

Analysis of ICT Diffusion in Egypt

1999-2010

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Abstract

The paper assesses ICT diffusion in Egypt from 1999 to 2010 within comparative framework of Arab countries, with further analysis of the relation between socio-economic factors and ICT diffusion, for further developments of ICT diffusion in Egypt.

The analysis found correlation between socio-economic factors and ICT diffusion in Egypt especially literacy rate, secondary school education, and income level.

Introduction

The Egyptian Ministry of Communications and Information Technology (MCIT) has adopted various policies and strategies to devote ICT diffusion in Egyptian society and promote ICT usage in economic and social sectors through tailored initiatives and programs, which made it a necessity to evaluate the Government efforts through evaluation of ICT diffusion in Egypt with further analysis of the factors that hinders or facilitate ICT diffusion for further development of the sector.

The study consists of six sections besides conclusions and recommendations; the first section discusses the economic, socio demographic and legislative environment in Egypt. Second section covers national ICT policies and initiatives. The third section discusses development of ICT diffusion in Egypt from 1999 to 2010 within comparative framework with Arab countries. The fourth section studies ICT impact on national economy. Fifth section will use SWOT analysis to evaluate ICT sector in Egypt. Finally sixth section will try to analyze the relation between socio-economic factors and ICT diffusion.

Importance of the Study: This study is considered important because it contributes to the ongoing debate on ICT diffusion by studying Egypt's case and Arab countries, as well as, looking behind the impacts of ICT diffusion to study the ICT adoption factors for future development of ICT.

Problem of the Study: Although Egypt has made efforts for ICT development, it is still deteriorated in comparison to other Arab countries.

Objectives of the Study: The objectives of the study are to assess ICT diffusion in Egypt, and identifying ICT adoption factors.

Hypothesis

- Economic variables have impact on ICT diffusion.
- Demographic variables have impact on ICT diffusion.

Methodology: The study will try to study the hypothesis using comparative analysis of ICT diffusion in Egypt with other countries to study the Impact of economic and demographic factors on ICT adoption in Egypt as; GDP per capita, age, education, unemployment rates, and ICT services prices.

First Section: ICT Environment

1.1 Economic and Market Structure

The average real GDP annual growth rate from 2000 to 2009 was 4.88%, with maximum rate of 7.2% in 2008, which decreased to 4.7% in 2009 (WDI, 2010) due to international linkages sectors affected by the global financial crisis as, tourism, Suez Canal and workers' remittances, as well as foreign direct investment (FDI) which dropped by around 38.7%. while in 2010/09 the GDP annual growth rate increased to 5.1%, with the highest annual growth rate of 13.3% in the communication sector, followed by construction sector of 13.2%, as shown from table (1), with the highest share of 16.1% by the manufacturing sector which also had the highest share of 40.5% of the established companies (CAPMAS, 2011)

Table (1) Annual Growth Rate and its Distribution by Economic Activity

Sector \ Year	Annual Growth Rate of GDP 2009/08 (%)	GDP Distribution 2009/08 (%)	Annual Growth Rate of GDP 2010/09 (%)	GDP Distribution 2010/09 (%)
Gross Domestic Product	4.7	100	5.1	100
Agriculture, Forests & Fishing	3.2	13.4	3.5	13.2
Mining	5.9	14.3	0.9	13.7
Manufacturing	3.7	16.1	5.1	16.1
Electricity	5.2	1.4	6.3	1.4
water	7.0	0.3	6.8	0.3
Sanitation	9.9	0.1	6.0	0.1
Construction & Building	11.4	4.9	13.2	5.3
Transportation & Storage	6.4	4.3	6.8	4.3
Communication	14.6	3.8	13.3	4.1
Information	6.1	0.2	6.5	0.2
Suez canal	-7.2	3.3	-2.9	3.0
Wholesale & Retail Trade	6.1	10.6	6.1	10.7
Finance	4.6	3.9	5.2	3.9
Insurance	4.2	0.3	5.1	0.3
Social Insurance	5.3	3.4	6.2	3.5
Tourism	1.3	4.0	12.0	4.3
Real Estate	3.8	2.8	4.2	2.8
General Government	3.1	8.9	4.3	8.8
Education, Health & Personal Services	4.5	4.1	5.0	4.1

Source: Ministry of Economic Development State

1.2 Socio-demographic Characteristics

Total Population Density¹ increased from 62.72 Population/Km² in 2000 to 75.35 in 2009 due the increase of population, while Demographic Dependency Rate² decreased from 69.4 in 2000 to 54.9 Population /100 dependants in 2008 (CAPMAS, 2011). GDP per capita³ increased from \$1422 in 2000 to \$2270 in 2009 (WDI, 2010), while in 2010, population below poverty line was 20% the 63rd worldwide (CIA fact book, 2011).

Labor Force was 33.1% of population in 2010 with growth rate of 3.7% from 2009 reaching 26.192 million with addition of 930,000 individual. While unemployed people decreased by 45 thousand to reach 2.330 million unemployed in 2010, with unemployment rate of 8.92% which decreased from 9.4% in 2009.

Table 2 Labor Force Data

Factor	Unit	2010
Labor Force	Million	26.192
Unemployed	Million	2.330
Unemployment rate	(%)	8.92
Employed population	Million	23.862
Average daily wages	LE	40.4

Source: CAPMAS, Central Agency for Public Mobilization and Statistics

¹ It is the individual's share from the country's total area which equals the total population No. inside the country's borders divided by the country's total area.

² Percentage of pop outside work age who are less than 15 years old and over 65 years old to pop in work age (15-65 year).

³ GDP per capita is gross domestic product divided by midyear population. Data are in current U.S. dollars.

Employed population increased to 23.862 million in 2010 with growth rate of 4.3% with addition of 975,000 employees from 2009, distributed among different economic activities with the highest percentage in Agriculture and fishing activities, followed by manufacturing, and construction. The general average daily wages for workers reached LE 40.4, with the highest wages in the public sector of LE 51.4, followed by public business sector of LE 46.8, and the lowest average wages in the private sector of LE 32.4 (CAPMAS, 2011).

Regarding education, public spending on education decreased from 4.8% of GDP in 2005 to 3.8% in 2008. Adult literacy rate⁴ deteriorated from 71.4% in 2005 to 66% in 2006, Primary gross enrollment ratio reached 100% in 2007, while tertiary gross enrollment ratio improved from 26.6% in 2005 to 28% in 2008 (WDI, 2010). Tertiary graduates included 6,786 from engineering division, 14,254 computer division and 1073 from languages and translation division, while number of post graduates was 31,227 graduates of post diplomas, 8,888 master degree graduates, and 4,444 PHD degree graduates (Egyptian Ministry of Higher Education).

1.3 Legal and Regulatory Environment

Literature has found that political stability has great effect on adoption of new innovations (James, 1993). Several studies suggest that the rate of adoption of innovations is a function of legislative systems as patent laws, which regulate adoption of technological innovations (Wejnert, 2002).

⁴ Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.

Egypt has adopted legislative system encouraging investment as Income and corporate taxes and custom duties reforms, and the investment law No. 8 of 1997 which includes many incentives for investors. In 2003, the Government issued law No. 12 to regulate the relation between the company and its employees, with flexibility to allow maneuverability for the employer.

Intellectual property law No.82 has been issued year 2002 to regulate adoption of innovations including information technology as databases, software and different computer programs to guarantee punishment for violators (MCIT, 2010).

The electronic signature law No.15 approved by Parliament in 2004, and launched in 2009, to regulate and formalize the use of electronic transactions, The Information Technology Industry Development Authority (ITIDA) has been established for the implementation of the law (MCIT, 2006).

Second Section: ICT National Plan and Initiatives

In 1999 the Ministry of Communication and Information Technology (MCIT) has been created, which soon launched a National Plan for Communications and Information Technology to develop the information and communication technology sector in Egypt and stimulate the growth of a strong, competitive, export-oriented ICT industry.

2.1 ICT Infrastructure and Access

Since the creation of MCIT it has tried to create an effective and reliable infrastructure to allow the expansion of ICT, and support of the industry to bring the

benefits of information technology to all segments of the society. MCIT has launched number of initiatives and programs as shown from table 3.

MCIT has established IT Clubs throughout the country to make computers more affordable and provide access to up-to-date technologies. As well as the creation of mobile IT units⁵ that travel to remote areas to spread awareness of various communication and information technologies, and also offer free of charge training courses (MCIT, 2008).

Table 3 Initiatives Carried by MCIT

Date	Initiative
January 2002	Free Internet service, elimination of monthly subscription fees for dialup internet access.
2002	PC for Every Home, to facilitate the availability of reasonably priced, high-quality personal computers.
May 2004	Broadband initiative, availability of higher speed connections to Internet at affordable rates.
2006	Egypt PC 2010 – Nation Online- PC for Every School Teacher and Student”, “PC for Every University Professor and Student”, “PC for Every Journalist” and “PC for Every Top Student.
2007	Reduction of broadband access to LE 45 per month

Source: MCIT in Ten Years- 2009

⁵ These units are buses equipped with computers and peripherals.

2.2 Export-Oriented ICT Industry

Egypt currently ranks as one of the world's most promising destinations for offshore and outsourcing services, as Egypt enjoys a number of competitive advantages, including robust, state-of-the-art infrastructure, a multilingual and cost-effective talent pool, the ability to speak to more than 150 million Arabic speakers in the region, and geographical proximity to Europe, Africa, the Middle East and Asia.

MCIT's efforts to grow this industry gained pace in 2003 with the inauguration of the Smart Village. Egypt's potential strength is in multilingual call centers, outsourcing, engineering and technical support centers, localization and language services, development and management of content, knowledge process outsourcing, and research and development in engineering (MCIT, 2009).

2.3 ICT for Socioeconomic Development

2.3.1 Education

MCIT has implemented a number of programs to assist in harnessing the potential of ICT to improve education and building a large cadre of highly trained technicians and professionals. In 2002, MCIT signed a protocol with the Ministry of Education to implement the Smart Schools Network to improve administration in preparatory schools across Egypt, leveraging technology to raise educational standards and promote computer literacy.

Due to high illiteracy rate in Egypt of more than 30% of population which consider a hindrance to ICT diffusion, MCIT has created ICT for Illiteracy Eradication

program to produce electronic content for teaching Arabic and elementary mathematics through a mix of taught and self-study courses based on the General Authority for Literacy and Adult Education (GALAE) curriculum.

MCIT has initiated The Egyptian Education Initiative (EEI) for better preparation of students to enter the digital workforce through improvement of the content and delivery of the education. The EEI develops e-learning methodologies and content, trains teachers and students, and revises curricula to match student skills to markets.

2.3.2 Health

In 2006, MCIT and the Ministry of Health and Population launched a program using ICT to improve healthcare, which has implemented projects in health administration, clinical consultation and health education for remote and underserved areas, involving project involves the establishment of family healthcare units across the country and a reliable network for electronic medical records. As well as the development of the National Network for Citizen Health Treatment to eliminate delays in treatment authorization, payment and creation of more accurate and responsive data system for public hospitals. Also a pilot project has been launched for automating hospital administration including development of a comprehensive database of electronic medical files for every patient.

Third Section: Egyptian ICT Sector within the region

Egypt's Digital economy rank⁶ was 57th in 2010 (The Economist, 2010), according to NRI⁷ it has improved six positions from 76th in 2009 to 70th in 2010 (World Economic Forum, 2010). And According to ITU, Egypt ranked 96th globally in ICT Development Index (IDI)⁸, among the medium group, and ranked 12th regionally among 19 Arab states as shown in table (4) (ITU, 2010), IDI has been chosen for the comparative analysis as it covers more indicators and countries than the other indicators.

Table 4 Egypt IDI Rank among Arab states 2008

Country	IDI Regional Rank	IDI Global Rank	IDI Groups
United Arab Emirates	1	29	High
Bahrain	2	33	High
Qatar	3	45	Upper
Saudi Arabia	4	52	Upper
Kuwait	5	65	Upper
Oman	6	71	Medium
Jordan	7	74	Medium
Libya	8	78	Medium
Lebanon	9	82	Medium
Tunisia	10	85	Medium
Syria	11	93	Medium
Egypt	12	96	Medium
Morocco	13	97	Medium
Algeria	14	100	Medium
Djibouti	15	125	Low
Mauritania	16	126	Low
Sudan	17	127	Low
Yemen	18	129	Low
Comoros	19	134	Low

Source: ITU World Telecommunication / ICT Indicators Database

3.1 Telecommunication

The Telecommunication industry in Egypt has been started in 1854, when the first telegraph line connecting Cairo and Alexandria was inaugurated, and later in 1881, the first telephone line was installed between Cairo and Alexandria. Until 1996, the Arab Republic of Egypt National Telecommunications Organization (ARENTO)

⁶ The Digital Economy Rankings calculated by The Economist Intelligence Unit covering 70 countries and it measures the quality of a country's ICT infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit.

⁷ The NRI calculated by the World Economic Forum covers 133 countries; is composed by three sub indices, covering the environment for ICT, stakeholders' readiness, and usage.

⁸ IDI calculated by International Telecommunication Union and covers 159 countries; it measures the Information Society combining 11 indicators into a single measure to assess the level of ICT development within a country.

was the sole provider of all public telecommunications services, which later renamed Telecom Egypt which became in 1998, a joint stock company 100% owned by the Government. Operations and regulation were separated as the NATRA was established to undertake the regulatory functions and Telecom Egypt was established as an independent operator.

Table 5 Infrastructure and Access Indicators

Indicator	Unit	1999	2010
Fixed line subscribers	Million	4.9	9.57
Fixed line penetration	Per 100 Inhabitants	7.6	12.23
Total Capacity of Local Public Switching Exchanges	Lines	6,400,000	14,491,507
Mobile line subscribers	Million	907,900	65,487,684
Mobile line penetration	Per 100 Inhabitants	1	85.71
Internet Users	Million	0.3	23.056
Internet penetration	%	0.58	28.94
Broadband penetration	Per 100 Inhabitants	0.001	1.83
International Internet Bandwidth Penetration	Per 100 Inhabitants	0.000038	1585.5

Source: MCIT web site; Egypt ICT Indicators Portal last visited 10/2/2011

Number of subscribers of fixed telephone lines has more than doubled, from 4.9 million in 1999 with penetration rate of 7.6 per 100 inhabitants to more than 9.5 million in 2010 with penetration rate of 12.23 per 100 inhabitants due to doubling of total capacity of local public switching exchanges during same period. The interest of fixed telephone lines has started to decrease in 2008 within the international trend towards mobile phones which can be shown by the reduction of penetration rate from 15.7% in 2008 to 12.23% in 2010, leaving excess capacity of local exchanges of around 44%, while number of mobile phone subscribers has grown more than 6,000%, from 907,900 in 1999 with penetration rate of 1 per 100 inhabitants to more than 65 million in 2010 with penetration rate of 85.71 per 100 inhabitants.

Egypt in 2009 had the largest number of fixed telephone lines of 10,312,559 lines representing 29% of Arab states lines, with penetration rate 12.42 per 100 inhabitants lower than the world rate of 17.7 and higher than Arab states rate of 9.8, with 136th rank globally and 10th rank regionally. While the number of mobile subscriptions was 55,352,233 subscriptions representing 21% of total subscriptions of Arab states, with penetration rate of 66.69 per 100 inhabitants, lower than world penetration rate of 67.9 and Arab states rate of 73.3, with 131st rank globally and 12th rank among Arab states.

Table 6 Telecommunication Indicators 2009

Country	Mobile subscriptions per 100 inhabitants	Mobile subscriptions	Fixed telephone lines per 100 inhabitants	Fixed telephone lines
World	67.9	4652 millions	17.7	1215 millions
Arab States	73.3	255 millions	9.8	34 millions
United Arab Emirates	232.07	10,671,878	33.95	1,561,196
Bahrain	177.13	1,401,974	30.07	238,000
Qatar	175.40	2,472,130	20.24	285,270
Saudi Arabia	174.43	44,864,355	16.22	4,171,000
Kuwait	129.85	3,876,000	18.54	553,500
Oman	139.54	3,970,563	10.54	299,826
Jordan	95.22	6,014,366	7.94	501,238
Libya	148.51	9,534,091	16.56	1,063,265
Lebanon	56.59	2,390,317	19.03	803,740
Tunisia	95.38	9,797,026	12.45	1,278,548
Syria	45.57	9,981,861	17.67	3,871,114
Egypt	66.69	55,352,233	12.42	10,312,559
Morocco	79.11	25,310,761	10.99	3,516,281
Algeria	93.79	32,729,824	7.38	2,576,165
Djibouti	14.90	128,776	1.95	16,842
Mauritania	66.32	2,182,249	2.26	74,464
Sudan	36.29	15,339,895	0.88	370,423
Yemen	35.25	8,313,000	4.23	997,000
Comoros	18.13	122,596	4.55	30,787

Source: ITU World Telecommunication / ICT Indicators Database

3.2 Internet

In 2009, Internet penetration rate in Egypt reached 24.26 per 100 inhabitants lower than the world rate of 27.1 and higher than Arab states rate of 20.5, with 115th rank globally and 10th rank among Arab States, which increased to 28.94 per 100 inhabitants in 2010 with total internet users of 23 million. Households in Egypt connected to Internet via different types of Internet access, 75.6% of households connected via ADSL, while 34.5% connected via Dial-Up connection and only 3.17% via ISDN. Fixed broadband subscriptions⁹ reached 1.33 per 100 inhabitants lower than both world rate of 6.9 and Arab states rate of 1.7, with 12th rank among Arab states, which increased to 1.83 per 100 inhabitants in 2010. In 2009, mobile broadband in

⁹ Fixed broadband subscriptions: Total fixed (wired) broadband Internet subscriptions refers to subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This can include for example cable modem, DSL, fiber-to-the-home/building and other fixed (wired) broadband subscriptions (ITU).

Egypt reached 8.43 per 100 inhabitants lower than world rate of 10.3 and higher than Arab rate of 6.2, with 8th rank among Arab states.

Table 7 Internet Indicators 2009

Country	Internet users per 100 inhabitants	Fixed broadband Subscriptions per 100 inhabitant	Mobile broadband subscriptions per 100 inhabitants
world	27.1	6.9	10.3
Arab States	20.5	1.7	6.2
United Arab Emirates	75.00	15.01	55.34
Bahrain	53.00	9.59	57.4
Qatar	40.00	10.35	27.15
Saudi Arabia	38.00	5.22	117.61
Kuwait	36.85	1.51	31.83
Oman	51.50	1.44	43.10
Jordan	26.00	3.22	0.00
Libya	5.51	0.98	13.29
Lebanon	23.68	5.26	0.00
Tunisia	34.07	3.63	0.00
Syria	20.40	0.16	5.00
Egypt	24.26	1.33	8.43
Morocco	41.30	1.49	5.16
Algeria	13.47	2.34	0.00
Djibouti	3.00	0.61	0.01
Mauritania	2.28	0.27	3.23
Sudan	10.16	0.38	0.79
Yemen	9.96	0.23	0.00
Comoros	3.59	0.00	18.13

Source: ITU World Telecommunication / ICT Indicators Database

In 2010, Individuals were connecting to Internet for different types of activities as shown in table (8); almost 50% of individuals were connecting to download songs and software, 39% connecting for education or learning activities, 34% reading e-books, 27% for communication, 25% getting health information and 24% connecting to play video games, while there were few percentage interested in e-commerce and e-government activities.

There is a huge gap in nature of Internet activities between Egypt and the ICT leaders for example; in Sweden 57 % of population in 2009 were connecting with local authorities, 75% of population making Internet banking and 66% purchasing goods or services online. In Denmark 72% of population were making Internet banking, 44% of population purchasing goods and services online, while 75% of population connecting with local authorities. In The Netherland in 2010, there were 75% of Internet users purchasing goods or services online, almost 70% of Internet

users connecting with local authorities and 73% of population were making Internet banking (European Commission, 2010), while in Egypt only 0.78% dealing with government, 0.021% making internet banking and only 0.10% purchasing goods or services online.

Table 8 Internet Activities Undertaken by Individuals in 2010

Activity	Proportion (%)
Communicating	27.23%
Dealing with Gov. Org.	0.78%
Download Songs and SW	49.71%
Education or learning activities	39.14%
General web browsing	0.25%
Get info. from Gov. Org.	9.08%
Info about goods or services	2.86%
Info related to health	25.82%
Internet banking	0.021%
Purchasing goods or services	0.10%
Reading e-Books	34.36%
Video Game	24.38%

Source: Egypt ICT Indicators Portal last visited 10/2/2011

3.4 ICT Access and Use by Business

Penetration of computers in business has increased from 51% in 2008 to 65.3% in 2009, while internet penetration increased from 30.38% in 2008 to 35.5% in 2009, 87.2% of businesses connected to Internet through ADSL, 7.5% through leased line and the rest through dial up and ISDN (Egypt ICT Indicators portal). More than half of the enterprises using Internet have websites, which they use as tools for facilitating their marketing and publicity activities, as well as selling online as about 34.8% of websites receive orders via the Internet, and buying online as 21% placing orders over the Internet, web presence differs according to firm size as 79% of large firms have

web sites, 68% of medium size firms and 51% of small firms has web sites (MCIT, 2008b).

Table 9 ICT Access and Use by Business

Indicator	2008	2009
Proportion of businesses using computers	51%	65.31%
Proportion of businesses using the Internet	30.38%	35.52%
Proportion of businesses with a website or web presence	63.44%	66.68%

Source: Egypt ICT Indicators Portal last visited 11/2/2011.

Internet use varies considerably across industries. For example, while 100% of Egyptian companies in air transport were Internet users in 2008, the corresponding shares for community and social services, retail industries and post and telecommunications were below 16%.

There is wide gap between Egypt and other countries in terms of the nature of Internet use. In Finland, where broadband and Internet connectivity are among the highest in the world more than nine out of 10 companies use the Internet for banking transactions and for interacting with public authorities (UNCTAD, 2009). In The Netherlands, there are 37% of enterprises purchasing online, and 22% selling online, and 83% of enterprises using e-government services. In Sweden, there are 48% of enterprises purchasing online, and 21% of enterprises selling online (European Commission, 2010). While in Egypt as shown in table (10) only 16% of the Egyptian companies using the Internet to interact with public authorities, and 23% companies connected to internet to do Internet banking (Egypt ICT Indicators portal).

Table 10 Businesses Using the Internet by Type of Activity in Egypt 2009

Activity	Proportion
Sending or receiving emails	82.95%
Info about goods or services	69.81%
Customer Services	47.31%
Info from government	38.61%
R&D	30.19%
Internet banking	23.51%
Delivering products online	18.58%
Dealing with government	16.47%
Others	1.23%

Source: Egypt ICT Indicators Portal last visited 11/2/2011.

3.5 Investments in ICT Sector

Egypt has made improvements to investment climate over the past decade including; WTO agreements, unrestricted ownership of investment capital, elimination of price controls, and reduced tax rates, free zones and special economic zones, and the legal and regulatory environment. In addition, the government has created a supporting environment for electronic payments and made a number of additional regulatory changes in the areas of e-contracting, e-payments and cyber crime (MCIT, 2009).

Many international ICT companies have invested in Egypt by locating regional headquarters and branch offices in the country, and Egyptian companies have begun to successfully compete in foreign markets. During the last decade, the number of ICT companies as shown in table (11) increased from 600 companies in 2000 to 3934 in 2010, with the largest number in IT companies of 3078 companies followed by IT services of 532 companies and 324 communications companies.

ICT investment as shown in table (12) has increased in ten years from LE2761 million in 2000 to LE21681.9 million in 2010; the private investment represented 80% of the total ICT investment of LE17256.2 million, and LE4425.7 million in public sector. ICT Issued Capital almost doubled in five years from LE 24375.8 billion in 2005 to LE44816.9 billion in 2010 (Egypt ICT Indicators Portal).

Table 11 ICT Companies

Indicators	Unit	2000	2010
Communications	company	74	324
Information Technology	company	498	3078
IT Services		28	532
Total	company	600	3934

Source: Egypt ICT Indicators Portal, 21/2/2011

Table 12 ICT Investment

Indicator	Unit	2000	2010
Public	Million	1756	4425.7
Private	Million	1005	17256.2
Total	Million	2761	21681.9

Source: Egypt ICT Indicators Portal, 21/2/2011

Investments undertaken by Governments and the private sector in the region are essentially spent on upgrading and expanding telecommunication infrastructure. Table (13) reveals the total value of telecom investments¹⁰ in years 2003 and 2008, in ten Arab countries excluding the rest of Arab countries due the unavailability of data.

Telecommunication investment in Egypt increased more than 11 folds from \$120 million in 2003 to \$1.4 billion in 2008. Liberalization of mobile market has permitted the entry of national and international investments, which led to high returns on investment in many countries, such as Bahrain, Oman and Saudi Arabia and Egypt as Orascom Telecom had a total market value of \$17 billion by of end 2007.

Table 13 Telecom Investments, 2003-2008

Country	Telecom investment (millions of \$)	Telecom investment (millions of \$)
Egypt	120,000,000	1,414,000,000
Morocco	100,000,000	843,000,000
Iraq	420000000	284,000,000
Algeria	520000000	264,000,000
Sudan	266200000	207,000,000
Tunisia	368000000	99,000,000
Syria	71250000	95,400,000
Jordan	81700000	90,300,000
Yemen	40000000	50,100,000
Mauritania	--	40,000,000

Source: The World Bank, Development Indicators database, 2009

¹⁰ Investment in telecom projects with private participation covers infrastructure projects in telecommunications that have reached financial closure and directly or indirectly serve the public. Movable assets are excluded. The types of projects included are operations and management contracts, operations and management contracts with major capital expenditure.

3.6 Research and Development in ICT Sector

expenditure on R and D as percentage of GDP in Egypt still modest as it was only 0.23% of GDP in 2007 which is consider low in comparison to other countries as Sweden spent on ICT 3.67% of its GDP, Korea 3.5% and Denmark 2.56%, and in comparison to other Arab countries as Tunisia of 1.02%, Morocco of 0.63%, while its higher than some countries as Saudi Arabia of 0.04%, and Kuwait of 0.08% (WDI, 2009). The expenditure on all types of R and D in the region is modest, which are mainly concentrated in the faculties of computer science and management information systems, colleges and universities, developing content and Arabization.

3.7 E-government

In 2001, MCIT launched web-enabled services on an e-government portal, designed with the help of Microsoft Egypt and its partner companies. The portal allows citizens to pay telephone bills, request copies of birth certificates and replacements of national ID cards, obtain information about more than 700 services, including customs tariffs, Air flight schedules, electricity bills, and university and school test results (MCIT, 2009). Egypt's plan to update and modernize the government sector seeks to use ICT to gradually automate all of the government's back office procedures through the Enterprise Resource Planning (ERP) project as shown from table (14).

Table 14 E-Government Projects

Year	Project
2001	Launching of E-government portal
2003	First deployment of ERP through automation of payroll, accounting, budget, personnel, inventory and procurement systems, as well as document management and electronic archiving. It later included development of a database of industrial establishments and products for the Central Agency for Public Mobilization and Statistics, automation of notarization offices and other offices in Ministry of Justice.
2004	Launching the project of automation of authentication offices affiliated with the Ministry of Justice. The project established a decision support system and data mining center and provided training to 850 employees from Real Estate Registry and authentication offices.
2005	Land registration program between MCIT, Ministry of Water Resources and Irrigation, and Ministry of Justice.
2006	Funding and supporting the upgrade of 1,000 offices and 27 social solidarity units and installation of network connecting 1,300 computers.

Source: MCIT 2008

3.7.1 Online Services

Egypt ranks 86th globally according to United Nations e-Government Development Index EGDI¹¹ (UN, 2010), a country's strength in online service provision correlates positively with its use of new technology such as the emerging tools for social networking, which enables governments to consult with citizens and expand opportunities for participation in decision-making processes (UN, 2010).

¹¹ EGDI is a comprehensive scoring of the willingness and capacity of national administrations to use online and mobile technology in the execution of government functions of 192 countries.

As shown from table (15) there are number of online services available in the Egyptian portal as site map which is available in 53% of the countries, links between the portal and ministries or public departments which is available in 74% of the countries, online forms and online transactions as online payment of phone bills and online buying of trains and air plane tickets. Also There are number of services are not available in the Egyptian national portal as;

- The section for archived information, which enable users to find information on past activities that are no longer highlighted.
 - The News section, to encourage users to browse updated information.
 - Frequently asked questions (FAQ) which can reduce the amount of time devoted to public inquiry functions.
 - Wireless devices such as mobile phones are being used by some other governments to provide services in the form of applications or fee payment.
- In 2008, 19 national portals had WAP implemented, and 14 national sites offered mobile alerts, while in 2010, that number increased to 25.
- The use of real simple syndication (RSS) feeds which jumped from 10% of national portals in 2008 to 35% in 2010. This means that more national portals are automatically releasing information and content to individual subscribers. Citizens are informed whenever any updates are made.

Table 15 Comparison between Online Services in Egypt and other countries

Online Service	Availability in Egypt's portal	Proportion of countries provide the service
Site Map	Yes	53%
Links between national home pages and ministries/departments	yes	74%
Links between national home page and public sector services	yes	67%
Site offers content in more than one language	yes	49%
Frequently asked questions	NO	44%
real simple syndication	NO	35%
Site supports WAP/GPRS access	NO	13%
Site offers service to send alert messages to mobile phones	No	13%
Archived information	NO	86%
Whats New?	NO	81%
Site support audio and/or video content	NO	49%
Online forms	Yes	28%
Online Transactions	Yes	32%

Source: United Nations E-Government survey, 2010- Egypt's portal by researcher

3.7.2 E-Participation

The provision of online services provides a transformative platform for the public sphere¹². The Internet is transformative because it allows anyone to be a publisher. It affords political leaders new routes to power. It affords citizens new ways to have their say. Even the voices of the marginalized can be heard.

Many governments are engaging citizens for feedback via their websites, as the majority of sites have polls or surveys or feedback buttons. As well as popular Web

¹² There are many types of public spheres operating across many different platforms, including the traditional mass media of television, radio and newspapers.

2.0 tools such as blogs, chat rooms and SMS as well as communication technologies such as Face book, Twitter and other social networking tools.

The e-participation index is indicative on how governments create an environment in which citizens can be more active and supportive of their governments. The Republic of Korea leads the e-participation index, followed by Australia, Spain and New Zealand.

Seventy-nine percent of the countries in 2010 have some aspect of e-consultation (UN, 2010). Egypt national portal includes polls for interacting with citizens about their opinion in some public matters. Also there are contact page for any complains or questions about the site.

The National portal is missing social networking tools, but beside the national portal the Egyptian Government started to use social networking tools as SMS in the form of message alerts, for political reasons as sending alerts and information since January 2011 revolution. Also the government started to use social communication technologies such as Facebook, the army and other authorities have created facebook pages to communicate with citizens and receiving their feedback.

3.7.3 E-government Services for Business

The use of e-government services by enterprises; is of particular importance for encouraging businesses to make further use of ICT to improve the efficiency of their operations. The Government of the Republic of Korea for example, provides firms with information on export-import logistics and Customs, and has started to

implement an electronic documentation service for private companies. In Mexico, the taxation agency recently launched online tax returns and e-invoices to encourage online transactions (UNCTAD, 2009).

In Egypt; the government offers number of services for enterprises for example; the national portal links to web sites of ministries and departments as; Industrial Control Authority web site. The National portal provides online Taxes services for companies, and downloadable forms of taxes declarations to be filled manually and submitted to the authorized department. Ministry of Finance provides online customs services and information regarding various customs. The National portal of General Authority for Investment provides beside another services, e-establishments of new enterprises.

3.8 E-commerce

Egypt has both business-to-business (B2B) and business-to-consumer (B2C) e-commerce, with greater potential for B2B than B2C sites. Large Egyptian companies have started using in-house websites to manage inventory. Sectors now covered by Egyptian B2C sites include stock market trading, real property, food delivery, lifestyle products, Egyptian handicrafts, and furniture and human-resources industries.

One problem with e-commerce growth is trust. Although Egyptian credit-card holders are gradually becoming used to using their credit cards on international sites, they are still wary of using their credit cards on domestic sites (The Economist, 2007).

3.9 E-Science

MCIT, in cooperation with the Academy of Scientific Research and Technology (ASRT) has launched a Science and Technology Portal. The main objective of this portal is to acquire, develop, and make available the Egyptian National Scientific and Technology Information Network (ENSTINET) content to the scientific community.

3.10 E-culture

In 2002, MCIT established the National Center for Documentation of Cultural and Natural Heritage (CultNat), to use the latest technology to document and preserve Egypt's cultural and natural heritage, to build a strong network of professionals in the field of conservation and documentation of cultural and natural heritage, and to increase public awareness of Egyptian culture using all available media resources. The main projects of CultNat are Eternal Egypt which shows the Pharaonic and Islamic treasures of Egypt in five languages, the project of digitization of historical maps and Arabic papyri which have completed the digitization of two archival collections of approximately 10,000 maps and 3,500 papyri. Culturama is the first interactive multimedia program displaying Egypt's cultural and natural heritage, displayed on a panorama of nine screens. In 2008, the Fekr-Rama portal designed to facilitate access to Arabic content in fields of culture, education, heritage, religion, sports and art for Egyptian, Arab and other online users (MCIT, 2009).

Fourth section: ICT Contribution to National Economy

4.1 ICT Revenues

ICT revenues almost doubled in five years from LE24.5 billion in 2005-06 to LE44.7 billion in 2009-10, along with 3.8% contribution to GDP up from 2.4% in 2006-07, which contributed to annual growth rate of GDP by 0.31% and increased to 0.5% in 2009-10 and also contributed to the treasury by LE 10 billion (Egypt ICT Indicators Portal).

In 2008, Telecommunication revenue in Egypt was \$5 billion with IT market value of \$1.2 billion the second in the region after Saudi Arabia of more than \$11 billion with IT market value of \$3.4 billion, then Kuwait of almost \$4 billion and United Arab Emirates, had telecom revenue of \$3.5 billion with IT market value of \$3.1 billion (ESCWA, 2009).

Table 16 Comparison of telecom revenues and IT market value in selected arab countries, 2008

Country	GDP (billions of \$)	Telecom revenue (millions of \$)	IT market value (millions of \$)
Saudi Arabia	467.6	11450.48	3400
Egypt	162.82	4958.08	1200
Kuwait	112.11	3924.07	774
United Arab Emirates	163.3	3501.95	3100
Lebanon	28.66	1948.18	251
Oman	35.73	964.6	294
Qatar	52.72	806.8	402
Bahrain	15.83	689.76	342

Sources: ESCWA 2009, based on The World Bank, *World Development Indicators 2009*; and Business Monitor International.

4.2 ICT Expenditure

In 2008, Egypt, United Arab Emirates and Jordan had ICT expenditures higher than the world average of 6.41% of GDP, which shows the governments' interest of ICT sector development in these countries. Jordan has a relatively high rate of ICT expenditure, but its expenditure value is only \$1.6 billion which is significantly low, when compared to Saudi Arabia \$20.4 billion, United Arab Emirates \$11.5 billion, Egypt \$9.7 billion, and Kuwait \$5.8 billion.

Egypt and the United Arab Emirates both have shown an increase of about 1.5% from 2003 to 2008, which shows the realization of importance of the sector to the economy and subsequent care for its development.

Table 17 ICT Spending in selected countries, 2003-2008

Country	GDP	ICT	ICT	GDP	ICT spending	ICT spending
	(billions of \$)	spending	spending	(billions of \$)	(millions of \$)	(percentage of
	2003			2008		
Jordan	10.2	1 016.60	9.97	17.46	1 643.60	9.42
United Arab Emirates	87.61	5 456.10	6.23	148.08	11 458.60	7.74
Egypt	71.36	3 540.10	4.96	149.02	9 775.20	6.56
Saudi Arabia	214.57	10 539.60	4.91	423.07	20 407.90	4.82
Kuwait	47.83	2 404.30	5.03	134.54	5 832.80	4.34
World	36 221.92	2 383 312.10	6.58	59 071.76	3 786 380.00	6.41

Source: ESCWA 2009, based on World Information Technology and Services Alliance (WITSA),

Digital Planet 2008.

4.3 Trade of ICT Goods and Services

ICT industries contribute moderately to the national economy mainly through system integration (software outsourcing) and computer assembly plants. Table (18)

summarizes the exports and imports of ICT goods and services and its growth from 2000 to 2008 in selected Arab countries.

Table 18 ICT Imports and Exports in Selected Arab Countries, 2000-2008

	Goods				Services	
	ICT exports		ICT imports		ICT exports	
Country	2000	2008	2000	2008	2000	2008
Bahrain	0.1	0.12			..	..
Egypt	..	1.80	..	4.41	3.35	7.34
Iraq	..	..	..	..	..	3.30*
Jordan	3.65	5.47	5.90	7.16	..	..
Lebanon	1.59	...	4.48	3.61*	..	1.87
Oman	0.64	1.59	3.74	3.20	..	..
Qatar	0.13	0.03	5.13	8.19	..	..
Saudi Arabia	0.14	0.38	5.15	7.96*	..	..
Sudan	0.04	0.01	5.65	2.25	9.48	1.18
Syrian Arab Republic	0.00	0.55	..	2.02*	..	4.35
Tunisia	3.40	5.02	5.46	5.62	1.16	2.39
United Arab Emirates	..	1.98	..	5.34	..	..
World	18.02	12.24	17.71	12.48	5.40	8.13

Source: The World Bank, World Development Indicators 2009.

Notes: ICT goods exports and imports include telecommunications, audio and video, computer and related equipment, electronic components, and other information and communication technology goods. However, software is excluded. Two dots (..) indicate that data are not available. (*) means that 2008 data isn't available and used the nearest data available

ICT exports still low in Arab countries, as shown in the table all countries has ICT exports rates as percentage of total good exports below the world rate of 12.24% with the highest rate in Jordan of 5.47%, followed by Tunisia of 5.02%, then United Arab Emirates 1.98%, and same fact applies for ICT service exports. It is evident from the table that the import rates largely exceeded the export rates, which owes to the absence of a real ICT industry.

In Egypt, ICT goods exports was 1.8% of total goods exports and ICT services exports was 7.34% of total services exports the highest in the region, ICT exports more than tripled from 2005 to 2009 from LE 250 million to LE 850 million.

Currently, most ICT firms in the Arab region are involved in retail of computers and software tools and applications, without neglecting the growing number of companies that provide total ICT solutions, including system integration and customization (ESCWA, 2009).

4.4 Employment in ICT Sector

In addition to ICT productivity impacts, there are other possible socio-economic impacts as raising skills and job creation. In Egypt there were cooperation between Government and private sector for the development of ICT skills through specialized training program which carried by Government represented by NTI and ITI¹³, and private sector as Ericsson, Fujitsu, Orascom Technology systems, and IBM and graduated till January 2011 were 40, 294 trainees. The programs included web applications development, IT technology, software development, E-commerce and communications as Network security. As well as graduate skills development program which graduated 6605 trainees till January 2011, which have been carried in different governorates by educational organizations as Government universities, and organizations as NTI, CAPMAS and the Egyptian Cabinet (MCIT portal last visited April 2011). Also ITI has trained over 50000 Governmental Employees and

¹³ Egypt's Information Technology Institute (ITI) has been established in 1993 by the Information and Decision Support Center, to help in creating a generation of IT professionals. The institute offers nine-month training programs tied to industry needs, and Knowledge Transfer Program in partnership with private sector companies.

supervised the training of over 700000 in Governorate's Training Centers (iti.gov.eg, viewed July 2011). In 2005, MCIT established e-Learning Competence Center (ELCC) in partnership with Cisco to leverage the E-Learning Platform. To date, the Center has delivered training to 56,610 students, 3,260 instructors and 3,000 small and medium enterprises (www.elcc.gov.eg, viewed July 2011).

ICT sector helps as well in solving the unemployment problem by adding direct job opportunities in the economy. ICT direct employees in Egypt reached 204,964 in 2010 from 115,280 in 2000 (Egypt ICT Indicators Portal), which one of the highest in the region as inn Saudi Arabia number of employees in telecommunication sector reached 80,000; and 22,000, 13,000 and 2,500, respectively, in Jordan, Qatar and Bahrain (ESCWA, 2009).

Fifth Section: SWOT Analysis

Table 19 SWOT Analysis of Egyptian ICT Sector

<u>Strengths</u>	<u>Weaknesses</u>
Strong telecommunication infrastructure	Low penetration rates
Competitive ICT market	Low ICT R & D
Innovative ICT programs	Insufficient E-Government tools
Job Creation	Insufficient E-Commerce regulations
<u>Opportunities</u>	<u>Threats</u>
Multilingual and cost-effective talent pool	High illiteracy rate
Geographical proximity	High population rate
ICT skills	Population under poverty line
Legislative Environment	Low GDP per capita
Automated Financial system	High unemployment rate
	Miss coordination of Policies
	Low Quality of education_

Source: Analyzed by researcher

5.1 Strengths

- A range of new initiatives has been introduced aimed at accelerating ICT infrastructure coverage and increasing ICT uptake, including the broadband incentive to increase uptake of high speed connections more widely across the economy. In 2009, Egypt has lead the Arab states of total number of fixed telephone lines of 10,312,559 lines, representing more than 29% of total lines in Arab states. Also Egypt has lead the Arab states and was 19th globally of 55,352,233 mobile subscriptions representing more than 21% of total subscriptions of Arab states.
- High competition in broadband market with four backbone providers and 214 Internet service providers, in addition to three mobile broadband operators, which lead to lower Internet prices relative to other countries and availability of Internet access almost in all exchanges. Also competition in Mobile market has lead to innovation and development of new services, better quality and lower prices.
- Innovative ICT government policy in promotion of ICT accessibility, stimulation of ICT skills, building a large cadre of highly trained technicians and professionals, and illiteracy eradication.
- ICT sector added 204,964 direct jobs in 2010 due to high number of ICT start up companies.

5.2 Weaknesses

- Low penetration rates of Internet and different kinds of communications by individuals and business in comparison to other countries, as well as there is a gap in nature of internet activities carried by individuals and business which shows the inefficient usage of Internet in Egypt.
- Despite initiatives to promote R&D, it still lagging which will affect the development of ICT in Egypt.
- Insufficient E-government portal suffers weak E-participation tools and online services for individuals and business.
- Insufficient E-commerce laws which is lagging in comparison to other countries.

5.3 Opportunities

- Multilingual and cost-effective talent pool, with the ability to speak to more than 150 million Arabic speakers in the region.
- The geographical proximity to Europe, Africa, the Middle East and Asia.
- Qualified labor force; large number of university graduates and more than 20% of the graduates are graduated from engineering and computer science departments, Post graduates of Diploma, Masters and PHD degrees, advanced IT training programs graduates.

- Investment encouraging legislative system as Income and corporate taxes, and investment law.
- Fully automated banking and financial sector, most banks developed online banking systems with highly secured networks.

5.4 Threats

The socioeconomic characteristics of Egypt represent threats and challenges as it form hindering factors for adoption of ICT which affect mainly the ICT penetration rates and nature of usage. As high population, poverty rate, high unemployment rate, high dependency ratio and high illiteracy rate.

- High illiteracy rate of almost 40% of the population affect ICT diffusion and development.
- High population rate which make it big challenge to the government to reach high penetration rates of ICT usage.
- There are 20% of population under poverty line and can't afford to use ICT technologies.
- Low GDP per capita which affect usage of ICT.
- Misuse of available skills as almost 94.8% of unemployed people exist among graduates of tertiary and postgraduate.
- Miss trust culture of online payment which affect E-business in Egypt.

- Policy coordination; a number of ministries and agencies are responsible for various parts of ICT policy and its execution. The ICT diffusion needs coordination between the public and private authorities.
- Quality of education needs improvement at all education levels.

Sixth Section: Analysis of ICT Adoption Factors

6.1 Income Level and ICT Adoption

As shown from table (20) which shows IDI¹⁴ ranks and GDP per capita for the top ten and the Arab countries, there is a general positive relationship between ICT diffusion and income indexed by GDP per capita. The top ten IDI countries are high income countries, with exception of The Republic of Korea with relatively low income level, which illustrates the effect of ICT public policies on ICT development (ITU, 2010).

Arab countries included in the analysis are divided to low income countries and the oil high income countries, the analysis shows that there is no correlation between income and ICT diffusion in oil countries which prove their need for more active ICT policies. As shown from the table Qatar with GDP per Capita \$86,435 higher than most of the top IDI economies still in 47th rank and improved only 2 ranks from 2002 to 2008, although its GDP per capita has more than tripled during this period. Kuwait with GDP per Capita \$54260 still in 65th rank and deteriorated from 49th in 2002

¹⁴ IDI has been chosen among other ICT indices because it covers the largest number of countries and ICT indicators.

although its GDP per capita more than tripled during this period. United Arab Emirates with GDP per capita of \$58,272 higher than five of the top ten IDI economies is in 29th rank. The positive impact of active ICT policies has been proven in UAE as it's leading the Arab IDI ranking although its GDP per capita is less than Qatar and has improved from 40th in 2002 with doubling of its income due its active ICT policies.

As shown from the table there is positive correlation between income and ICT diffusion in low income Arab countries as in case of Egypt, Tunisia, Jordan, Syria, Algeria, Morocco, Yemen and Sudan.

The relation between income and ICT diffusion has been further studied in Egypt, through statistical analysis using Spearman rank correlation coefficient¹⁵ for the period from 1993 to 2009, between GDP per capita and number of Internet users, which found to be highly positively correlated of 0.76 Spearman rank correlation coefficient, and have strengthened over the period from 2002 to 2009 of Spearman rank correlation 0.83 which prove the impact of active ICT policies along with the higher income on ICT diffusion.

¹⁵ It is a non-parametric measure of statistical dependence between two variables.

Table 20 IDI Rankings and GDP per Capita in selected countries 2002-2009

Country	2002		2008	
	IDI Rank	GDP / Capita	IDI Rank	GDP / Capita
Sweden	1	28122.0	1	52884.5
Luxembourg	21	50605.4	2	105043.7
Korea (rep.)	3	12093.8	3	19161.9
Denmark	4	32354.4	4	62035.8
Netherlands	6	27110.7	5	53075.9
Iceland	5	30927.8	6	52932.1
Switzerland	7	38247.4	7	65699.4
Japan	18	30745.3	8	38267.9
Norway	5	42293.3	9	94567.9
United Kingdom	10	27172.1	10	43360.8
United Arab Emirates	40	20965.8	29	58272.4
Bahrain	38	12482.0	33	28240.5
Qatar	45	28288.0	47	86435.8
Saudi Arabia	73	8742.9	52	19151.6
Kuwait	49	16334.1	65	54260.1
Oman	76	8071.1	71	21648.6
Jordan	65	1902.4	74	3905.2
Syrian Arab Republic	102	1237.6	93	2648.8
Tunisia	85	2151.7	94	3954.8
Egypt	95	1205.2	96	1997.3
Morocco	111	1353.6	97	2768.7
Algeria	100	1816.2	105	4974.5
Sudan	131	411.3	127	1403.5
Yemen	129	513.7	129	1174.5

Source: The World Bank, World Development Indicators 2009, ITU 2010

6.2 Education and ICT Adoption

Table (21) shows IDI ranks and Education (indexed by Adult literacy rate, secondary school gross enrollment ratio, and Tertiary education enrollment ratio) for the top ten countries and Arab countries studied in IDI ranking. The data shows a positive relation between adult literacy rate¹⁶ and ICT development. All top ten IDI economies experience literacy levels of 99%, and on regional level IDI ranks goes in same direction with literacy levels which are all above the world average of 83.4% and

¹⁶ Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.

MENA Region average of 73.5% except of Tunisia, Algeria, Sudan, Egypt, Yemen, and Morocco with rates 78%, 75.4%, 69.3%, 66.4%, 60.9%, 56.4%, with IDI Ranks 94th, 105th, 127th, 96th, 129th, and 97th respectively which are the last five countries in the sample which shows the relation between literacy and ICT development.

There is also a positive relation between secondary school gross enrollment ratio ¹⁷ and ICT development as shown from the table, all top ten IDI economies have secondary school gross enrollment ratio more than 95%, and on regional level secondary school gross enrollment ratio are above the world average of 72.6% and MENA region average of 67% except Morocco, Yemen, and Sudan with rates 59.3%, 45.7%, and 33.5%, with IDI Ranks 97th, 129th, and 127th, respectively which are three of the last five countries in the sample. These results show the impact of secondary school education on ICT development, as secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development.

As shown from data there is a weak positive relation between tertiary¹⁸ education and ICT development. All top ten IDI economies have tertiary enrollment ratio of almost 50% except Luxembourg of 9.2% which is less than the world ratio 26.6%. The weak relationship also represented by Sweden which has ratio of 71%

¹⁷ Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

¹⁸ Tertiary education normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

which is less than Korea by 27% and Denmark by 13.2% although it leads the IDI rankings.

On regional level the IDI ranks also show weak relationship between tertiary education and ICT as UAE which leads the region has ratio of 25% which is less than the world average and MENA average of 26.4% and less than other eight countries which are Syria with a ratio of 83% while it has the 93rd IDI rank, Jordan, Tunisia, Saudi Arabia, Egypt, Bahrain, Oman and Algeria of 74th, 94th, 52nd, 96th, 33rd, 71st, and 105th IDI rank respectively. These show that Tertiary education has weak significant impact on ICT diffusion.

Table 21 IDI Rankings and Education in selected countries 2008

Country	IDI Rank	Adult Literacy rate	Sec. Enrollment (%)	Tertiary Enrollment (%)
Sweden	1	99	103.5	71
Luxembourg	2	99	95.9	9.2
Korea (rep.)	3	99	97.2	98
Denmark	4	99	117.7*	84.2*
Netherlands	5	99	120.6	60.6
Iceland	6	99	110.1	74.6
Switzerland	7	99	96.1	49.4
Japan	8	99	100.9	58
Norway	9	99	111.6	73.2
United Kingdom	10	99	98.9	57.4
United Arab Emirates	29	90*	97.7*	25.2
Bahrain	33	90.8	96.8	28.5*
Qatar	47	93.1*	93.2	11
Saudi Arabia	52	85.5	94.6	29.9
Kuwait	65	94.5*	89.8	15.8*
Oman	71	86.7	88.1	26.9
Jordan	74	91.1*	88.2	40.7
Syrian Arab Republic	93	83.6	73.9	83.1*
Tunisia	94	78	91.8	33.7
Egypt	96	66.4*	80.6	28.6
Morocco	97	56.4	59.3*	12.3
Algeria	105	75.4*	85	25.4*
Sudan	127	69.3	33.5	5.9*
Yemen	129	60.9	45.7*	10.2

Source: Source: The World Bank, World Development Indicators 2009; ITU 2010
 Note: (*) means that 2008 data isn't available and used the nearest data available

In Egypt, the statistical analysis found that ICT indexed by number of Internet users is highly correlated with adult literacy rate for the period from 2003 to 2008, at Spearman rank correlation coefficient of 0.82. Also the analysis has found a perfect monotonic function between secondary school gross enrollment ratio and Internet users for the period from 1999 to 2008 of Spearman correlation coefficient of 1, while there is a weak correlation between gross tertiary education and number of Internet users at Spearman rank correlation coefficient of 0.6 for the period from 2003 to 2008.

6.3 Labor Force and ICT Adoption

Table (22) includes IDI ranks and unemployment rates for the top ten IDI countries and Arab countries shows a general negative relation between ICT diffusion and unemployment rates, with some exceptions. Top ten IDI countries have low unemployment rates except of Sweden although it leads the IDI it has unemployment rate of 6.2% the highest among the top ten, also Luxembourg although it has second IDI rank but has unemployment rate of 5.1% higher than all top ten except of Sweden and United Kingdom of 5.6%.

On regional level there is a negative relationship between unemployment rate and ICT except of Kuwait although it has IDI Rank of 65th it has the lowest unemployment rate of 1.6% (ITU, 2010).

In Egypt upon statistical analysis between number of Internet users and unemployment rates for period from 1993 to 2008 there is a weak negative correlation between unemployment rate and internet usage at Spearman rank correlation coefficient of -0.12.

Table 22 IDI Rankings and Unemployment rate in selected countries 2002- 2008

Country	2002		2008	
	IDI Rank	Unemployment Rate	IDI Rank	Unemployment
Sweden	1	5.2	1	6.2
Luxembourg	21	6.4	2	5.1
Korea (rep.)	3	3.3	3	3.2
Denmark	4	4.3	4	3.3
Netherlands	6	3.1	5	2.8
Iceland	5	3.3	6	3
Switzerland	7	2.9	7	3.4
Japan	18	5.4	8	4
Norway	5	3.9	9	2.6
United Kingdom	10	5	10	5.6
United Arab Emirates	40	2.3	29	3.1*
Bahrain	38	5.5	33	--
Qatar	45	3.9	47	--
Saudi Arabia	73	5.2	52	5.6
Kuwait	49	1.1	65	1.6*
Oman	76	..	71	..
Jordan	65	16.2	74	12.7
Syrian Arab Republic	102	11.7	93	--
Tunisia	85	15.3	94	14.2*
Egypt	95	10.2	96	8.7
Morocco	111	11.6	97	9.6
Algeria	100	25.9	105	13.8
Sudan	131	..	127	..
Yemen	129	..	129	..

Source: The World Bank, World Development Indicators 2009; ITU 2010

Note: (*) means that 2008 data isn't available and used the nearest data available

Two dots (..) indicate that data are not available

Conclusions

- Low ICT penetration rates in Egypt as fixed telephone penetration rate and Internet penetration rate are lower than the world rate and higher than the Arab states rate, and mobile subscriptions penetration rate in Egypt lower than the world penetration rate and the Arab states rate.
- ICT Public policy in Egypt has been innovative in specific areas, for instance promotion of ICT accessibility (the home PC/broadband scheme) and stimulation of ICT skills.
- Legal Environment in Egypt is encouraging to investment, but there are no enough regulations for E-commerce which is hindering its improvement.
- Socio demographic characteristics in Egypt represent threats and challenges as it form hindering factors for adoption of ICT which affect mainly the ICT penetration rates and nature of usage. As high population, poverty rate, high unemployment rate, high dependency ratio and high illiteracy rate.
- There is a disinterest of E-commerce and E-government in Egypt as only 0.021% connected for internet banking, 0.78% connecting with local authorities and 0.10% for purchasing goods and services.

- E-government portal is not used widely by individuals and business, and there are weak E-participation tools and online services for individuals and business.
- Socio economic factors affect ICT diffusion specially income level, literacy rates, and secondary school education.
- Strong and targeted policy towards ICT development can drive the development of the information society, even in countries with relatively lower income per capita.
- Literacy rates and secondary education has a significant positive impact on ICT adoption as it gives the essential education the population need for the usage of ICT.

Recommendations

- Policy coordination between MCIT and other ministries is needed. Clarification of responsibilities among different ministries will help set a common focus for ICT policy and improve development of the general institutional framework with more focused policies.
- Diffusion of information on already established legislation and regulatory change need to be strengthened. Further legal frameworks for network security, transaction security, privacy, and Internet-based businesses need to be established, and E-commerce law should be issued.

- IT-security strategy could be devised and adopted.
- Policy measures can be taken to expand ICT access in rural areas.
- Higher level funding and support is necessary to R&D in general, with paying attention to ICT-related R&D.
- Further efforts are needed to encourage a stronger supply of venture capital.
- Better use of qualified labor resources; as the unemployment rate within the higher education graduates is 94.8% of unemployed population with fact that 20% of tertiary graduates are graduated from engineering and computer science departments who could be used by government and private sector to enhance their skills towards the development of ICT in Egypt.
- Raise population awareness of E-commerce and E-government.
- Improving E-government services as it should provide citizens with an avenue for direct impact on how government operates. Introduction of fully electronic services in the areas of taxation, voting, and health care.
- Improvement of E-participation tools to include more social communication tools with feedback system and fast reply to citizens inquiries and complaints to gain trust.

- Advanced E-recruitment portal should be created by government including access to both employers and job seekers to help in reducing unemployment rates.
- More effort is needed to build common e-business platforms that can be used by firms.
- Although ICT-related data and indicators have improved, they could be further strengthened to help track the development and diffusion of ICTs across the economy, and more particularly in the area of ICT impacts, to help improve policy monitoring and policy implementation.

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17/5/2010

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