the project will be completed by 2014 as planned[60].

UAE's Ministry of Labor portal is another excellent example of a one-stop shop for all transactions. It offers payment features via credit cards, online submission of forms and permits and creation of personal accounts. The website is one of a few sites which also provides a facility for electronic signature.

In 2009 the UAE Ministry of Justice launched an e-Justice program that aims to provide electronic services to the ministry's staff community and the public. This e-Services portal aims at offering electronic archival, electronic payment, electronic notary, case management, electronic filing, legal research, electronic drafting and publishing of legislation. The first phase of this initiative was completed in September 2010[61].

Further development, and as part of its e-Government efforts, the Dubai Public prosecution (DPP) launched (January 2009) an SMS service for the general public, lawyers and prosecutors, to enable them to find out details of specific cases[62]. The e-Services department offers more than 50 services programs, which are either informational or transactional. The most popular of these services are the 'Good Conduct Certificate,' 'Fines Payment and Inquiry Service,' 'Let Us Fight Crime,' 'Victim Care Program' and the 'Job Recruitment' service. The most recent addition to these programs is the "Home Safety Service", launched in January 2011. This allows customers to fill a notice form to police specifying their intended overseas travel, or their absence for other reasons, in order for the police to protect their homes during this absence[63].

B. E-BUSINESS

E-Business transactions in the UAE are progressing at a slow rate. Even the e-Commerce marketplace Tejari.com, which until recently was considered an exception, has shown some signs of stagnation due to a number of factors, chief among them, the impact of the global financial/economic crisis and a change of executive management. Tejari.com was launched by Dubai World, and is now franchised in Oman, Jordan, Saudi Arabia, Kuwait, Lebanon, and Pakistan. Tejari provides a single point of contact for an open and growing community of buyers and suppliers, permitting spot-purchasing and on-line auctions that enable participants', real-time access to new markets and greater cost savings. In 2009, Tejari was ranked as the eighth largest electronic sourcing platform in the world, in a Forrester research report entitled "Holistic View: The ePurchasing Software Market" (2009)[64].

Another example of e-Business applications is the initiative of the Dubai Road Transport Authority (RTA). Bus commuters in Dubai can now plan their journey virtually with the click of a mouse, thanks to a new portal launched by the RTA. The bilingual website (www.rta.ae) has a link called "journey planner", which gives information such as which bus to take from location to location in Dubai, frequency of buses and fares. The portal includes a comprehensive list of online services available through Dubai government websites, a

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[60] www.emiratesid.ae

[61] UAE Federal Supreme Court Completes First Phase of e-justice Project, Sept. 4, 2010; www.globalarabnetwork.com

[62] Dubai Public Prosecution adopts Dubai eGovernment's SMS service, April 13th, 2009, http://www.ameinfo.com/192390.html.

[63]Request to Monitor House, http://www.dubaipolice.gov.ae/dp/english/e_services.jsp?Page=A26&Id=13735&num2=SRV&mainlayid=194

[64] Forrester Report places Tejari in 8th spot in the world among global eSourcing vendors, Jan 11, 2009, www.Reuters.com.

search facility, downloadable application forms for government services, an e-Pay service and eJawaz. eJawaz allows users to use all public services without having to register with each relevant government department separately. E-Pay allows users of government services to pay all charges electronically through a single site. Dubai portal has the infrastructure required for the integration of all government services, but many government departments have not yet made full use of this infrastructure. Today, the entire procurement cycle of the various Dubai governments has been automated, from requisition to invoicing and settlement, enabling end-to-end electronic procurement using Tejari[65].

The launch of the combined UAE Federal e-Government portal in October 2010, is a positive development and an important step towards achieving the UAE's vision of 2021. Having a unified portal is also in line with the UAE Government Strategy for 2012-2013, which promotes accountability, innovation, and a forward-looking government. A unique characteristic of the Federal e-Government portal is that it incorporates many Web 2.0 features, especially social media, making it one of the most interactive portals in the country[66].

C. E-LEARNING

The UAE places special emphasis on e-Learning, the many initiatives undertaken by the Ministry of Education and local governments are an indication this importance. In June 2005, e-TQM (Total Quality Management) was established with the objective of facilitating quality education, by the creation of an effective environment for e-Learning through an electronic information network. E-TQM was renamed Hamdan Bin Mohammed University back in 2010, but its mission has not changed. It is still dedicated to e-Learning and blended learning[67]. Back in April 2004, the Dubai government signed an agreement with Microsoft Corporation for establishing an "eSchool" without papers, books or pens as the first eSchool in the Middle East and the second one in the world. In addition, a large number of colleges and universities adopted the hybrid model of learning combining in-class with online modes.

A number of e-Learning services and initiatives have been setup by public and private entities. For instance, starting in 2004 Etisalat has been running "LearnOnline", a portal dedicated to lifelong learning by teaching languages online, among other subjects. Some of the language courses available are: English (American/British), Spanish, Italian, French, German and Dutch. On the other hand, Dubai e-Government has setup their own on-line learning portal dedicated to IT related courses spanning topics such as ICDL, Application Development Client/Server, Communications/Networking and Wireless technologies to name a few[68].

The Centre for Excellence for Applied Research and Training (CERT) runs a countrywide continuing education program for all nationalities. The program has been designed for professional development and personal enrichment for people with an eye for continuing education. Initial projects include 100 face-to-face instructor-led courses and approximately 100 on line courses through a Cert website (cert.hct.ac.ae). CERT is the continuing education and applied research arm of a system servicing more than 10,000 students throughout the UAE with more than 40 programs in engineering, technology, and business. The Center operates two Technology Parks in Abu Dhabi and Dubai, fostering a number of joint venture businesses and training operations, it achieves this through more than 20 strategic alliances with multinational technology providers like Lucent Technologies, Honeywell, and GEC Marconi. These Technology Parks were established to foster the application of the latest technology in the UAE and to help develop the infrastructure necessary to support this technology. In December 2010, CERT partnered with *Dassault Systèmes* (Paris), a world leader in 3D, Product Lifecycle Management (PLM) solutions and search based applications, to boost

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[65] www.tejari.com
[66] www.government.ae
[67] www.hbmeu.ac.ae
[68] http://www.ameinfo.com/69995.html.

the UAE's digital-based economy by developing cutting edge engineering programs based on PLM solutions[69].

The recent Arab World Competitiveness Report published in September 2010, ranks the UAE as top amongst Arab countries, with its focus on world-class service in areas including finance, health care and ICT. While the UAE excelled in many categories and was ranked 25th worldwide, the report also focused on potential problems with the biggest issues being education and a lack of innovation. The shortage of an educated labor force was listed as the number two challenge for the UAE second only to access to financing[70].

To facilitate e-Learning in the UAE, all universities in the country employ some form of e-Learning Management systems (ELMs) such as WebCT, BlackBoard, and Moodle. A number of schools also make use of ELMs.

D. E-HEALTH

The UAE has witnessed a rapid development in health care over the past five decades. The World Health Organization (WHO) ranked Abu Dhabi and Dubai amongst the three healthiest cities in the Middle East; but in 2010 the country was ranked by WHO as the eighteenth (18th) fattest country[71]. In December 2010, the Abu Dhabi Health Services Company SEHA, implemented an advanced EMR functionality, which allows SEHA physician's to view, share, and collaborate on a patient care regardless of a patient's location. This new feature supports SEHA's One Patient, One Record philosophy. The UAE Ministry of Heath has devised a well-thought-out plan to capitalize on the benefits of ICT in health care. Among the initiatives spelled out are:

- linking hospitals and other medical centers by an interactive IT system project;
- e-Recruitment for physicians and specialists project;
- preventive Medicine update project;
- developing IT systems in school health centers project;
- IT medical equipment system project.

The Ministry started the implementation of the above mentioned initiatives, in October 2008 when entering into a deal with Cerner Corporation. According to this deal, fourteen hospitals and 60 clinics will implement a suite of Cerner Millennium solutions to optimize and automate paper-based processes. In July of 2011, SEHA in cooperation with Cerner announced the implementation of the *PowerChart Maternity* solution, digitizing maternity health care in the Emirates[72]. With the Cerner Millennium solutions implemented throughout, the MoH healthcare delivery facilities have automated processes in the scheduling, admissions, emergency, laboratory, pharmacy, radiology, surgery, medical records and clinical supplies departments. Nurses and physicians also use Cerner Millennium solutions to manage and document patient care through online order, entry, results notification and viewing. In May 2011, SEHA announced the launch of an iPhone application that allows customers and the community to interact with the SEHA healthcare network through their mobile phones. The applications contain a list of all SEHA hospitals, 37 Ambulatory Healthcare Centers and 25 public health clinics attached to hospitals. The application also includes information listings for contractors and job seekers, with open tenders and vacancies updated on a regular basis[73]. SEHA

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[69] CERT Partners with Dassault Systèmes to Develop Advanced 3D Digital Design & Manufacturing Expertise, Dec. 14, 2010. www.3ds.com
[70] Arab Competitiveness Report 2010-2011;
http://www3.weforum.org/docs/WEF_GCR_ArabWorldReview_2010_EN.pdf
[71] www.who.org
[72] SEHA Works with Cerner to Simplify Care for Expectant Mothers, July 10, 2011. www.Cerner.com
[73] SEHA Launches iPhone Application for Interactive Customer Experience; May 16, 2011.
http://www.ameinfo.com/265247.html

launched an e-Library portal which allows doctors, nurses and administrators access to reports, books and other documents. By July 2011, 3000 users were already registered to use this service[74].

The core of the e-Health strategy is the new the Dubai Biotechnology and Research Park (DuBiotech). The Dubai Biotechnology Park, is a free zone (100% tax-free and 100% foreign ownership allowed) dedicated to the biotechnology industry, which was announced in 2005 and scheduled to be completed by the second quarter of 2008, but has not been completed according to schedule yet. The park which is located on 2.3 square kilometres is part of an initiative to create an incubator for researchers and scientists. It will also become a centre for production, creativity and development in the biotechnology field with applications focusing on agro-food, health care, environment, genetics and stem cell research. Moreover, it will house regional offices of major biotechnology and pharmaceutical companies in addition to manufacturing plants. Dubiotech will be regulated by the Ministry of Health (MoH) and aims at building cooperation with local and international organisations such as the World Health Organisation, the Food and Drug Administration (FDA) and the European Medicines Agency.

In 2006, Etisalat continued its strategic partnership roles with many local and government entities in rolling out ICT solutions and e-Service initiatives. A case in point is Etisalat's partnership with the General Authority of Health Services in Abu Dhabi, to reengineer their operations and install an IP network connecting all five major hospitals and over fifty five clinics in the Emirate of Abu Dhabi.

Part of the country's strategy was unveiled by Sheikh Mohammed in the week of April 15 2007. The Ministry of Health (MoH) inaugurated its first one-stop MoH help stop in Dubai, 30 more centers are scheduled to open within a year all over the country. These centers will be connected to hospitals, healthcare centers and medical district offices with fully computerized counters handling pharmacies, purchases, human resources, evaluation of exams of doctors, nurses and include labs.

Another success was the development and management of the Messaging Solution. The solution aims to provide a fully managed secure, reliable and scalable messaging service to all Ministries and other entities, accessible through multiple channels with the following objectives: (1) To have Standard Email Policies implemented across all Ministries/Entities; (2) Centrally enforce Security Standards and Policies for the infrastructure; (3) Avoid duplication of resources and activities at various Ministries to manage messaging infrastructure; (4) Consolidation of investment by individual Ministries for infrastructure; (5) Reduced total cost of ownership; (6) To provide unique identities for employees within Government for official email communications; (7) To grow steadily or exponentially without disruption of service.

In July 2011, Etisalat implemented UAE's first futuristic e-Health solution for cardiology in partnership with GE Healthcare, which has the potential for reducing cardio vascular disease (CVD) and related ailments in the UAE. The solution implemented at the RAK Hospital as a pilot project, enables remote ECG (electrocardiogram) monitoring, allowing cardiologists to use Etisalat's state-of-the-art technology and GE's MUSE ECG data management system, to electronically receive and analyze ECG's on their computers and smartphones[75].

While the country lacks a well-designed strategy for e-Health implementation, many of the projects and initiatives undertaken point to the fact that the country recognizes e-Health as an important tool for the development and advancement of its healthcare system.

E. E-EMPLOYMENT

A number of public and private sector entities offer the option of online recruitment. Some of these place more emphasis on e-Employment than others. Dubai e-Government is a pioneering initiative in the region, to

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[74] www.seha.elibrary.com
[75] Etisalat, GE launch e-Health solution, July 13, 2011. http://www.tradearabia.com/news/HEAL_201964.html

provide online services and promote iRecruitment services. The online recruitment portal supported by the Department of Government Information and Resource Planning provides opportunities for all national graduates and job seekers. Other entities who offer this functionality are the Dubai Airport Free Zone Authority, Dubai Civil Defense, Dubai Courts, Dubai Police, Dubai Public Prosecution, Entrepreneur's Forum, Financial Audit Department, Department of Naturalization and Residency, Government Information Resources Planning Department in the Ruler's Court, Department of Finance and Etisalat. This form of recruiting seems to be well accepted by job seekers in the UAE. A poll conducted by

bayt.com in January 2007 revealed that over 22% of polled applicants found their last job through an internet job site such as bayt.com, compared to 11% through a recruitment company and 30% through a newspaper advertisement. With more and more traditional recruitment companies posting the bulk of their jobs on local jobsites such as bayt.com, the number of online jobseekers is on the rise. In addition, Bayt.com is the first employment website in the Middle East region to create an online platform designed to allow jobseekers and employers to interact in real time over the internet using a live chat function called LiveHire[76].

VIII. CULTURAL DIVERSITY AND IDENTITY, LINGUISTIC DIVERSITY AND LOCAL CONTENT

A. USE OF ICT IN SUPPORT OF CULTURAL AND LINGUISTIC DIVERSITY

The UAE has made ICT one of its most important priorities as a basis for encouraging cultural diversity and increasing local content. A number of digital Arabic content initiatives have been undertaken. Launched in 2000, as an initiative of the Abu Dhabi Cultural Foundation, Alwaraq.net is the first comprehensive free Arabic Digital library. The website contains in excess of one million pages of the most important Arabic classical books, plus some important books relating to world heritage. This digital library has evolved over time and now even has a powerful text search engine.

B. LOCAL AND NATIONAL DIGITAL CONTENT DEVELOPMENT

An example of increasing local content is the move to launch websites in Arabic, by the largest corporations and foundations in the country. All governmental sites in the country are in Arabic and the majority are also available in English. In addition, the official approval of the proposal which was put forward by the Telecommunications Regulatory Authority, as part of a national strategy to manage Arabic language on the internet, will pave the way for future inclusions of UAE domain addresses in Arabic (Emarat). The Internet Corporation for Assigned Names and Numbers (ICANN) extended top-level domain names in July of 2008, approving the introduction of Internationalized Domain Names (IDN) written in Arabic script. This decision to introduce Arabic domain names will contribute to increasing the number of surfers to Arabic sites and further promote and strengthen the UAE's identity[77].

The country is extremely serious about Arabization, two initiatives are worth mentioning. , Firstly, the Emirates Centre for Strategic Studies and Research (ECSSR), whereby books on the region written in foreign languages are being translated to Arabic and digitized. One of the author's books, The Diffusion of E-commerce in Developing Economies, for which a Resource-Based Approach was chosen and translated from English to Arabic and is available at ECSSR. The second initiative is the one undertaken by HH Sheikh Mohammad Bin Rashid Foundation, aiming to translate and digitize relevant books to Arabic.

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[76] Bayt.com launches live chat, May 22nd, 2011. http://www.itp.net/584859-baytcom-launches-live-chat
[77] UAE Introduces Arabic Domain Names, March ,2009. http://www.idnnews.com/?p=9123.

It is believed that bilingual websites will serve both the Arab region and the world at large. This move is pivotal both to private and public sector entities and corporations to ensure continuous communications with all stakeholders for these entities.

C. ICT TOOLS AND R&D PROGRAMS

A number of initiatives have been undertaken to promote public/private partnerships especially in research and development; it is still very early to tell if these programs will bear fruition. One important initiative is the Mohammed Bin Rashid Foundation's *Tarjem Programme* which seeks to develop the translation process in the Arab World by translating foreign works into Arabic and vice versa. The Foundation's main priority is to translate key cultural contributions published in neighbouring countries to foster cultural understanding. The Foundation will also work to increase information transfer from knowledge-producing countries, especially in North America, Scandinavian countries and East Asia. By April 2011, only 713 titles had been translated, falling short of what was expected from the program[78].

To encourage research and development in ICT, the TRA established the Information and Communication Technology Fund (ICT Fund, www.ictfund.ae) which the objective of advancing the UAE ICT sector domestically, regionally and internationally. The ICT fund has allocated millions of dollars to R&D projects and student scholarships. This year (2011), the fund allocated $15 in scholarships and invested $6 million in ICT R&D projects[79]. According to the ICT Fund, the UAE market will generate $13.6 billion in 2011, up from $8.2 billion earned in 2005, with an annual growth rate of about 20 per cent. The UAE's ICT industry ranks second in the region behind Saudi Arabia.

IX. MEDIA

A. MEDIA INDEPENDENCE AND PLURALISM

Emirates Media Incorporated (EMI) plays an important role in development of the media in the UAE. As the largest and most diversified media corporation, not only in the UAE but throughout the Arab world, EMI has interests in all branches of media: television, radio, print, publishing, distribution and the Internet. While the UAE government has given up formal control over EMI, the corporation remains partially dependent on government funding. Nevertheless, EMI enjoys administrative and editorial independence and functions very much as a private company.

Most printed media incorporate the latest information technology modules. Given the UAE's diverse populations, a mix of TV viewing content is required to address the needs of the various language based and ethnic groups. Therefore, e-Vision is the only regional source to offer over 250 TV channels in 21 different languages, ranging from sports, movies, music, documentaries and kid's channels. The product line-up includes 15 premium packages from all the major TV providers like Showtime, Orbit, ART, Pehla, Firstnet, TFC, PInoy Plus and many more, in addition to e-Vision's basic package. Viewing content was localized by introducing Dubai and Abu Dhabi live stock market quotes and adding to the popular e-Masala movie schedule. In addition, e-Vision is strategically placed to make the most of the convergence of telecommunications and TV entertainment services. As of April 2011, Etisalat announced it has reached 880,000 residential broadband subscribers[80]. The company just completed the connection of the entire city of Abu Dhabi to its next generation network[81]. As a result of this network, Etisalat today offers the fastest

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[78] www.gulfnews.com April 24th, 2011.
[79] UAE to invest in ICT start-ups, June 16, 2011; http://www.commsmea.com/11246-uae-to-invest-in-ict-start-ups/
[80] 880,000 active broadband users in UAE, July 5th, 2011. www.duwire.com
[81] Etisalat Makes Abu Dhabi the First Capital Connected with Fibre Optic Networks, May 1st, 2011; www.telecom;ead.com

broadband internet services for its customers in the region, reaching speeds of 30 MBps for individuals and 100 MBps to the business sector, in addition to next generation TV services such as HDTV and 3DTV.

The Emirates News Agency (WAM) provides news in Arabic and English, together with pictures and news video clips. It has invested in cutting-edge information and communication technologies and now makes extensive use of the Internet through a bilingual news website (www.wam.org.ae).

Fair gender portrayal in the media is essential, if the media portrays women in traditional or stereotypical roles, they will be responsible for showing a distorted image and inaccurate picture of people's lives. Media in the UAE has started to increase its coverage on women's issues. The appointment of some prominent women to government and ministerial jobs is also helping to shed light on women issues[82].

B. THE MEDIA AND ITS ROLE IN THE INFORMATION SOCIETY

There are fifteen national newspapers published in the UAE, eight in Arabic and seven in English. In addition, many regional and international newspapers circulate freely in the country. At the last count, there were 174 magazines and journals (69 in Arabic and 105 in English) published by local and national organizations and many publications produced in the UAE have active websites.

The UAE has numerous indigenous television channels broadcasting in Arabic and English, with many focusing on Arab culture and identity and others on business and sport. Many of the UAE's television broadcasts are available internationally, via satellite. Emirates Cable TV and Multimedia (E-Vision), the only digital cable TV service provider in the UAE, provides over 70 channels, including a variety that offer programs in more than 14 languages and premium packages from ART, Showtime and B4U. There are also many radio stations broadcasting in Arabic and English.

The quality of programming is high and covers a wide range of ICT related topics. Many newspapers have a dedicated section dealing with information technology and telecommunications issues. Many radio programs are also available on the Internet. Dubai Media City (DMC) has become an international centre for media-based operations. It is now a successful media community with a highly developed infrastructure that hosts broadcasting companies, TV channels and numerous associated media production companies and freelancers. Major global companies in DMC include CNN, CNBC, MBC, Reuters, Sony, Bertelsmann, BMG, the Associated Press and McGraw Hill. CNN runs its Arabic news website and regional news bureau from DMC.

X. INTERNATIONAL AND REGIONAL COOPERATION

A. FINANCING THE ICT NETWORKS AND SERVICES

The government of the UAE represented by Etisalat, and lately Du, has done a significant job in financing the ICT Networks and offering ICT services. In March 2009, SmartSat, a US$ 500 million joint venture and the region's first private company specialised in the satellite industry, announced a groundbreaking project that will send the Arab World's first private satellite into orbit[83]. SmartSat was supposed to set up its headquarter in Dubai Studio City, a cluster of 1800 companies, but it seems the project did not take off the ground. In April 2011, Abu Dhabi launched its first satellite into space. The Ariane 5 rocket carrying Y1A of Yahsat, a unit of Mubadala Development Company, tan investment arm of Abu Dhabi, lifted off from the European Space Center in Kourou, French Guiana. Y1A is part of $1.6-billion satellite program which will be completed when another satellite will be fired into space in the last quarter of the 2011. Y1A is the fifth satellite sent by the UAE into space for communication purposes.

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[82] The UAE government has four women Ministers and five women ambassadors both appointed in Europe.
[83] http://www.uaetoday.com/mee_dtls.asp?pid=5521

The Emirates Institution for Advanced Science and Technology, which launched the spacecraft, announced its plans to send another satellite (DubaiSat-2 I) into orbit in 2012[84].

B. INFRASTRUCTURE DEVELOPMENT PROJECTS

A number of international and regional initiatives are under way in the UAE, especially the ones signed through the GCC countries. A leading initiative is the GCC's cooperation on the biometric smart ID project. Most GCC countries have adopted the chip-based national ID cards allowing their citizens to use them instead of passports, while traveling within the GCC zone. In the UAE, the Emirates Identity Authority (EIDA)[85] is in charge of issuing these mandatory, secure, high-tech cards issuing these cards from the beginning of 2008. Up until the time of writing this report (July 2011), there were 3.2 million cards issued in the UAE. The registration of these cards started with UAE nationals and continued to other residents. Holders of the ID cards will soon be able to use them as an e-Gate at airports. The project is expected to be complete by 2014[86].

As mentioned in this report, international and regional cooperation is also being facilitated by the UAE Telecommunications Regulatory Authority (TRA). The TRA was set up by the UAE government's decree No. 3 of 2003 and has spearheaded a number of initiatives, including its cooperation with the International Telecommunication Union (ITU)[87].

C. WSIS Follow-up

In order to follow up on the implementation of the WSIS recommendations and action plans, the UAE established the National WSIS Committee by Cabinet Resolution No. 28 of 2009. The Committee is chaired by the Director General of the TRA, with members representing the UAE Ministry of Foreign Affairs, the General Information Authority, the TRA and the UAE Cabinet Office. The UAE's WSIS National Committee has made impressive efforts to stimulate community leaders, governmental and non-governmental organizations, to commit to the achievements of WSIS objectives. Much has been achieved and the UAE is committed to making progress on the higher objectives of WSIS by 2015[88].

In-line with WSIS progress, a number of websites are available which also serve as knowledge sharing portals; the UAE government's newly constructed website is a good source of information; the Dubai e-Government website is another showcase example; the e-Commerce success story of Tejari; the Bayt.com website for e-Employment; the newly developed website for the Emirates ID Authority (EIDA) are examples in point. As mentioned above, more centralized, formal, and structured efforts should take place in order to track progress towards WSIS goals and objectives.

XI. MILLENNIUM DEVELOPMENT GOALS

A. PROGRESS TOWARD ACHIEVING THE MDG

As mentioned in the report above, an explicit national plan of action for building the Information Society was developed and announced in 2006, and as such official/centralized information on progress towards achieving the MDGs does not exist. However, the ongoing commitment of the UAE to developing a robust ICT sector is clear. As indicated in the report, many international indicators point to the UAE's

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[84] UAE newest satellite launched successfully, April 23, 2011. www.gulfnews.com
[85] www.emiratesid.ae
[86] 2m register for ID cards in a year, May 31st, 2011. www.emirates247.com
[87] For a list of the various initiatives, please refer to www.tra.ae
[88] Delivering on the WSIS Goals, May 21, 2011. http://www.itu.int/net/itunews/issues/2011/04/43.aspx

accomplishments in this regard, in addition to the many initiatives undertaken by the government to boost ICT infusion and diffusion in the country.

It is extremely difficult to measure the country's progress in achieving the Millennium Development Goals. However, all indications lead one to believe that the country is moving in this direction. These include changes in the industrial structure, with the creation of the new telecommunications company Du, in addition to Etisalat; the establishment of a telecommunications authority at the federal level (TRA); the high levels of mobile and internet diffusion rates in the country; the commitment to Arabization from the top political leadership; the high penetration rate of broadband and fibre optics in the various Emirates; and the establishment of the National WSIS Committee to follow up on WSIS recommendations and action lines, among others.

B. USE OF ICT FOR ACHIEVING MDGS

As mentioned above, since there is no structured approach to measuring progress towards achieving the MDGs, it is extremely difficult to identify how ICT can help in reaching these objectives.

The UAE has reaffirmed its commitments to helping achieve the MDGs by 2015, and it is expected that the TRA and the National WSIS Committee will lead efforts in this direction[89].

Since there is no direct, structured strategy to deal with achieving the MDGs, most of the initiatives and projects mentioned in the report lead directly or indirectly to achieving the MDGs.

XII. BUILDING THE ICT SECTOR

A. ICT Firms

The main promoter of ICT in the UAE is the government, in general, and the Telecommunication Regulatory Agency (TRA), in particular. On a the competitive landscape the country is moving in the appropriate direction by allowing new players to compete, such as Du. However, Etisalat is still in the lead. As the country's sole telecommunications company for the last 30 years, Etisalat has developed strengths that are difficult to duplicate, not least of which is a customer base much larger than the population of the UAE. In order to increase competition in fixed-line telecommunications services, the TRA announced that Etisalat and Du are working together to bring choice for consumers and businesses in picking their fixed telecommunications service provider[90].

The choice by Du to position itself as a low-cost, value-for-money operator may have seemed a little out of place in the untroubled days of early 2007, when money was not an issue for the majority of UAE residents, and marketing was filled with the language of rich promising luxury, lifestyle and products for discerning customers. Currently, value-for-money is the name of the game and this is what Du is driving through. Aside from pricing, Du benefits from one of the best free-marketing campaigns any company can have, its status as a new entrant breaking a long-running monopoly.

The new standing of Du, as a justifiable competitor rather than an irritating underdog, means the character and nature of competition between the two companies will be transformed in the near future. Both will concentrate progressively more on capturing and retaining the best customers and appealing to the most valuable customers from the other side to switch and try their services.

In a nutshell, the UAE government has created, conducive regulatory environments and institutional

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[89] UAE will do its best to support the MDGs, Sept. 22nd, 2010. www.uaeinteract.com
[90] Etisalat and Du set for competition by year end, July 20th, 2011. www.khaleejtimes.com

mechanisms and provided the physical infrastructure necessary to increase the likelihood of success within the ICT sector. UAE corporations such as Etisalat, and most recently Du, are indeed value adding organisations for the country. The government is also providing financial training to SMEs through various mechanisms.

B. R&D and Investment in the ICT Sector

Efforts for research and development in the communication and information sectors are concentrated in research centers and universities, where most UAE universities make basic and applied research in the field of communication and computers in the existence of mature Faculties of Computers Science and Management Information Systems. In addition to the major universities, as of 2011, there were 450 business partners including tens of colleges and universities in Dubai Knowledge Village. Most of these are satellite campuses to well known European, Australian and American Educational institutions. Recently, Abu Dhabi has become an epicenter for satellite campuses of leading American and European colleges and universities such as INSEAS, Sorbone, New York University, among others.

Given the financial/economic crisis, Dubai Holding, the holding company of TECOM, consolidated its 11 business parks into 5 industry cluster groups. These five industry cluster groups are: Information and Communication Technology (ICT), Media, Education, Sciences, and Manufacturing and Logistics. Additionally, a new entity was created in 2010 called the Tecom Business Parks Operations[91].

C. Contribution of ICT Sector in the National Economy

ICT contribution to the national economy is still minor, this might be due to the shortage of local content that plagues the Arab world. In June 2009, a poll of search engine users in the UAE revealed that six out of 10 Internet users are more likely to turn to Google's global search portal (www.google.com) rather than the national version (www.google.ae). In July 2010, it was estimated that the Arab world has 75 million Internet users, While the UAE boasts the highest internet penetration in the Arab world with 76%[92].

The UAE government takes substantial dividend payments from its stake in Etisalat, however, with a royalty fee of 50 percent of pre-tax profit. Etisalat is the second largest contributor to the UAE federal government budget after oil revenues. Furthermore, the ICT fund receives 1 percent of gross revenues from the operators in the UAE, and is contributing millions of dollars in ICT scholarships and financing R&D projects in ICT.

The value of the ICT market is expected to generate $ 13.6 billion by the end of 2011 from $8.5 billion in 2005[93]. In addition, several major initiatives coupled with regional trade and economic liberalization are expected to boost IT growth in the UAE. IT in particular, has become a driving sector for growth in the UAE. The UAE as a regional hub is leading the adoption and development of new technologies.[94]

D. Government Facilitation

As mentioned previously in this report, the government of the UAE has been an avant-garde in creating the necessary environment, both institutional and regulatory, and in facilitating the adoption and implementation of ICT in small and medium-sized enterprises (SMEs). Most notable is the UAE's e-Government portal which was ranked by the United Nations Department of Economic and Social Affairs as the world's fifth best in terms of transactional services and 12th in terms of Web measurement[95].

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[91] Tecom Investments realigns 11 business parks into five industry cluster groups, April 21, 2010. http://www.ameinfo.com/230268.html
[92] Report: 75 million Internet users in Arab World, August 17th, 2010. www.albawaba.com
[93] ICT in the United Arab Emirates; http://www.itu.int/net/itunews/issues/2011/04/43.aspx
[94] UAE to invest in ICT start-ups, June 16, 2011; http://www.commsmea.com/11246-uae-to-invest-in-ict-start-ups/
[95] "the ICT e-volution" http://www.ameinfo.com/159937.html .