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Challenges Facing ICT in Palestine

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Acronyms

ADSL	Asymmetric Digital Subscriber Line
EDGE	Enhanced Data rates for GSM Evolution
GDP	Gross Domestic Product
GOI	Government of Israel
GSM	Global System for Mobile Communications
ICT	Information and Communication Technology
IP	Internet Protocol
ISP	Internet Service Provider
JTC	Joint Technical Committee
MTIT	Ministry of Telecommunication and Information Technology
PalTel	Palestine Telecommunication Company
PalTrade	Palestine Trade Center
PITA	Palestinian Information Technology Association of Companies
PNA	Palestinian National Authority
SIM	Subscriber Identity Module
WBG	West Bank and Gaza
WiMAX	Worldwide Interoperability for Microwave Access
2G	Second Generation Wireless Technology
3G	Third Generation Wireless Technology

Contents

1. Introduction

Despite concurrence on specific components in the 1995 Oslo Interim Agreement addressing general telecommunication issues including the allocation of telecom frequencies, development pertaining to Area C and the import of equipment in the West Bank and Gaza (WBG), Telecommunication operators, Internet Service Providers, and ICT companies continue to have difficulty acquiring needed frequencies for existing and potential wireless networks, building telecom networks in Area C and importing needed equipment. New restrictions have been imposed by the Israelis, due to unclear restrictions and policies, including the refusal to release frequencies needed for the development of existing mobile networks and the development of new advanced wireless and mobile networks.

In addition, it is unclear what the exact requirements for acquiring frequencies are. The Joint Technical Committee (JTC) was created and managed by both Government of Israel (GOI) and the Palestinian National Authority (PNA) to address all Technical issues between both sides, Including Telecommunication issues in WBG; however, the committee has failed to meet since late 2000 - with the exception of two meetings between the years of 2005 and 2007. The main constraints that impede ICT firms' growth include, inter alia, restrictions on import of Telecommunication equipment, the unclear procedure and requirements for obtaining and acquiring network frequencies, as well as the inability to operate in Area C. These issues have been discussed in various local and international publications.[1] This paper will focus on identifying the challenges that ICT firms face due to the existence of such impediments.

To learn about the challenges that are facing ICT firms and operators, PalTrade team did desk research and conducted numerous personal interviews and a number of meetings with Palestine Information Technology Association of Companies (PITA), a number of ICT firms, and with PA government agencies such as the Ministry of Telecommunication and Information Technology (MTIT) and the Ministry of National Economy (MNE). Unfortunately, PalTrade team was unable to arrange appointments with GOI officials.

[1] Sample Publications: World Bank: West Bank and Gaza Telecommunications Sector Note, Introducing Competition in the Palestinian Telecommunications Sector, January 2008.

PITA:The Palestinian ICT Sector.A Three-Year Outlook.Based on Economic Indicators, May 2009.

2. Background

The ICT sector in the WBG started in the early 1980's mainly with IT hardware retailers and other basic services. Towards the late 1980's early 1990's, ICT firms were able to provide basic software solutions such as basic accounting programs to local private sector firms, hospitals etc. However, in the early 1990's an increasing demand occurred with the emerging development of the social, private and public sectors in Palestine due to the signing of the Oslo Agreement and the inception of the PNA. Since its inception, the PNA has been one of the major contributors to the growth of the ICT sector in Palestine, demanding basic software solutions and hardware equipments to its various departments and organizations. On the other hand, the ICT sector growth was affected by: the privatization of the telecommunication sector in 1997 that lead to the creation of Palestine Telecommunication Company (PalTel), the emergence of the first mobile operator in 1999, and the most recent emergence of the second mobile operator. Currently, (4.9%) of the GDP in Palestine is attributed to the ICT sector compared to (3%) in 1999.[2]

When compared to other countries, the given contribution could be a good indicator, yet it also shows that the sector has not reached its full potential. In Jordan, the ICT sector contribution to GDP reached about 14% in 2009 compared to 10% in 2005. Sector revenues have been growing continuously reaching a value of US$ 882 million in 2007 in comparison to the value of US$ 440 in 2004. Exports have also grown continuously since 2004 with an estimated US$ 79 million reaching US$ 196 million in 2007. The opening of the sector and the incentives provided by the government have attracted new Foreign Direct Investments (FDI) reaching a total of about US$ 110 million in cumulative investment for the period 2003-2008. [3]

[2] The Palestinian ICT Cluster Report, Palestinian Enterprise Development Project-A USAID Project, 2006.
[3] Information Technology Association of Jordan, http://www.intaj.net/node/62.

3. Challenges

In an emerging country with a promising economy like Palestine, broadband internet connectivity is becoming an imperative step towards the development of the ICT sector. Mobile and wireless internet technology is currently available in WBG. 85% of the population own mobile phones, and internet penetration per capita in Palestine is at 7%, which is comparable to that of countries such as Egypt, Syria, Algeria and Tunisia.[4] Most recently, Jawwal started to offer internet and data service through its network, however, the system still relies on GSM[5] and EDGE[6] technology that is known for low internet speed in comparison to the more recent 3G[7] technology. It is crucial to provide wireless broadband at cost effective rates to consumers while taking into consideration the Palestinian socio-economic conditions. Competitive internet connectivity will drive the prices down to become more affordable, and providers will be forced to provide better quality of service. However the development of this sector is dependent on coordination between the Palestinian and the Israeli sides, as per the Oslo Agreement[8]. Meanwhile, the following challenges are still at hand:

3.1 Legal Challenges

The legal framework regulating telecommunication in WBG is outlined in the Telecommunications Law 3/1996 and by regulatory provisions under the Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip "Oslo Agreement"[9,] where a joint committee of technical experts addresses any arising issues. The JTC represents both the Palestinian and Israeli sides, and is supposed to meet on a regular

[4] West Bank and Gaza Telecommunications Sector Note, Introducing Competition in the Palestinian Telecommunications Sector, January 2008.

[5]GSM (Global System for Mobile Communications: Second Generation) is the most popular standard for mobile telephony systems in the world. http://en.wikipedia.org/wiki/GSM.

[6] Enhanced Data rates for GSM Evolution (EDGE) (also known as Enhanced GPRS (EGPRS), or IMT Single Carrier (IMT-SC), or Enhanced Data rates for Global Evolution) is a backward-compatible digital mobile phone technology that allows improved data transmission rates. http://en.wikipedia.org/wiki/EDGE.

[7] 3rd Generation wireless format. This high-efficiency data and voice format follows 1G (analog service) and 2G (digital service). http://www.ipwireless.com/glossary.

[8] Oslo Agreement, Annex III, Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs" and "The Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip ("Oslo 2"— 9/28/95), Annex III, art 36).

[9] Oslo Agreement, Annex III, Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs" and "The Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip ("Oslo 2"— 9/28/95), Annex III, art 36).

basis to solve relevant problems, and meet as needed when there are more pressing issues to address. The JTC is also responsible for allocating frequencies for the PNA, as per Annex III, article 36 C.2 of the Oslo Agreement ("Oslo 2"— 9/28/95) which states that "….the Palestinian side shall present its requirements through the JTC which must fulfill these requirements within a period not exceeding one month. Frequencies or sections of frequencies shall be assigned, or an alternative thereto providing the required service within the same band, or the best alternative thereto acceptable by the Palestinian side, and agreed upon by Israel in the JTC."

Unfortunately, since 2000 the JTC has not been able to meet regularly. The committee met only twice between the years 2000 and 2007, whereas it used to meet regularly prior to 2000. This has resulted in many pending issues which would benefit from a joint meeting including the process for releasing frequencies to allow the new mobile company (Wataniya) into the market, which has only recently been finalized after a delay of two and half years. Other issues are still pending such as the presence of Israeli mobile operators illegally serving Palestinian customers in the West Bank, and the establishment of long-distance communications and infrastructure developments in Area C. Following the Oslo interim agreement, Israel withdrew its military rule from some parts of the West Bank, which was divided into three administrative divisions of the Oslo Accords: Area A, B and C. Some 60% of the West Bank ("Area C") is under Israeli military law and Civil Administration control, and the PNA has de facto no control over Israeli acts within this part of the Palestinian Territory, which is creating growth impediments on the ground for the ICT sector.

Any Telecommunication development pertaining to Area C is outlined in Annex III art. 36 A 2.a. of the Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip ("Oslo 2"— 9/28/95). "In Area C, any digging or building regarding telecommunications and any installation of telecommunication equipment, will be subject to prior confirmation of the Israeli side, through the CAC".[10] This article clearly states that any telecommunication development in Areas C must be approved by the GOI. In addition, Israeli mobile operators are permitted to provide service to the West Bank settlements in accordance to the Oslo agreement ("Oslo 2" - ANNEX III, Art. 36), "…the supply of telecommunications services in Area C to the settlements and military locations, and the activities regarding the supply of such services, shall be under the powers and responsibilities of the Israeli side." Settlements are spread out over the WB and *usually* located on hills and mountains, therefore, taking their geographic distribution

[10] Oslo Agreement, Annex III, Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs" and "The Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip ("Oslo 2"— 9/28/95), Annex III, art 36).

into consideration; Israeli mobile operators' service reaches the majority of the WB including highly populated cities.[11]

3.2 Landline bandwidth Challenges.

Internet penetration per capita in the PNA exceeds that of post-conflict countries such as Iraq and Afghanistan. WBG internet penetration rate is at 7% which is comparable to that of countries such as Egypt, Syria, Algeria and Tunisia.[12] Consequently, with a potential to reach higher levels, WBG internet penetration could reach leading regional benchmarks of Morocco and Turkey, where there is currently 15 percent penetration. The number of ADSL subscribers has increased from 7,483 in 2005 to 72,518 within three years at an average increase of about (300%) annually. At present, according to PalTel commercial department there is 102,000 DSL subscribers in the WBG. As such, the WBG is still considered an emerging market when it comes to internet broadband access and services. However, the following hinders the broadband potential:

A. At present, there is only one service provider that mainly goes through copper wire based connections, and faces hardly any competition.

B. Broadband availability, over wire line, wireless and fixed or mobile networks. The MTIT granted several ISP licenses to local Palestine ICT companies to provide internet locally either by procuring the needed broadband bandwidth directly from Israel or through an international supplier. [13] A Licensed ISP could procure as much broadband bandwidth as their business demands. However, PalTel, the solely fixed landline operator, provides broadband (ADSL) services only to about 102,000 retail customers. [14] PalTel permits ISPs to resell this service to their own customers. ISPs do not have their own infrastructure or facilities, and they therefore are seeking other mediums to offer internet services such as WiMAX and 3G. Nevertheless, they cannot offer such services due to the GOI refusal to release the needed frequencies for WiMAX and 3G.

Local experts indicated that the lack of investment in the existing local land broadband infrastructure run by PalTel is hindering Palestinians from accessing adequate bandwidth. Experts consider the cost of infrastructure development, compared with the expected depleted profits, as the major factor hindering PalTel form implementing such

[11] Oslo Agreement, Annex III, Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs" and "The Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip ("Oslo 2"— 9/28/95), Annex III, art 36).

[12] West Bank and Gaza Telecommunications Sector Note, Introducing Competition in the Palestinian Telecommunications Sector, January 2008.

[13] Regardless of the supplier the bandwidth must pass through the Israeli Gateway.

[14] PalTel Comercial Department

development. On the contrary, PalTel states that the existing infrastructure is adequate; however, new investment on infrastructure is usually delayed and hindered by the GOI restriction on Area C coupled with the delay and confiscation of imported equipment.[15]

In sum, not allowing Palestinian telecommunications firms to smoothly import equipment and build necessary infrastructure in all areas of the WBG will limit any growth potential. Many experts indicate that internet availability with proper bandwidth and price would encourage more subscription considering the young demographic nature of the WBG.

3.3 Wireless Technology Challenges.

3G, Third Generation Mobile Network Challenges:

At present, local mobile operators rely on 2G technology that is known for its low internet speed in comparison to the more recent 3G[16] technology. 3G, the 3rd Generation wireless format, is a generation of standards for mobile phones and mobile telecommunications services with a high-efficiency data and voice format follows 1G (analog service) and 2G (digital service, currently used by Jawwal and Watanya). The Israeli mobile operator Orange introduced 3G to the area in 2005. 3G technology offers a major enhancement over previous wireless technology by providing:

- High-speed internet transmission and advanced multimedia access compared to the current low internet speed of the 2G network;
- Cost effective internet rates in comparison to current internet rates; and
- Means to connect the phone to the internet in order to make voice and video calls, to download and upload data and to surf the internet.[17]

The advantage of 3G network over the existing 2G network is the ability to provide mobile users a fast access to all type of data through wireless broadband access. Consequently, expanding the utility of mobile devices; leading for a new market opportunity for mobile software development.

However, local mobile operators need additional spectrum in the existing 2.1GHz spectrum ranges so that they can launch 3G and mobile internet services. The GOI refusal to release additional spectrum to local mobile operators, combined with the current restriction on imports of equipment lead to a major loss of market share to Israeli

[15] PalTel Group Engineering Department.

[16]. http://www.ipwireless.com/glossary

[17] http://voip.about.com/od/mobilevoip/p/3G.htm

operators of 3G networks. Telecom Palestinian experts indicate that the GOIs refusal to release additional frequencies is driven by economical reasons, given that most Israeli operators use 3G and it serves a large part of the WB. The WB market represents a new market opportunity for Israeli operators where the usage of 3G technology to access the internet could be more reliable and cost effective to Palestinians both in densely populated areas and in Area C. Currently, Palestinians can buy an Israeli operator prepaid 3G internet USB SIM card for computers or an ordinary 3G SIM that allows internet access in Area C and most of the WB without the need for any obligations or contracts. Experts indicate that the price is a major factor attracting Palestinians to Israeli mobile service. Hadara, a subsidiary of PalTel group offers a maximum home internet speed of 2 Mega at a rate of NIS 170,[18] while the Israeli mobile operators Cellcom offers maximum internet speed of 7.2 Mega using 3G technology at a rate of NIS 110.[19] In the same manner, the other Israeli mobile operator Orange offers a maximum internet speed of 10 Mega using 3G technology at a rate of NIS 150.[20]

WiMAX, Challenges:

The existence of a sole medium internet service in the WBG through fixed line by one-company forces licensed ISPs to search for alternative broadband mediums to reach their customers. Wireless broadband technology represented a simpler alternative due to the ease in deployment, wide area coverage and cost effectiveness. Wi-Fi[21] was the first wireless technology to be implemented by local ISPs. Wi-Fi operates on public frequency, which requires no frequency license, and therefore, local ISPs face minimum problems in deployment. However, Wi-Fi network users could face varying levels of broadband width that lead to a weak signal, as well as lot of distortion thus reducing the quality of service, especially in the densily populated areas.

In parallel, other ISPs attempted to introduce another wireless technology known as WiMAX, which is a fairly new technology that provides high-speed wireless internet and

[18]Hadara Technologies officail website: http://www.hadara.ps/index1.php?page=boxs&pid=1&parentId=0&lang=1&sectionid=1

[19] Cellcom officail website: http://arab.cellcom.co.il/article/pages/article.aspx?ID=c90cb5fb-ac01-4bc1-8f86-fe43da626c8e

[20] Orange officail website: http://www.orange.co.il/heil/internet_and_phone/packages_and_deals1/ispdeals/mini-pc1/

[21] WiFi "is the name of a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections."

data network access over a wide area.[22] WiMAX is considered the next-generation of wireless technology designed to enable pervasive, high-speed mobile Internet access to the widest array of devices including notebook PCs, handsets, smartphones, and consumer electronics. WiMAX delivers low-cost internet, open networks and is the first internet protocol (IP) mobile Internet solution enabling efficient and scalable networks for data, video, and voice.[23] Additionally, given the relatively low cost to deploy a WiMAX network (in comparison to GSM, DSL or Fiber-Optic); it is possible to provide broadband in places where previously it may have not been economically viable.[24] It could be concluded that the availability of such a service in the WBG could enable more people and businesses to access the internet at lower rates, while enjoying better coverage and service. Moreover, WiMAX provides fast access to all type of data, as well as internet access, and therefore expands the utility of mobile devices, which would lead to a new market opportunity for mobile software firms to develop new applications.

Opposite to Wi-Fi, WiMAX requires a licensed frequency; nevertheless, the GOI refuses to release the needed WiMAX frequency. Many Palestinian ICT experts indicate that the GOI's refusal is due to their claim that WiMAX frequencies are currently used by the military; therefore releasing such frequencies would pose a security threat. Many of these experts also emphasized that no WiMAX licenses have been granted in Israel yet.

On the other hand, a local Palestine ISP was able to implement a WiMAX pilot project in the WB. The project was implemented in three cities and currently serves a minimum number of pilot customers. The ISP Company indicates that currently they operate on a pilot license and their inability to acquire the official release of frequencies hinders them from developing their pilot network into the implementation stage.

3.4 Mobile Operators challenges.

Currently there are two mobile operators in the WBG, the Palestine Cellular Communications Company, Ltd, known as Jawwal, and the Wataniya Telecommunication. Jawwal has launched its operation in 1999 as part of PalTel and operates on the 2G technology. Jawwal's estimated lost revenue of US$ 382.7[25] million between 2002 and 2009 due to the GOI delay in releasing additional 2G spectrums, delay and confiscation of equipment, and the GOI restrictions to operate in Area C. One recent

[22] "WiMAX: Broadband Wireless Access". wi-fiplanet.com. http://www.wi-fiplanet.com/tutorials/article.php/3412391. Retrieved 2010-05-17.

[23] http://www.intel.com/technology/wimax/

[24] *"WiMAX: Broadband Wireless Access". wi-fiplanet.com. http://www.wi-fiplanet.com/tutorials/article.php/3412391. Retrieved 2010-05-17.*

[25] *Jawwal Financial Department*

example of equipment confiscation was the holding of six telecommunication switches for Jawwal upon arrival at the port by the Israeli Authorities in 2005. Jawwal estimates the equipment value at US$ 1 million and an estimated US$ 315 thousands were paid in storage fees until today.[26]

On the other hand, Jawwal subscription rate increased rapidly in the last 5 years, reaching 2 million[27] subscribers in 2010 in comparison to 570 thousand[28] in 2005. It could be estimated that if Jawwal had the opportunity to provide 3G services to its subscribers since 2005 (Orange Israel offered 3G in 2005) Jawwal would have been able to avoid a lost revenue of almost US$ 67 million, of which US$ 14 million would have been paid to the PA for taxation and share revenue.[29] ***(Jawwal lost of revenue calculations were prepared by PalTrade team based on various actual and estimated data. The data shall not be considered or interoperated as actual Jawwal financial position. See Annex 1: Financial Calculation of Estimated Lost Revenue.***

In September 2006, Wataniya Telecommunication won a license bid for launching a second mobile service operator in Palestine. The bid included the ability to offer both 2G and 3G services to its subscribers. However, due to the unfortunate delay of a period of two and half years by the GOI in providing the required frequencies to start the operations, Wataniya Telecom was forced to delay the start of its operation until late 2009. Despite the recent release of the 2G frequencies, Wataniya Telecom still awaits the release of the 3G frequencies.

However, both operators are affected mainly with identical obstacles concerning frequencies:

- The refusal of the GOI to release additional frequencies on the existing 2G network forced mobile operators to invest additional capital on equipment to strengthen their signal to reach wider subscribers.

- The refusal of the GOI to release frequencies concerning 3G-advance network. At present, Wataniya Telecom holds a 3G license provided by the PNA, nevertheless, the frequencies needed for the operation are still not released.

- The refusal of the GOI to allow mobile operators to establish mobile stations in Area C have lead to a major loss of market opportunity.

[26] Jawwal Financial Department.

[27] Jawwal Website, www.jawwal.ps

[28] PalTel Group Annual Report, 2008.

[29] Annex 1: Financial Calculation of Estimated Lost Revenue

Local mobile operators fear that their inability to provide advanced mobile technology that allows a reliable cost effective service to their customers aids Israeli mobile operators to realize the business opportunity associated with the weakness of Palestinian mobile operators. The following are some of the factors behind Israeli operator's ability and desire to access the Palestine market:

- Settlements are spread out over the WB and usually located on hills and mountains, therefore, taking their geographic distribution into consideration; Israeli mobile operators' service reaches the majority of the WB including highly populated cities.

- Locals demand advanced Israeli mobile internet services due to their competitive price as well as their mobility. Israeli operators offer a prepaid 3G SIM card units that could be attached to any mobile, USB, computer or router. Prepaid payment cards, as well as USB units are sold illegally within WB border villages and cites.

Many experts have emphasized that Israeli operators invested enormous capital in providing 3G in the West Bank to serve settlers. On the contrary, settlers demand for advanced technology and wireless data access is minimum compared to the demand within Israel. Therefore, Israeli mobile operators' awareness of the substantial market opportunity in Palestinian cities that are close to settlements have lead them to make substantial investments in infrastructure.

3.5 Software Development Challenges.

According to PITA, there are around 20 large general software development firms that develop software and exports regionally and internationally. As for mobile software development, the industry is considered very small; few companies provide such services mainly to regional markets. Taking the current use of remote communication capabilities and advanced technology usage, Palestinian software firms were able to reach regional markets such as Jordan, Iraq, UAE, Saudi Arabia and Kuwait. The growth of software development business could be visualized through the increased number of ICT exports estimated at US$ 3 million in 2001 to an estimate of US$ 15 million in 2008.[30]

However, software-developing firms fear that the development of this sector could be substantially hindered by the following factors:

[30] PITA estimates based on DATA from their member companies that export in 2008.

- The inability to access advanced wireless broadband technology such as 3G and WiMAX could limit their ability to compete both locally and internationally. Taking the current increase of 3G networks regionally, local firms lose the competitive edge in producing 3G based applications and software. To illustrate, a local ICT firm developed a special sales and inventory tracking mobile software to operate on a mobile handheld device for a local distribution firm. When the device was tested on the existing 2G network, the device failed to continuously update the main office with just on time update on new sales and inventory changes. As a result, there were limitations in data transfer, coverage in Area C as well as in other areas in West Bank. The firm considers an additional investment in new device that could function while using the current 2G network.

- The lack of advanced networks hinders local firms' ability to perform commercial deployment application tests. Therefore, firms are faced with additional cost by performing such tests in neighboring countries.

- The absence of advanced wireless broadband networks such as WiMAX and 3G which provides fast access to all type of data as well as to the internet. Availability of advanced wireless broadband expands the utility of mobile devices and in turn opens new market opportunity for mobile software firms by developing new applications.

- The absence of advanced broadband technology will affect the availability of local skills that are specialized with such technologies.

- The inability to access advanced mobile technologies, which allow mobile access to software solutions, will hinder firms from producing advanced applications in addition to the extra costs incurred due to further software development needed to adapt to current unreliable data mobile technology. For instance, a local accounting program company programmed a new online accounting system to operate for local customers. During implementation, the company was surprised that the program is not functioning well due to the low existing bandwidth on the landline infrastructure. The company had to reinvest and redesign its program to operate on the existing low internet bandwidth.

With an increasing number of internet users in the WBG expecting to reach 100,000 retail subscriber, new internet based applications software development opportunities are emerging including E-Government, E-Banking and E-Learning. At present, the PNA is initiating an E-Government system through MTIT. The aim of the project is to create a comfortable, transparent, and cost effective interaction between government and citizens, government and business and inter government's agencies. E-Government initiative

would provide a continuous software development opportunity to local firms; however, local firms are skeptical concerning the implementation of the E-Government due to the slow implementation process. In the same manner, few banks implemented an E-Banking system allowing local customers to perform traditional banking products and services through electronic channels without visiting an actual bank, thus far, current systems are limited to few basic applications and lacks major applications such as E-Payment, that allow local customers to pay bills and purchase local products electronically. Banks censure such a limitation to the unavailability of a Palestinian E-Payment gateway as well as the lack of proper security measures on the existing landline infrastructure.

On the other hand, with an increasing number of Palestinian students reaching up to 1.4 Million students in 2010[31,] coupled with the increasing internet penetration rate, the demand for an E-Learning system allowing students to interact with teachers and other educational sources electronically through a web based application is imminent. Online educational applications allow just-in-time access to information at anytime and anywhere, hence, advancing the educational process as well as creating a business opportunity for local software development firms.

Some experts believe that the development of web-based applications could be mainly hindered by the availability of proper broadband bandwidth that accommodate such systems and allow proper interaction. Yet, other local experts indicated that broadband bandwidth issue is not a major obstacle hindering the development of web-based applications.

4. Recommendations

- Palestinian and Israeli officials should work on activating the Joint Technical Committee and encouraging a permanent regular meeting schedule to address many of the issues that were raised in this paper and in previous ones.
- Palestinian and Israeli officials should either work on the activation of Oslo agreement articles regarding the request to release needed frequencies or review the agreement as a whole.

[31] Sources: Ministry of Education, Statistics about Palestinian General Education, 2007/08; PCBS, Education Statistics; PCBS.
Press Release on International Literacy Day, 8 Sept. 2006.

- GOI should adopt and implement clear and transparent policy with regard to releasing frequencies, imports of equipment through Israeli port, and infrastructure development in Area C.
- The PNA should establish a Telecommunication Regulator to manage the sector regulatory issues such as local competition and illegal Israeli Competition.

Annex 1: Financial Calculation of Estimated Lost Revenue.

(Jawwal lost of revenue calculations were prepared by PalTrade team based on various actual and estimated data. The data shall not be considered or interoperated as actual Jawwal financial position).

	2005	2006	2007	2008	2009	
Jawwal Total Customers *	*570,000*	*830,000*	*1,020,000*	*1,310,000*	*1,800,000*	
Est. 3G Subs / Total Subs **	*2%*	*7%*	*18%*	*28%*	*33%*	
Est. 3G Subs	*13,148*	*55,162*	*182,416*	*365,180*	*596,340*	
Est. Jawwal 3G Average Rate Per User (ARPU) ***	*173*	*62*	*33*	*24*	*16*	**5 Years Total**
Jawwal Est. 3G Total Lost Revenue *****	***13,685,444***	***25,369,436***	***46,955,261***	***77,417,211***	***93,334,357***	***256,761,709***
VAT 14.5%	*1,984,389*	*3,678,568*	*6,808,513*	*11,225,496*	*13,533,482*	***37,230,448***
PNA Revenue Share 7%	*957,981*	*1,775,861*	*3,286,868*	*5,419,205*	*6,533,405*	***17,973,320***
Estimate of Income Tax	*Exempt*	*Exempt*	*Exempt*	*Exempt*	*Exempt*	**-**
Total Payments to PNA	***2,942,370***	***5,454,429***	***10,095,381***	***16,644,700***	***20,066,887***	***55,203,767***

Currency: In New Israeli Shekel (NIS)

*** Source: Jawwal's Annual Report,** *Jawwal Annual report:* http://paltel.ps/site_files/files/en%20AR2006.pdf

**** Avg. of Israeli Cellular operators, Orange and Cellcom, starting from their first full year of W-CDMA (3G) operations 2005. Based on the assumption that Jawwal's 3G subs growth trend would have been similar if Jawwal was allowed to operate 3G**
Source : Orange annual report: http://www.orange.co.il/en/Investors-Relations/lobby/financial-information/financial-report/
Source : Cellcom annual report: http://investors.ircellcom.co.il/sec.cfm?DocType=Annual&Year

***** The percentage of Jawwal's blended ARPU to Orange's blended ARPU multiplied by (84% of Orange's Data and content ARPU)**

Orange annual report: http://www.orange.co.il/en/Investors-Relations/lobby/financial-information/financial-report/
Jawwal Annual report: http://paltel.ps/site_files/files/en%20AR2006.pdf

****** Estimated 3G ARPU multiplied by (Estimated 3G Subs + Previous Year Estimated 3G Subs) divided by 24**