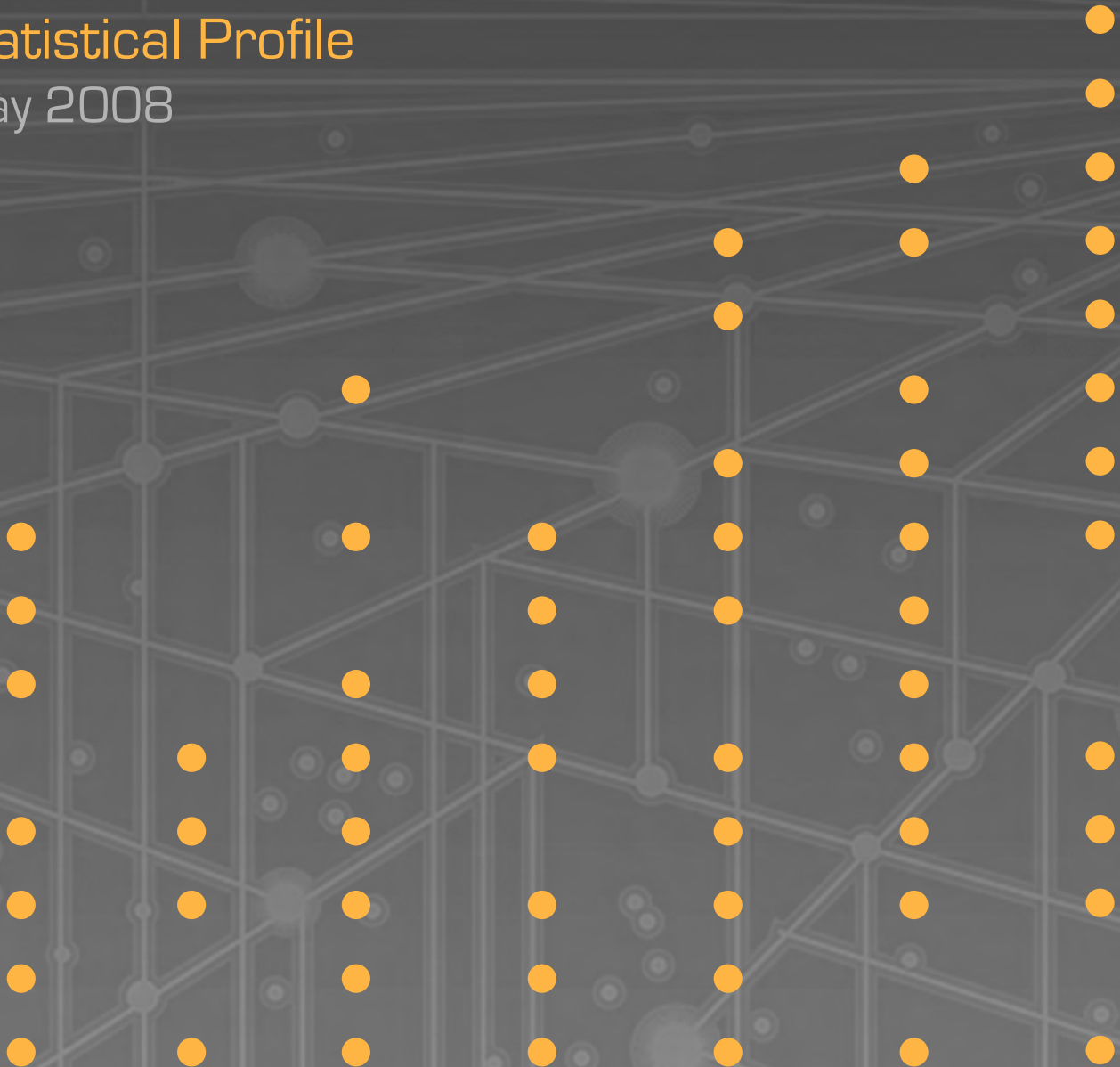Arab Republic of Egypt
Ministry of Communications
and Information Technology

The Future of Internet Economy in Egypt...

Statistical Profile
May 2008

The Future of Internet Economy in Egypt...

Building on our efforts in standardizing the ICT indicators according to international organizations, this statistical profile was produced in line with the OECD's
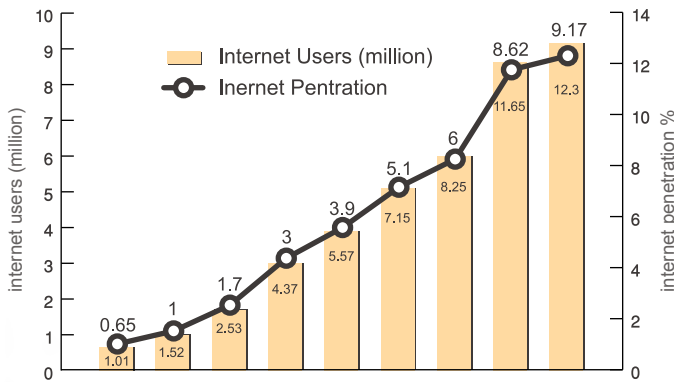"Statistical profile for the future of internet economy"

Content

The Internet has grown fast

Figure (1) **Internet users and internet penetration**

Internet users increased to reach 9.17 million in March 2008

- Egypt adopted many strategies to increase the diffusion of the internet; this has been reflected in a significant increase in internet users from 0.65 million users in 2000 to 9.17 million in March 2008.

- Internet penetration hiked from 1.01% in 2000 to 11.65% in 2007 with an annual growth rate of 12.3% by the end of 2007.

- The number of internet subscribers has increased everywhere in Egypt; Cairo region constitutes a total share of 50% of the total internet subscribers in March. 2008.

- On the other hand Internet subscribers in both Delta region and Upper Egypt constitute a big portion of internet users reaching 33.8% of the total subscribers.

Figure (2) **Internet subscribers by region March 2008**
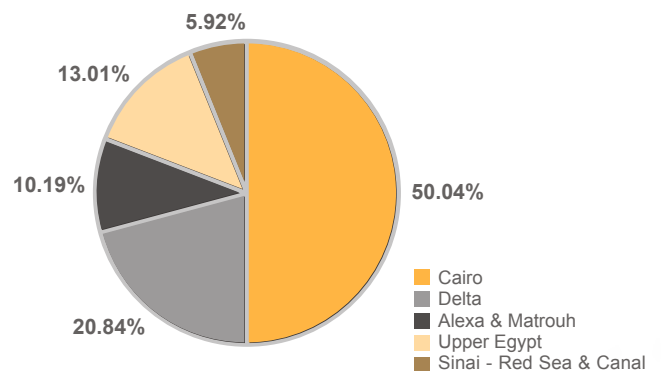
Legend:
- Cairo
- Delta
- Alexa & Matrouh
- Upper Egypt
- Sinai - Red Sea & Canal

Figure (3) **International internet bandwidth**

- Percapita share of international internet bandwidth BPS
- International internet bandwidth MBPS (million)
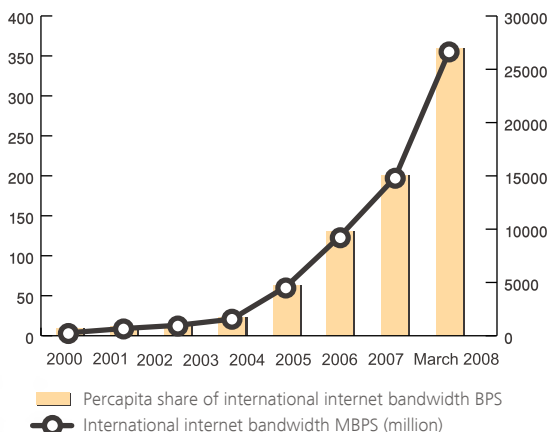
International internet bandwidth increased by 92% annually on average

- International internet bandwidth witnessed a steady growth through the last seven years with an average annual growth rate of 92%.

- Total international internet bandwidth reached 26827 MBPS in March 2008; due to this significant increase per-capita share of internet bandwidth increased to 361 BPS.

Figure (1) **Internet Price Basket**

	($/ Month)
South Africa	63.2
Brazil	26
Chile	25.6
Israel	22
Slovenia	18.6
Indonesia	17.3
Russian Federation	12.7
Estonia	10.8
China	9.8
India	6.8
Egypt	5
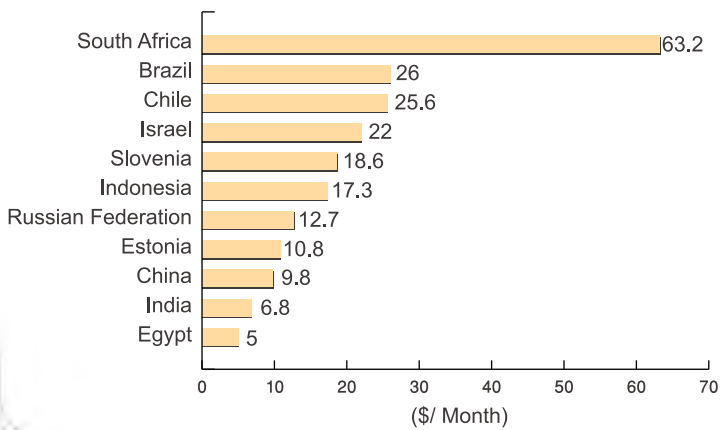
Internet cost is very competitive in Egypt

- According to the World Bank, the monthly cost of using internet does not exceed 5 US$ in Egypt.

Connecting more households and businesses in Egypt ...

14.7% of Egyptian households use the internet in 2008

- Number of households using internet in Egypt increased to 14.7% in Jan. 2008 compared to 12.9% in July 2007.
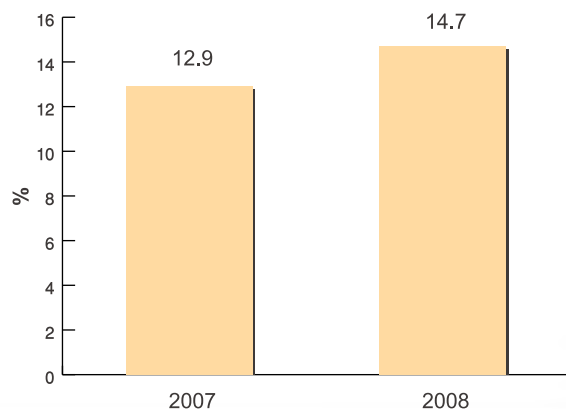
Figure (2) **Proportion of households using internet**

	2007	2008
%	12.9	14.7

Figure (3) **% of individuals using the internet by governorates**

| Governorate	%
CAIRO	16.69
DAMIETTA	14.28
DAKAHLIA	10.52
SHARKIA	6.34
KALYUBIA	6.11
KAFREL SHIEKH	5.99
GHARBIA	4.44
MENOUFIA	4.24
BEHERA	4.12
ISMAALIA	4.07
ALEXANDORIA	3.29
GIZA	3.21
BENISUEF	2.61
FAYOUM	2.39
MENIA	2.29
ASYOUT	2.27
SUHAG	2.22
QENA	1.14
ASWAN	1.05
LOUXR	1.00
PORT SAID	0.75
AL WADY AL GADID	0.42
NORTH SINAA	0.27
SUEZ	0.27
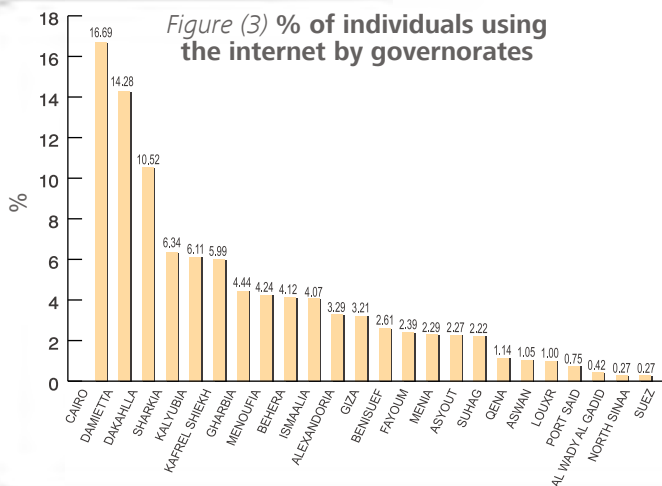
- Number of individuals using the internet varied across the regions.
- Number of individuals use the internet exceeds 10% in three major governorates and it is growing rapidly in the other governorates.

## 53.2% of Egyptian private enterprises using internet.

- No. of enterprises using internet in Egypt increased to 53.2% of the total enterprises in 2007.
- The highest proportion of enterprises using the internet is within the category of medium enterprises; as 59% of this category use the internet.
- Medium enterprises seem to be the most dynamic segment in the Egyptian Economy.

Figure (1) **Enterprises using the internet by firm size**

%

51.8	59	52.9
10-49	50-249	+250
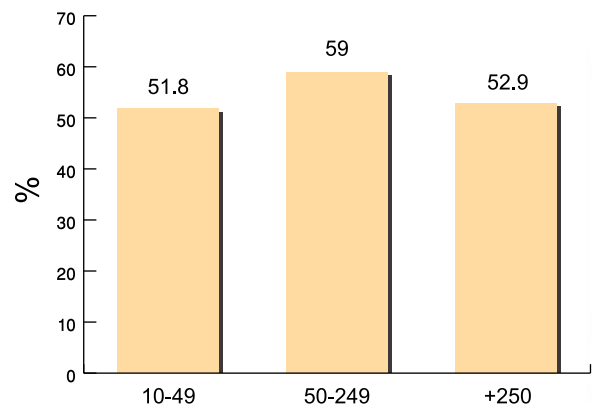
Broadband is feeding internet diffusion …

Figure (2) **Internet access modes (households)**

2007
2008

Dial up	ADSL	ISDN	Other
46.5 / 42.5	56.2 / 60.6	2.6 / 0.1	0.7 / 0.1
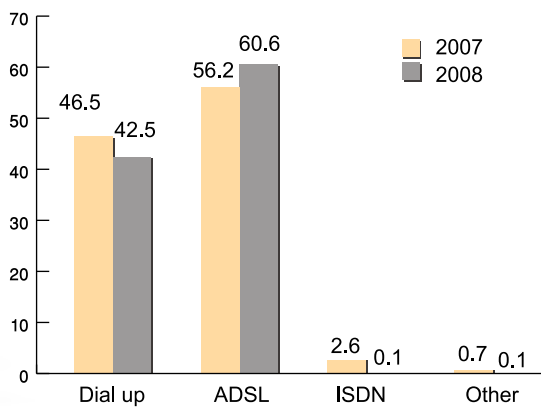
60.6% of Egyptian households connecting to the internet use ADSL connection.

- About 60.6% of the households connecting to the internet at home use ADSL connection in 2008, compared to 56.2% in 2007.
- Broad band is increasingly replacing dial-up and this trend was due to many governmental initiatives aiming at reducing the monthly cost of ADSL connection for households and businesses to reach about 8 US $.

72% of Egyptian enterprises using the internet are connected through ADSL

- ADSL is the most prevalent mode of access in the private sector as 72% of the Egyptian enterprises connected to the internet through ADSL.
- Leased lines connection came next with a very big difference (22.8%). These figures show clear dependence of most of the enterprises on ADSL, as it is considered the best choice for any enterprise to ensure fast and best internet connection.

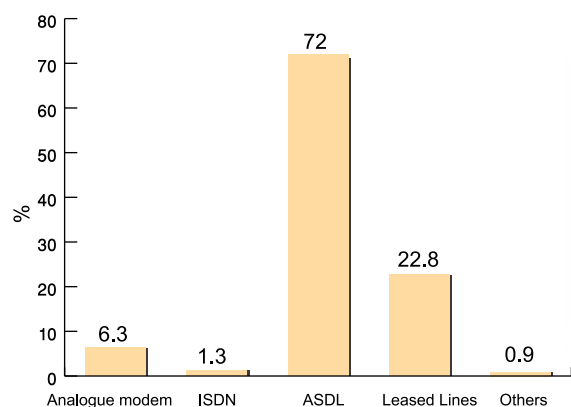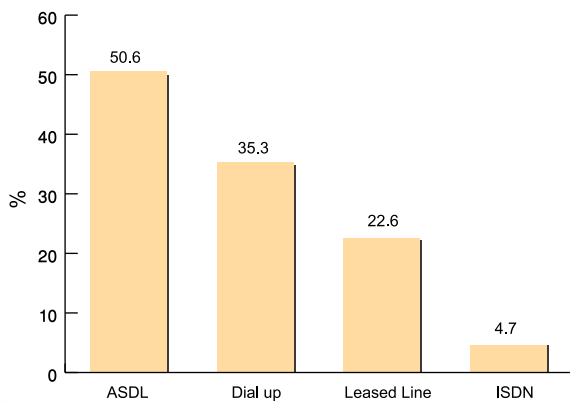*Figure (3)* **Inernet access modes (enterprises)**

%

Analogue modem	ISDN	ASDL	Leased Lines	Others
6.3	1.3	72	22.8	0.9

Figure (1) **Internet access modes (government)**

ADSL is commonly used to access internet in the government sector

- ADSL is commonly used to access internet in the government and public enterprise sector.
- Around half of the entities (50.6%) connect to the internet through ADSL, while around 35.3% log in through dial up connection and 22.6% through a leased line.

.. and driving convergence among digital ICTs..

Mobile subscribers witnessed a 64% increase in 2007

- Egypt witnessed a massive increase in Mobile subscribers to reach 31.4 million subscribers in March 2008.
- Mobile subscribers' annual growth rate reached 64% by the end of 2007.
- 3G, technology allows internet access and usage through mobile phones. It brings benefits to both the existing customers and the future subscribers.
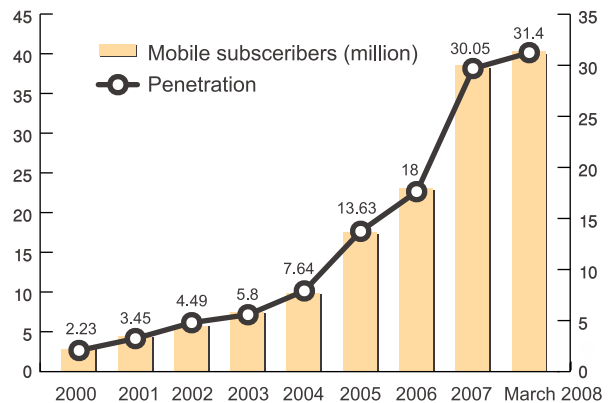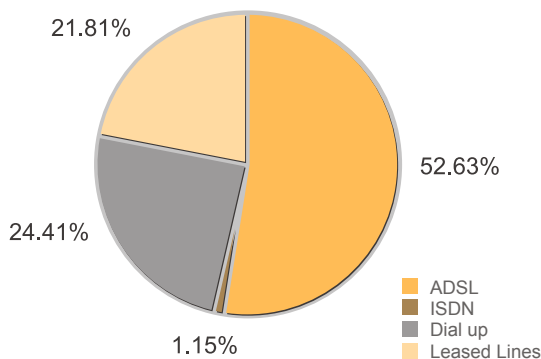
Figure (2) **Mobile subsceribers**

Figure (3) **Internet subscribers by mode of access March 2008**


52.6% of internet subscribers using ADSL

- Number of ADSL subscribers is increasing dramatically to reach 482 thousand subscribers by the end of March 2008.
- This figure accounted for around 52.6% of the total internet subscribers in Egypt.

A tremendous increase in ADSL users with annual growth rate reached 108% in 2007

▫ Number of ADSL users increased by 108% in 2007 to stand at 427 thousand users compared to 206 thousand users in 2006.

▫ It is worth mentioning that 8.9% of the Egyptian households access the internet via ADSL in 2008; as 60.6% of the Egyptian households that using internet connected through ADSL.

Figure (1) **ADSL subscribers**

Number of ADSL users (Thousands)
Linear (Number of ADSL users (Thousands))

2003 2004 2005 2006 2007 March 2008
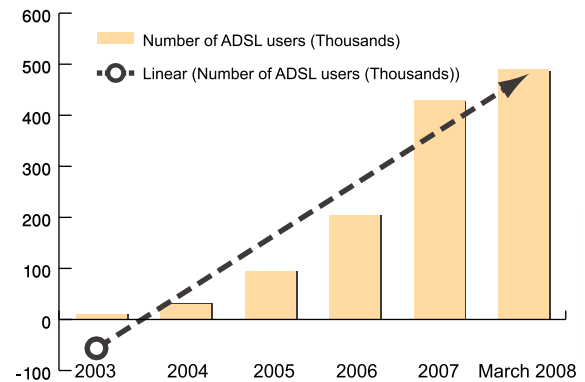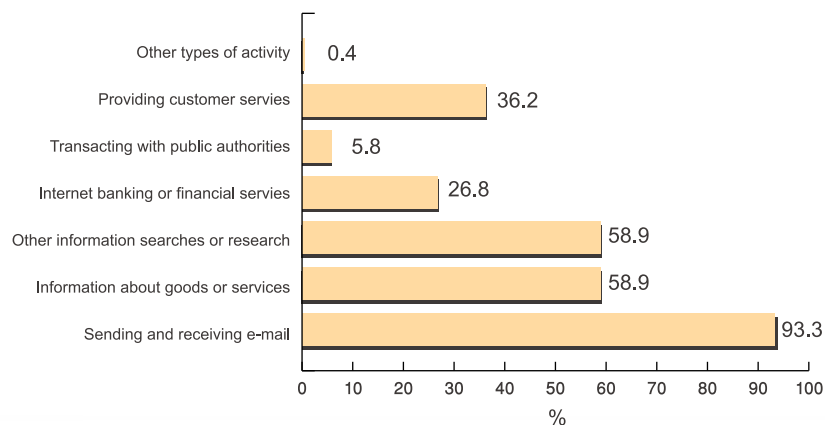
Internet is changing traditional behaviors …

Egyptian Enterprises using internet extensively for communicating

▫ 93.3% of Egyptian enterprises using internet for communicating with other enterprises.

▫ Sending and receiving e-mail is the most common purpose for using the internet among enterprises.

▫ On the other hand about 59% of the Egyptian enterprises use internet either to get information from public authorities or to get information on searches and research activities.

26.8% of enterprises using internet for financial transactions

▫ Around one fourth of the companies use the internet for accessing internet banking and other financial services 26.8%.

Figure (2) **Proportion of enterprises using internet by types of activities**

Other types of activity 0.4
Providing customer servies 36.2
Transacting with public authorities 5.8
Internet banking or financial servies 26.8
Other information searches or research 58.9
Information about goods or services 58.9
Sending and receiving e-mail 93.3

0 10 20 30 40 50 60 70 80 90 100
%

New opportunities are emerging for education

Figure (1) **Activites undertaken by individuals using internet in 2008**
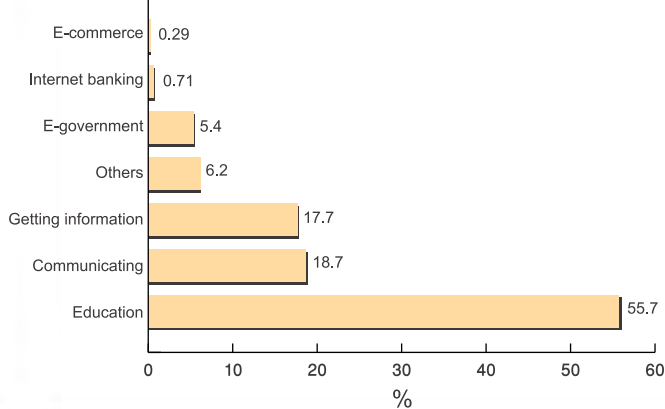
55.7% of Egyptian individuals using internet for educational purposes

- 55.7% of Egyptian individuals using internet for educational purposes.
- Communicating is the second dominant internet activity as 18.7% of individuals using internet for communicating purposes; these include sending and receiving mails, chatting and internet phone.

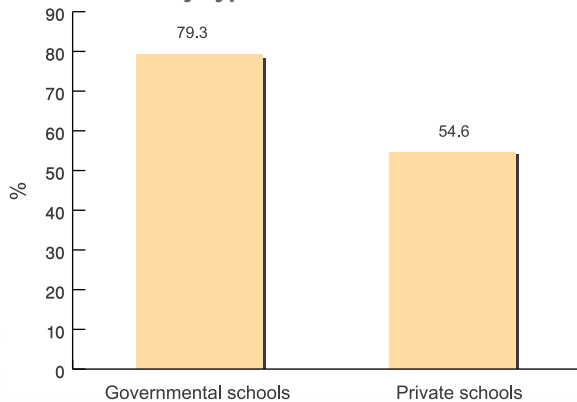*Figure (2)* **Proportion of school connected to the internet by type of education**

79.3% of Egyptian governmental schools connected to the internet

- 79.3% of Egyptian governmental schools connected to the internet.
- On the other hand around 54.6% of the private schools connected to the internet.

Government and citizen relationship …

Figure (3) **E-government activities undertaken by housaholds**
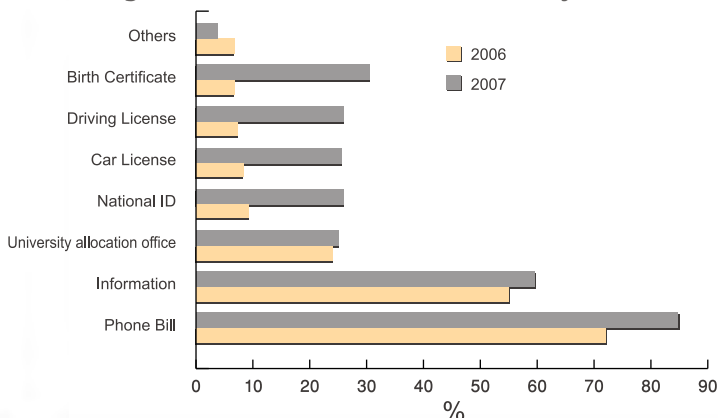
E-government has the potential to improve the relationship between citizens and government

- Most of the e-government users use it for checking and paying for their phone bills.
- E-Government activities witnessed a great improvement in the number of users who use it for licensing and extracting civil certificates (25% of the users).
- Further more, around half of them use E-Government for Information purposes.

Governmental entities offer a diversified scope of on line services

▫ The main service provided through government websites is publishing different types of information (70.9%), while almost half of the entities reply public inquiries through their websites (49.8%).
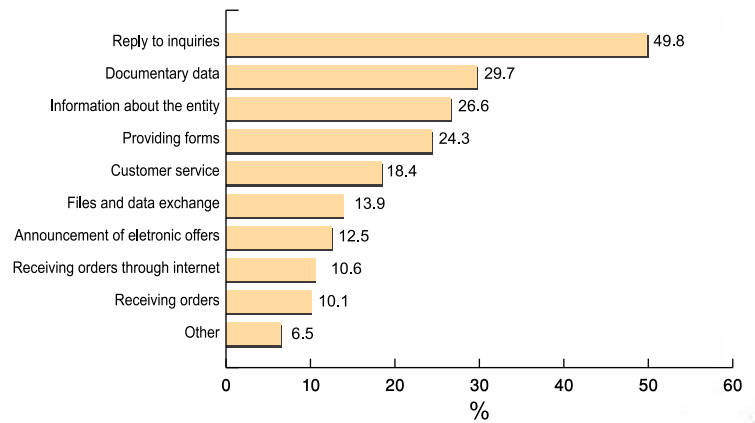
▫ Nearly one third (29.7%) publish documentary data and around one quarter publish information about the entity and provide forms to be filled by the public (25.5% and 24.3% respectively.

Figure (1) **Services provided through E-government websites**

Service	%
Reply to inquiries	49.8
Documentary data	29.7
Information about the entity	26.6
Providing forms	24.3
Customer service	18.4
Files and data exchange	13.9
Announcement of eletronic offers	12.5
Receiving orders through internet	10.6
Receiving orders	10.1
Other	6.5

But still usage could be increased among the elderly, women and low income people …

Figure (2) **Individual using internet by age group 2008**

Age group	%
16-24	39.57
25-54	29.93
55-64	2.85
65-74	0.42
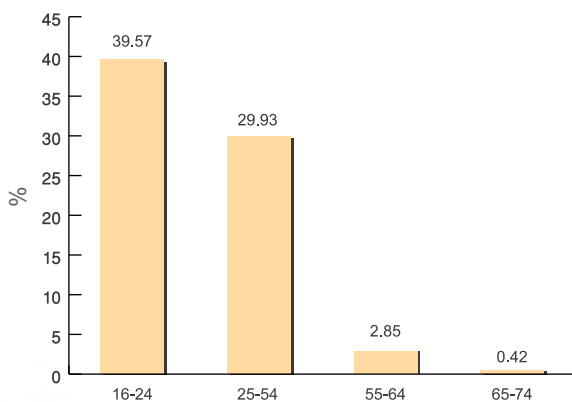
Elderly people account for about 3% only of the total internet users

▫ Elderly people are less likely to use internet than young people as their percentage didn't exceed 3% of the total number of individuals using the internet.

▫ On the other hand using the internet is highly concentrated in two groups: 16-24 and 25-54 year; as around 69.5% of individuals using the internet are in these two groups.

There is a gap in internet usage between males and females

▫ Males are more likely to use the internet than females.

▫ The percentage of males using the internet reached 61% while the percentage of females reached 39%

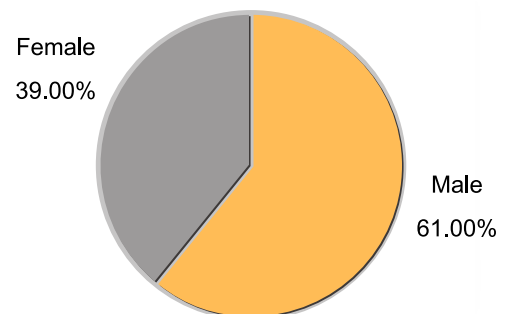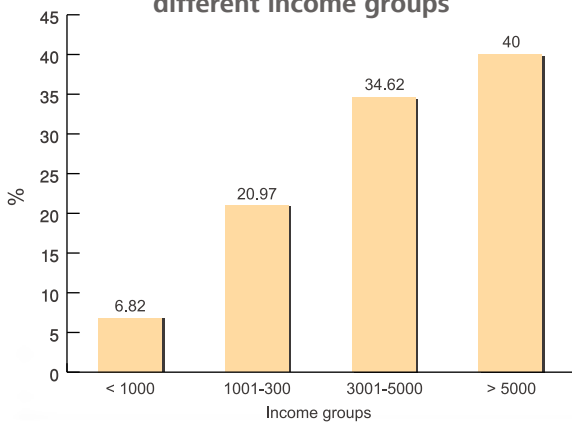*Figure (3)* **Internet users by gender in 2008**

Female 39.00%

Male 61.00%

Figure (1) Households using internet by different income groups

Only 6.8% of the lower income households use the internet

- Only 6.8% of the lower income households (income below 1000 EGP) use the internet.

- The gap in internet usage between the lower and higher income group reaches 33.2%.

More and more firms are connected

Economic Sectors with Highest Level of ICT Usage

- The manufacturing sector. (Around half the enterprises in this category)

- Hotels and restaurants.

- Financial intermediation.

- Other sectors include: agriculture, fishing, mining, trade, construction, electricity, transportation…etc.

Figure (2) Internet usage in different economic sectors in 2007

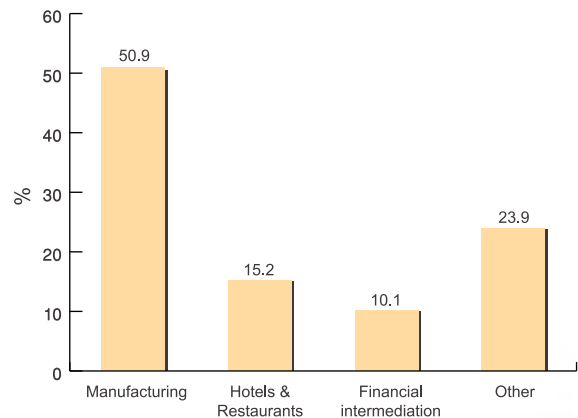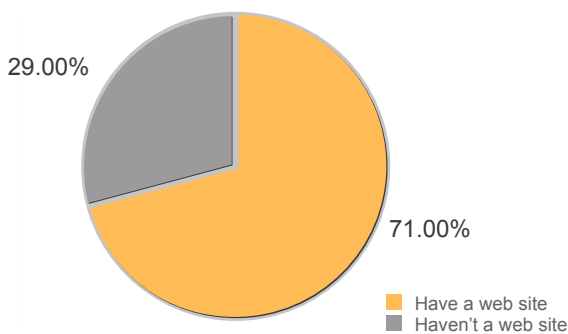**Figure (3) % of enterprises having websites**

29.00%

71.00%

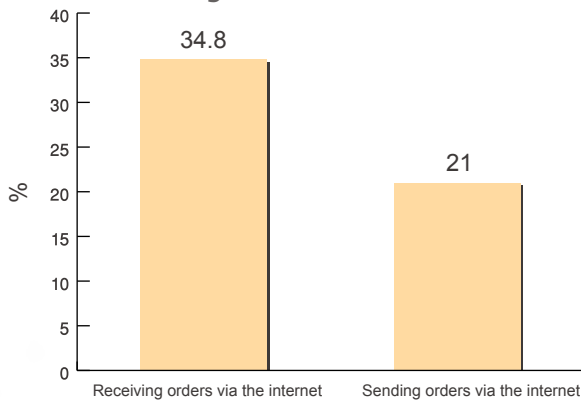- Have a web site
- Haven't a web site

71% of Egyptian enterprises having websites

- More than half of the enterprises using the internet have websites (71%), which they use as tools for facilitating their marketing and publicity activities.

And run their business over the internet

Figure (1) **Proportion of enterprises receiving and sending orders via the internet**

A growing number of enterprises having websites send and receive orders over the internet

- About one third of the enterprises having websites 34.8% receive orders via the internet, while those placing orders over the internet account for 21% of those having websites.

Private enterprises are gaining many benefits from e-commerce

- As for benefits of applying e-commerce as regarded by surveyed enterprises, most of them (94%) considered that applying e-commerce speeded up operations, while only around half of them (51%) believed it increased customers' accessibility.

- Other benefits like reducing transaction costs and increasing security came later with 31%

Figure (2) **Private Enterprises Benefits from Applying E- Commerce**
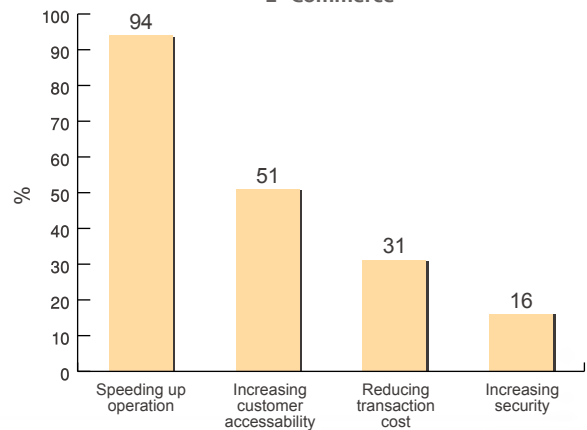
ICTs are a major driver of economic growth

Figure (3) **ICT Sector Contribution to Real GDP%**
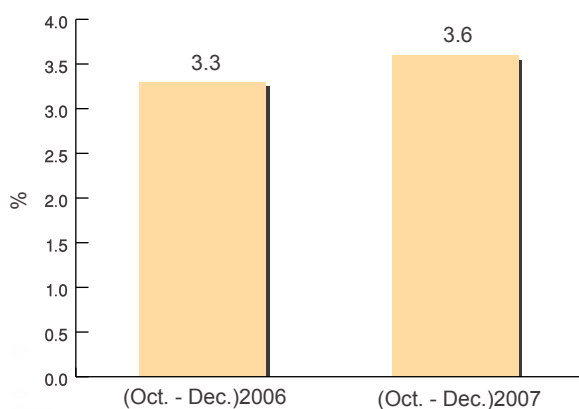
ICT is a major engine of economic growth in Egypt

- ICT sector contribution to real GDP increased to 3.6% in Q4 2006 compared to 3.3% in Q4 2007.

Figure (1) **Growth rates of some economic secors (Oct.-Dec.) 2007**

Sector	%
Hotels and restaurants	38.3
Financial intermediation	5.8
Trade	8.5
Suez Canal	19.2
ICT	15.5
Transportation and storage	8.1
Housing and construction	15.2
Gas	1.4
Oil	6.6
Agriculture, forestry and fishing	3.4

ICT is one of the fast growing sectors in Egypt

- ICT is one of the fast growing sectors in Egypt; The quarterly growth rate of ICT sector reached 15.5% in Q4 (Oct.-Dec.)2007.

ICT is a very dynamic and attractive sector

- ICT sector succeeded to attract many talented human resources working in many diversified fields.
- Number of ICT employees increased by the end of 2007 to reach 162.5 thousand compared to 147.8 thousand by the end of 2006 with an annual growth rate of 9%.
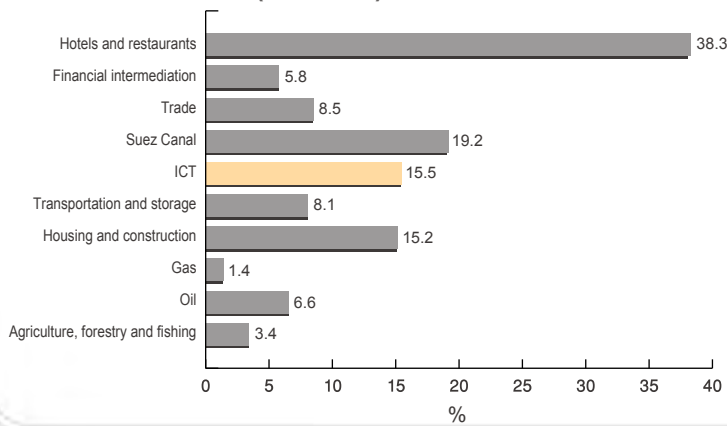
Figure (3) **No. of ICT employees**

Period	Thousands
Oct.-Dec. 2006	147.8
Jan.-Mar. 2007	159.5
Apr.-Jun. 2007	160.5
Jul.-Sep. 2007	161.5
Oct.-Dec. 2007	162.5
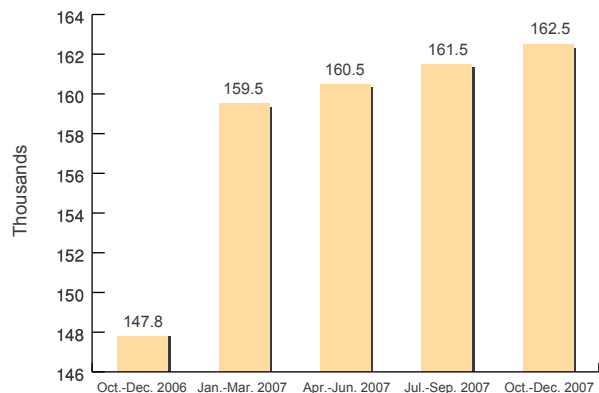
The internet is opening new market opportunities

Figure (3) **ICT exports**

Year	million US $
2005	250
2006	350
2007	450
2010+	1000
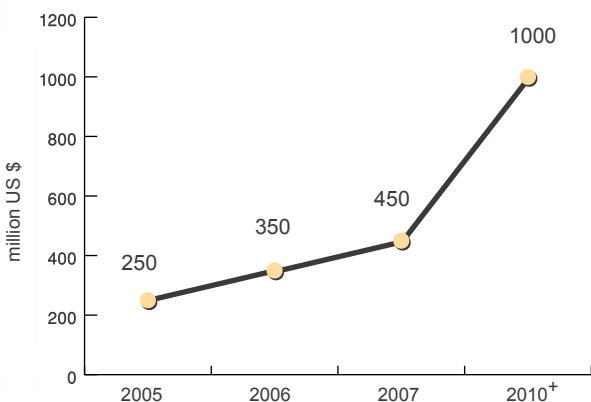
Egypt is planning to increase ICT exports to 1 Billion US$ BY 2010

- Exports of ICT sector witnessed an increase form 250 million US$ in 2005 to 450 million US$ in 2007.
- Egypt adopted many policies to increase the exports of ICT sector targeting to raise its level to 1 billion US$ in 2010.
- It is expected that the growth of E-commerce transactions will help Egypt to boost ICT exports to reach its targeted level in 2010.

But it is still important to remove barriers ...

Lake of awareness of the importance of E-commerce is major barrier to on-line trading

- The main reasons why users don't undertake e-commerce is mainly because they don't know how to use it (64%) or they found it of no need to them (30%) or the denial of E-contract (9.5%).

Figure (1) **Reasons for not undertaking E-commerce by households**
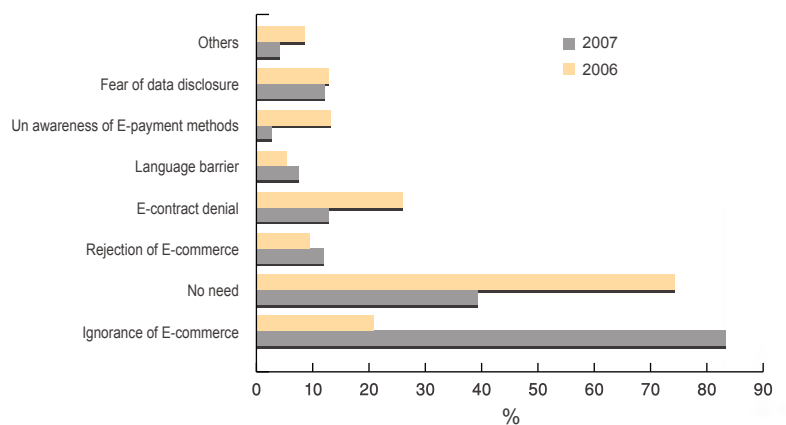
Protect privacy and improve security

Figure (2) **Proportion of enterprises using security measures**
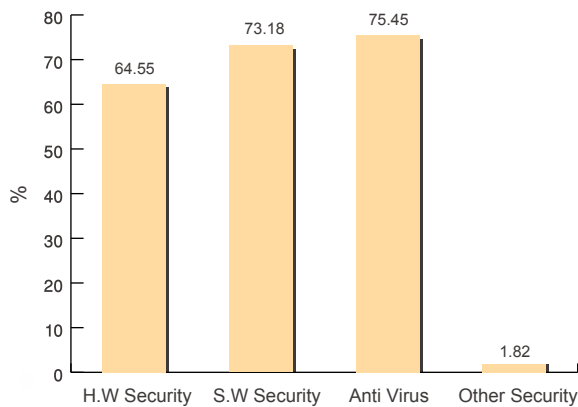
75% of the Egyptian enterprises having web sites have an anti virus security measure

- Despite that 75% of the Egyptian enterprises having web sites apply anti virus security measures; Egyptian enterprises still need to increase the level of the security and privacy measures

List of Technical terms*

Code	Description_English	Definition_English
i61	Population	
i271	Mobile cellular telephone subscribers (post-paid + prepaid)	Refers to the use of portable telephones subscribing to a public mobile telephone service and provides access to Public Switched Telephone Network (PSTN) using cellular technology. This can include analogue and digital cellular systems. This should also include subscribers to IMT-2000 (Third Generation, 3G). Subscribers to public mobile data services or radio paging services should not be included. If this service has a name, please indicate in a note, as well as the year the service commenced operation.
I911	Cellular subscribers per 100 inhabitants	i271/i61 *100
i4213tfb	Total fixed broadband Internet subscribers	Total fixed broadband Internet subscribers Total broadband Internet subscribers refers to a subscriber who pays for high-speed access to the public Internet (a TCP/IP connection), at speeds equal to, or greater than, 256 kbit/s, in one or both directions. If countries use a different definition of broadband, this should be indicated in a note. This total is measured irrespective of the method of payment. It excludes subscribers with access to data communications (including the Internet) via mobile cellular networks.
I992	Broadband subscribers per 100 inhabitants	Broadband subscribers divided by population and multiplied by 100.
I993	Internet subscribers per 100 inhabitants	Internet subscribers per 100 inhabitants
i4214	International Internet bandwidth (Mbit/s)	Total capacity of international Internet bandwidth in Mega Bits Per Second (Mbit/s). If capacity is asymmetric (i.e., more incoming than outgoing), the incoming capacity should be provided.
I994	International Internet bandwidth per inhabitant (bit/s)	International Internet bandwidth per inhabitant (bit/s)

* International Telecommunication Union (ITU).

Sources and Notes

Page 3

Figure (1) **Internet users and internet penetration**

Source: Telecom Egypt and National Telecom Regulatory Authority

Figure (2) **Internet subscribers by region March 2008**

Source: Telecom Egypt and National Telecom Regulatory Authority

Figure (3) **International internet bandwidth**

Source: National Telecom Regulatory Authority

Page 4

Figure (1) **Internet price basket**

Source: World Bank, "ICT at a glance", 2007

▫ (Price Basket for Internet Service is calculated based on the cheapest available tariff for accessing the Internet 20 hours a month (10 hours peak and 10 hours off-peak).

▫ The Basket does not include the telephone line rental but does include telephone usage charges if applicable. Data are compiled in the national currency and converted to U. S. Dollars using the annual average exchange rate. (International Telecommunications Union-ITU))

Figure (2) **Proportion of households using internet**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

▫ Calculated as a percentage of the total households included in the sample.

Figure (3) **No. of individuals using the internet by governorates**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics (CAPMAS), with a response rate 92%).

Page 5

Figure (1) **Enterprises using internet by firm size**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in 2007 on businesses in cooperation with Central Agency for Public Mobilization and Statistics. The total sample was 1821 enterprises. To ensure the efficiency of the sample, it was distributed at all governorates proportionally with the number of enterprises in each governorate, including all economic activities).

▫ Calculated as a percentage of the total (small, medium and large) enterprises using computer.

Figure (2) **Internet access modes (Households)**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

▫ Multiple answers were allowed.

▫ Calculated as a percentage of the total number of households using the internet.

Figure (3) **Internet Access modes (Entreprises)**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in 2007 businesses in cooperation with Central Agency for Public Mobilization and Statistics. The total sample was 1821 enterprises. To ensure the efficiency of the sample, it was distributed at all governorates proportionally with the number of enterprises in each governorate, including all economic activities).

▫ Calculated as a percentage of the total number of (small, medium and large) enterprises using the internet.

Page 6

Figure (1) **Internet access modes (Government)**

Source: Ministry of Communications and Information Technology

▫ Results of Survey conducted on all government & public enterprises sector organizations in cooperation with CAPMAS.

▫ Data collection was implemented on a total of 3,754 entities from which 1,386 entities enterprises are governmental (including 110 ministries, 1,116 governorates & directorates and 160 general agencies) and 2,368 public and public business sector enterprises. The framework was obtained from the governmental administrative structure.

▫ Calculated as a percentage of the total number of governmental entities using the internet.

Figure (2) **Mobile subscribers**

Source: National Telecom Regulatory Authority

Figure (3) **Internet subscribers by mode of access March 2008**

Source: National Telecom Regulatory Authority

Page 7

Figure (1) **ADSL subscribers**

Source: Telecom Egypt

Figure (2) **Proportion of enterprises using internet by types of activities**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in 2007 on businesses in cooperation with Central Agency for Public Mobilization and Statistics. The total sample was 1821 enterprises. To ensure the efficiency of the sample, it was distributed at all governorates proportionally with the number of enterprises in each governorate, including all economic activities).

▫ Multiple answers were allowed.

Page 8

Figure (1) **Activities undertaken by individual using internet**

Source: Ministry of Communications and Information Technology

▫ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

▫ As a percentage of the individual using the internet.

▫ Multiple answers were allowed.

Figure (2) **Proportion of schools connected to the internet and mode of access**

Source: Ministry of Communications and Information Technology.

▫ (Results of Survey conducted in 2006 on 35007 schools (30403 governmental and 4604 private) in cooperation with Central Agency for Public Mobilization and Statistics).

▫ % of governmental schools connected to the internet is calculated as follows: (No. of governmental schools connected to the internet (20944) / total number of governmental schools owning computer (26401)).

▫ % of private schools connected to the internet is calculated as follows: (No. of private schools connected to the internet (1017) / total number of private schools owning computer (1860)).

Figure (3) **E-government activities undertaken by households using internet**

Source: Ministry of Communications and Information Technology.

▫ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

▫ Calculated as a percentage of the total number of households using the internet.

▫ Multiple answers were allowed.

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Figure (1) **Services provided through governmental websites.**

Source: Ministry of Communications and Information Technology

◻ Results of Survey conducted on all government & public enterprises sector organizations in cooperation with CAPMAS.

◻ Data collection was implemented on a total of 3,754 enterprises from which 1,386 enterprises are governmental (including 110 ministries, 1,116 governorates & directorates and 160 general agencies) and 2,368 public and public business sector enterprises. The framework was obtained from the governmental administrative structure.

◻ Multiple answers were allowed.

Figure (2) **Individual using internet by age group**

Source: Ministry of Communications and Information Technology

◻ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

◻ As a percentage of the individuals using the internet.

Figure (3) **Internet users by gender in 2008**

Source: Ministry of Communications and Information Technology

◻ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

◻ As a percentage of the individuals using the internet.

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Figure (1) **Internet usage in different income groups.**

Source: Ministry of Communications and Information Technology

◻ (Results of Survey conducted in Jan. 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

◻ Calculated as a percentage of the total number of households using the internet.

Figure (2) **Internet usage in different economic sector in 2007**

Source: Ministry of Communications and Information Technology

◻ (Results of a survey involving 2,123 enterprises with a response rate of 85.8% (1,821 enterprises) covering 27 governorates, where 1,547 represent urban areas & 274 represent rural areas. The sample represents different economic sectors & enterprise sizes).

◻ Calculated as a percentage of the total enterprises using the internet.

Figure (3) **Proportion of enterprises having website**

Source: Ministry of Communications and Information Technology

◻ (Results of a survey involved 2,123 enterprises with a response rate of 85.8% (1,821 enterprises) covering 27 governorates, where 1,547 represent urban areas & 274 represent rural areas. The sample represents different economic sectors & enterprise sizes).

◻ Calculated as a percentage of the total enterprises using the internet.

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Figure (1) **Proportion of enterprises receiving orders via the internet**

Source: Ministry of Communications and Information Technology

◻ (Results of Survey conducted in 2007 on businesses in cooperation with Central Agency for Public Mobilization and Statistics. The total sample was 1821 enterprises. To ensure the efficiency of the sample, it was distributed at all governorates proportionally with the number of enterprises in each governorate, including all economic activities).

◻ Calculated as a percentage of the total enterprises having a website.

Figure (2) **Private enterprises benefits from applying E-commerce**

> *Source:* Ministry of Communications and Information Technology

> ◻ (Results of Survey conducted in 2007 on businesses in cooperation with Central Agency for Public Mobilization and Statistics. The total sample was 1821 enterprises. To ensure the efficiency of the sample, it was distributed at all governorates proportionally with the number of enterprises in each governorate, including all economic activities).

> ◻ Multiple answers are allowed.

Figure (3) **ICT contribution to the real GDP %**

> *Source:* Ministry of Economic Development

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Figure (1) **Growth rates of some economic sectors (Oct.-Dec) 2007**

> *Source:* Ministry of Economic Development

Figure (2) **No. of ICT employees**

> *Source:* Ministry of Communications and Information Technology and Ministry of Investment

Figure (3) **ICT exports**

> *Source:* Information Technology Industry Development Agency (ITIDA), Ministry of Communication and Information Technology

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Figure (1) **Reasons of not undertaken E-commerce activities (Households) in 2008**

> *Source:* Ministry of Economic Development

> ◻ (Results of Survey conducted in 2008 on 19289 households in cooperation with Central Agency for Public Mobilization and Statistics, with a response rate 92%).

> ◻ Multiple answers are allowed.

Figure (2) **Proportion of enterprises using security measures**

> *Source:* Ministry of Communications and Information Technology

> ◻ (Results of a survey involved 2,123 enterprises with a response rate of 85.8% (1,821 enterprises) covering 27 governorates, where 1,547 represent urban areas & 274 represent rural areas. The sample represents different economic sectors & enterprise sizes).

> ◻ Calculated as a percentage of the total enterprises having a website.

> ◻ SW Security: Security solution just provides obfuscation. SW layer supports a widely used Cryptographic APIs for developers to take advantage of the Software-only security solution just provides obfuscation. This is why software alone is not robust enough to withstand many common attacks. For any type of encryption, it is absolutely critical to protect the keys. But the plaintext keys can not be safely protected in memory or CPU registers so it is perhaps easily reachable by a simple software debugger.

> ◻ HW Security: HW based solution protects keys and other sensitive data from being exposed, to ensure a complete security for DM, DRM, M-Commerce HW-based security solution is very hard to be breakdown. If it is breakdown, the cost paid for relevant attack mechanism will be extremely high. The kind of high cost will significantly reduce or even eliminate the incentive to tamper with device. Therefore HW-based security solution provides the necessary security strength to enable new and pervasive wireless solutions for diversified mobile subscribers. Hence a robust HW-based security is what the end users need to protect their usages of security demanding wireless services.

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