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M-Government adoption and diffusion: A case study of sultanate of Oman

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Abstract
This paper reviews mobile government (m-Government or m-Gov.) adoption and diffusion factors in one of the developing countries which is Sultanate of Oman. M-Gov. is viewed as a new class of e-Government or e-Gov. applications and it refer to any transaction via mobile technologies, such as laptops, smart phones or personal digital assistants (PDAs) with the most significant features of mobility and portability. The mobile technologies ubiquitous dimension provides means of accessing services anywhere, anytime and on the move. Thus, advanced wireless interface technologies especially in Information and Communication Technologies (ICT). The paper examines previous literatures and illustrate different obstacles faces the adoption and diffusion of m-Gov. Furthermore, drawing the distinction between technical and non-technical barriers. Then ICT sector and the current available m-Gov. initiatives in Oman setting up the mobile different services and aimed to understand the key factors to adoption and diffusion of these services through SWOT analysis and TOWS matrix.

Keywords: ICT, EGDI, IDI, e-Gov., m-Gov., KI, II, KBE, EIR, KEI, SWOT, TOWS

1. Introduction

Every government is seeking to provide the best services to its country to achieve efficiency and accepted performance. This goal could be achieved by improving the service performance of the entire sectors in society. Billions of dollars was invested by governments in order to undertake their first step towards implementing the e-Gov. project and specially implementing the best methodology of all attached and correlated electronic-based services to it like: e-payment, website, e-system, e-application…etc. Hence, they will permit new channels of interaction and communication between different government sectors and between government and business organizations. This interaction will lead to improvement in government performance and efficiency while interacting with citizens which will enhance government-citizens relationship.

Nowadays, mobile phones are no longer used for voice communication only especially after introducing the smart phones but are a convenient and very powerful way of connecting to the Internet and are used for other services like transferring data, exchanging e-mails, and doing different small scale business transactions (Sadeh, 2002). Mobile phone penetration in general is well used and with higher rate than home PCs usage in different countries and it seems that the trend will continue to get higher (Varshney, 2000). These mobile or wireless devices are widely used worldwide not only by developed countries but also commonly used by many other developing nations like Oman. Mobiles technologies with the introduction of internet and specifically ICT enabled mobile phones, PDA's, WiFi and wireless networks to offer their users enjoyment of all the benefits of telephones, information accessing, text messaging.

This paper would review the development methodologies used in m-Gov. construction in Sultanate of Oman which is showing tremendous developments in all sectors in e-Gov. generally and m-Gov. specifically. This review through the identification of the major issues and aspects in implementing its initiatives in Oman. Moreover, some major challenges in such performance would be better identified and strategically considered using important methodologies like SWOT analysis and checked using TOWS matrix. Therefrom, available challenges with faced criteria along with best opportunities to be captured would be listed with related suggestions and recommendations.

1.1 E-Gov. and m-Gov. relationship

E-Gov. is defined variously, and the vast majority of definitions focus on the role of ICT in facilitating the public services delivery to government, companies and citizens (Choudrie *et al*., 2004; OCED, 2003). However, Bassara *et al*. (2005) define m-Gov. as "*the use of all kinds of wireless and mobile technologies, applications and devices for improving services delivery to the parties involved in e-Gov. including citizens, businesses and all government units*" (Al-Hadidi and Rezgui, 2014, p 93).

From the above, it was established that in general m-Gov. is considered as a complimentary sub-set of e-Gov. (Kushchu and Kuscu, 2003). Furthermore, most researchers believe that e-Gov. is counted as the cornerstone for m-Gov. (Goldstuck, 2003; Scholl, 2005). Therefore, the differences between these two deliveries of public services relate to the access and delivery means (Kushchu and Kuscu, 2003). E-Gov. provides different services through wired networks and PCs with interactive web applications. However, after the development of mobile PCs with different devices and accessories attached to it, e-Gov. is not becoming sufficient and enough. The value of m-Gov. comes from its applications capabilities that supports mobility of the citizens, businesses and internal governments operations. Whereas, some of the typical challenges and barriers faced by e-Gov. are naturally shared by the m-Gov. efforts (Kushchu and Kuscu, 2003).

1.2 M-Gov. adoption and diffusion barriers

Although data communications, ICT infrastructure and different system applications became very attractive to many citizens and business users (Kushchu and Kuscu, 2003) but they

also bring many technological and cultural concerns. In this respect, Goldstuck (2003) have observed that "*it is ironic that Information Technology (IT) is currently serving as both a facilitator of the global economy and as a potential impediment to its advancement*" (Al-Hadidi and Rezgui, 2014). This section reviews the technical and non-technical aspects and barriers faced by different developing countries when attempting to adopt m-Gov. systems.

1.3 Technological Barriers

The most common known technical barriers to m-Gov. development and dissemination involve a lack of infrastructure and especially ICT infrastructure (Kushchu and Kuscu, 2003; Goldstuck, 2003; Al-khamayseh *et al*., 2007) and this is considered highly particular problem in developing countries. According to Kushchu and Kuscu (2003) m-Gov. infrastructure is comprised of different wireless networks, mobile access devices and accessing software services. Another technical known barrier is identified as security in both of its aspects like citizen's information and personal security or country's security from cyber and external aspects (Lambrinoudakis and Gritzalis, 2003). According to Al-khamayseh *et al*. (2007) m-Gov. applications security is considered the successful initiative hallmark. Thus, Goldstuck (2003) recommends some wireless network security fundamental standards for securing controlling and managing access to services.

Another known barrier is the compatibility potential lack between mobile systems and existing systems of e-Gov., a problem which as noted by NOIE (2002), may escalate further where government offices have legacy old systems which may not be easy to integrate and simulate both in terms of functionalities and data administration.

1.4 Non-Technological Barriers

Non-technical impediments are found in relation to those who develop, manage or use an e-Gov. system, and the surrounding environment that hosts the system. The literature highlighted culture as one of the non-technical barrier for both e-Gov. and m-Gov. adoption of a belief that is echoed in the literature by some scholars (Goldstuck., 2003; NOIE, 2002). Other cultural factors that have impact on the adoption and dissemination of m-Gov. are: trust, language, change resistance, management support and different users' expectations (NOIE, 2002). Whereas, privacy and security are also raised by (NOIE, 2002; Kushchu and Borucki, 2004) who argued that these two issues are the most significant concerns faces citizens in accepting m-Gov.

Another major non-technical issue is people's resistance to change, which occurs basically due to the fear of the unknown or inability to deal with uncertainty (NOIE, 2002).

Another barrier indicated by Bassara *et al*. (2005) is the lack of skills and especially in IT confronts some hard challenges relating to government's ability to provide e-Gov. and m-Gov. desired services. Kushchu and Kuscu (2003) comment that accessibility is counted as the key for the m-Gov., success but other factors such as income, education level, knowledge, gender, age, handicap, language differences and regional discrepancies affect accessibility, and hence citizens' attitudes towards m-Gov. initiatives would clearly cause issue to the implementation progress.

Another barrier is the cost of the e-Gov. and m-Gov. implementation from government point of view as well as obtaining tools, equipment and right accessories from citizen's point of view is considered one of the major barriers faces any countries even the developed ones. Kushchu and Kuscu (2003) pointed out that the cost of owning mobile devices for accessing services should be affordable and low.

2. Oman e-Gov. status

Oman is part of the Gulf Cooperation Council (GCC) with a total area of 309,500 sq.km and last total population of 3.992 million only. The capital of Sultanate of Oman is Muscat region and it holds a monarch government in it. E-Gov. in Sultanate of Oman is part of the 2020 economic vision that was initiated and presented in 1995. E-Gov. or as known locally Oman Digital or e-Oman was approved on November 2002 and it is the main foundation plan. Thus, it improves that backbone of the knowledge spreading by the e-Gov.. The first marketing strategy initiated for e-Gov. in the Sultanate of Oman called "Towards Digital Oman" was in 2003. The Sultanate of Oman is considered and identified as a developing country which is located on the south east of the Arabian Peninsula (Ministry of Information – Oman, 2008b).

In Sultanate of Oman, the e-Gov. readiness demonstrates announces that it can provide a platform to develop a new better relationship between government, service users, citizens and companies through the use of ICT that allows gathering and dissemination of services and information inside and outside government. It is obvious that the promotion of information access, transparency, accountability and anti-corruption in both government and public institutes and organizations through the usage of ICT will open opportunities to exercise civil and political rights. This aspect will reinforce the democracy and a lead to a distinct culture generation that confronts corruption, secrecy and kidnapping of public sphere by different groups of power not only by the power of public by the participation capacity and social control, oversight or monitoring but also through by official public and political leaders by improving their level of awareness towards the importance of action and decision in favor of social welfare. The effort that is being given and appointed in order to undertake the e-Gov. project is great but there are other factors that should be considered such as the infrastructure level and capability, the penetration made up to date and operation process that a close link to the initiatives and survey known as e-participation index. E-Gov. readiness is to measure the ability, adaptability and the willingness to move towards e-Gov. and its implementation. Time to time update of the index in order to ensure the nature and highlights of the efforts done by the government in the corresponding period is essential. ICT is an important factor with an increasingly developing approach in the nation's development process. Major barriers can be faced in the adoption and e-Gov. services diffusion depending on the country's readiness in terms of infrastructure and deployment of ICT (Alghamdi, Goodwin and Rampersad, 2011). Although the Information and Communication Technology (ICT) in Sultanate of Oman is an initial and early stage of improvement but it is rapidly picking up energy and improving in a great sequence. Hence, the administration is undertaking an impressive arrangements and improvement target program. The Information Technology National Committee created in 1998 in Sultanate of Oman was aiming to address issues regarding data and interchange part in the nation and it led by the Ministry of National Economy (ESCWA, 2007).

ICT enable and facilitators the encouragement and engagement of discussion between different stakeholders of e-Gov. rather than just a passive language recipients (Jose and ZainolAbidin, 2015). The 'Data Technology Task Force' was shaped by the committee in April 2000 in order to create the Oman's IT vision (AlEsmaeli, 2002). The main consideration of the Task Force is to process the accompanying explanation that explains the information technology and correspondences leveraging in the administration of giving community in order to private and open residences and parts through the means of electronic as they are the main impetus to strengthen the Sultanate of Oman's knowledge based economy and accomplishing maintainable advancement (National Committee for Information Technology –Oman, 2003).

As Information Technology Authority (ITA) is the main supervisor of Oman's ICT and e-Gov. or as known internally as Digital Oman (ESCWA, 2007) and Omantel is the main administration supplier of telecom until 2004 when Ooredoo turned to be the second telecom supplier in the Sultanate. As illustrated by Ministry of National Economy Oman (2008), there is an expanding amount of endorsed and portable supporters while on the other hand there is a diminishing amount of endorser in the settled telephone. Since, 6% decrease in settled telephone supporters in 2007 compared to 2006 as illustrated in Figure 1 and in the same period it can be noticed a sharp climb of cellular prepaid endorsers which is 40.4% and relatively medium ascent in postpaid administrations as can be noticed in the following figure 1: Subscribe of internet and fixed phones

3As regard the services provided by the two telecommunication companies Omantel and Ooredoo, multimedia massage administration (MMS), wireless provision convention (WAP)

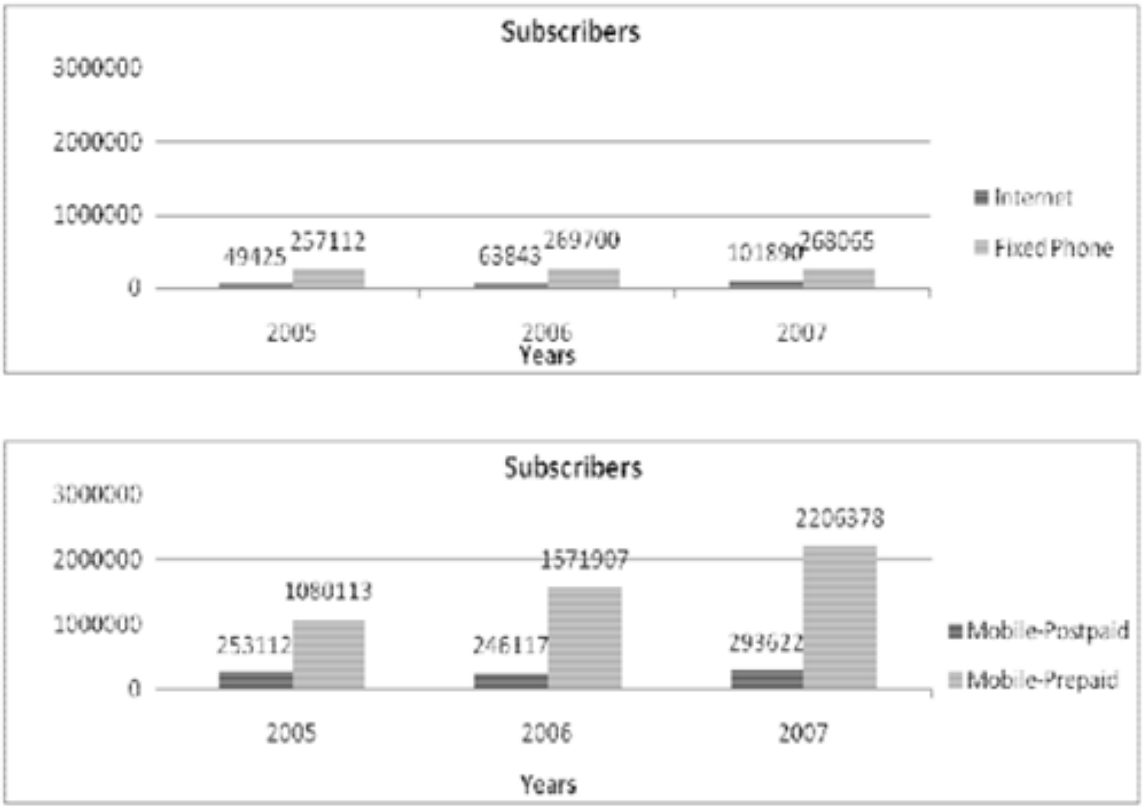

Fig 1: Subscribe of internet and fixed phones

And general parcel radio administration (GPRS) were first presented to public in the end of 2004 (ESCWA, 2005). While, the third generation network (3G) was dispatched first by Ooredoo in the end of 2007 (Nawras, 2008).

2.1 Oman m-Gov. Services

As indicated earlier, more than half of the Omani population has mobile devices that allow them to access m-Gov. services and information. Thus, several organizations in Oman have initiations to start utilizing this opportunity to open mobile channels with their clients and customers. This section outlines the major m-Gov. services in Oman categorized in two basic groups; push and pull services. Push services are passive in its nature where clients or end-users usually receive notifications about certain activities, service, product or events. On the other hand, Pull services ask users to play more like active role in either initiating or applying the service or responding to certain queries via mobile devices.

2.2 Push Services

Muscat Securities Market is one of the services that has developed a paid service that enables any investor or customer to receive regular updates on market and stock alerts via SMS (Oman Mobile, 2007b). This service also enables customers and users to get regular continuous SMS every 30 minutes on market movers - top winners, losers and most active companies in order to keep them updated on the situation to allow them to coordinate accordingly (Oman Mobile, 2007c).

The Civil Aviation and Meteorology in cooperation with Oman Mobile introduced a weather forecast service for many towns

in Oman. This service allow customers and users to receive daily weather reports along with the future forecasts on their mobiles (Oman Mobile, 2007d).
Other public organizations and companies started to send bulk messages to customers and citizens (it can be targeted in specific segments) informing them about certain activities, product, service, events or even opening new branch. Pull Services.

2.3 Pull Services
Muscat Municipality is a good example where it developed an m-parking system which enables public to pay parking fees via SMS only (Muscat Municipality, 2007). Drivers can now SMS details of their vehicle, location and duration and to receive confirmation immediately. Moreover, Five minutes before the allocated time expires, the municipality sends a gentle reminding message asking for extension of time.
The Royal Oman Police (ROP) initiated a m-service allowing different drivers to inquire and receive information about their traffic offences. Moreover, car owners may receive the expiry reminder of their vehicles.
The Ministry of Education initiation is to send the final results to students via SMS.
In addition, the Higher Education Admission Center in Oman inform students of their admission status and progress in different institutions via SMS in order to update them and to allow them to accept or reject the received offer by messaging back their choice.

3. Research Methodology
In order to understand the current available trends and business practices about e-Gov. in Oman, this paper would combine analytical and descriptive methods together based on data from both primary and secondary sources. The primary data are collected by structured interviews with key staff working in government organizations. Interviewers were selected according to their position titles, experience with m-Gov. and responsibilities (Navqi and Al-Shihi, 2009)
An additional method for data collection, Braun & Clarke (2006, p. 79) define thematic analysis as "*a method for identifying secondary data analysis and information derived from previous statistical reports" (*Müller *et al*., 2014). General literature systematic review data is provided on e-Gov. and the ICT sector in Oman. Moreover, SWOT analysis is applied in order to show and define the strength, weakness, threats and opportunities for e-Gov. approach in Oman. Hence, providing better platform and background for TOWS analysis. Finally, suggestions and conclusion are drawn on the basis of derived analytical approaches from the two methods.

3.1 SWOT Analysis
"SWOT analysis is an important analytical technique for understanding the performance and prospects of any issue under study through identifying the external and internal factors influencing it." (Hassan and Sallahuddin, 2014) The internal factors include the first two parts which are strengths and weaknesses points. While the other two parts, opportunities and threats considering the surrounding environment consists the external factors. These factors would influence the system's performance. Identifying these four factors, improvement and enhancement strategies may developed in order to enforce and overcome analyzed obstacles by enforcing strengths, eliminating weaknesses, exploit opportunities and counter threats (Hassan and Sallahuddin, 2014, p.3).

3.1.1 Strength
- **Primary data**

Sultanate of Oman is having great international relations with other nations worldwide with calm and peaceful internal society. All of this due to the strong leadership vision and support by His Majesty Al Sultan Qaboos Bin Said (Navqi and Al-Shihi, 2009). In Oman there is a tremendous comprehensive mobile coverage of almost 95% of the country (Ministry of National Economy, 2007) without forgetting the great governmental support to private sector and especially small and medium enterprises (SMEs). Indeed, rising of any nation in any aspect will always require young knowledge population. Hence, majority of the population is between 15 and 65 years (Navqi and Al-Shihi, 2009).

- **Secondary Data**

ICT sector in Sultanate of Oman is developing rapidly in good manner from 2010 till 2014 where it rocketed from 0.21 to 0.49 over the period 2010-2014 which indicate that it is developing well and it has a special treatment and follow-up. However, in the ICT ranking among gulf countries, Oman is still the last one and its development index (IDI) is before the last (ESCWA, 2014). Another aspect which is considered as strength is the e-participation where it increased dramatically over the same indicated period from 0.16 to 0.71. Besides to the indicated aspects, online base index is scoring high and increasing rapidly from 0.37 to 0.73 for the same period. E-participation and online index show that citizens are having more engagement in the e-Gov. implementation and development and that the e-Gov. approach is moving towards citizens-centricity. Hence, Chan *et al*. (2010), Vencatachellum & Pudaruth (2010), Abdulwahab & Dahalin (2011), Keramati & Chelbi (2011), Lessa *et al*. (2011), Alzahrani & Goodwin (2012) adopted different empirical study in order to have a system facilitating e-Gov. as more of citizen-centricity and to influence citizens and their intentions to use as the main goal. All of these indicated strengths of the e-Gov. in Oman reflected in the E-Government Development Index (EGDI) and enhanced the e-Gov. ranking in the world. Since, EGDI shifted from 0.46 to 0.63 and therefrom Oman e-Gov. ranking enhanced from 82 position to 48 position among 192 countries analyzed in the study (ESCWA, 2014).

3.1.2 Weaknesses
- **Primary Data**

Navqi and Al-Shihi (2009) illustrated many aspects considered under weaknesses of ICT sector in Oman in general. For instance, internet penetration and skilled IT staff are considerably low and the education and introduction of IT programs is slow. Moreover, ICT infrastructure is incomplete and its achievements is under-marketing with slow adoptions considered with the appointed vision (Navqi and Al-Shihi, 2009).

- **Secondary Data**

Innovation in Oman is showing a weakness spot and it show that it requires special treatment with better planning in order to be developed and meet the desired goal. As indicated earlier,

Although ICT in Oman is still developing but it still considered below the average and still in the last position compared to the GCC countries. As per the Knowledge Innovation (KI), Oman score is 5.87 and it is in the 4th position compared to GCC just slightly higher than Kuwait and Qatar. The same issue is clear in the Innovation Index (II) where it ranks 75 in the world and the last among GCC with efficiency of 0.6% only. This show a severe issue that government should consider it as very important aspects in order to eliminate it and overcome it (ESCWA, 2014).

3.1.3 Opportunities

- **Primary Data**

Navqi and Al-Shihi (2009) discussed that Omani government is seeking and targeting ICT sector to move towards privatization for better support and because citizens and society are open to change and flexible. In addition, neighbor countries like UAE having successful e-Gov. and m-Gov. with high rate of mobile telecommunication services which makes it a great opportunity of adoption due to the same nature and culture (Navqi and Al-Shihi, 2009).

- **Secondary Data**

There is a bright spot in the Omani economic side in the surveys especially in Knowledge-Based Economic Index (KBE) and Economic Incentive Regime (EIR) where both of them show good position and development. As per the EIR Oman is in the first position among GCC countries with score of 6.96 in 2014 while KEI score is 6.14 in 3rd position after UAE and Bahrain. These opportunities could be captured and exploit by enhancing the education index which show a blind spot in this area which decrease the knowledge index. Since, education index score is 5.23 and ranked 4th among GCC (ESCWA, 2014).

3.1.4 Threats

- **Primary Data**

In general, government organizations adoption of e-Gov. and m-Gov. in Oman is not central and united among all governmental agencies that make the adoption rate varies with isolated plans among them (Navqi and Al-Shihi, 2009). Whereas, ICT sector growth is considerably depends on citizens and public sector demands which affect its implementation especially with frequent structural changes among governmental organizations and agencies (Navqi and Al-Shihi, 2009).

- **Secondary Data**

As indicated earlier, although IDI is increasing in Oman and its ranking worldwide is improved by 9 positions to move from 61st to 52nd position over the period 2012 to 2014 but it is still slow compared to GCC and it needs to be improved and get more focus and consideration. Another aspect is the Human Capital Index (HC), this indicator was showing good enhancement till 2010 when it started again to reduce and downward trend where it dipped from 0.8 to 0.66 over the period 2010 to 2014. This indicator is attached to Gross Indicator Product (GDP) in the country and it shows a fluctuation and instability readings over the period from 2009. Figure 2 shows GDP readings over the mentioned period (ESCWA, 2014; ITU, 2014).

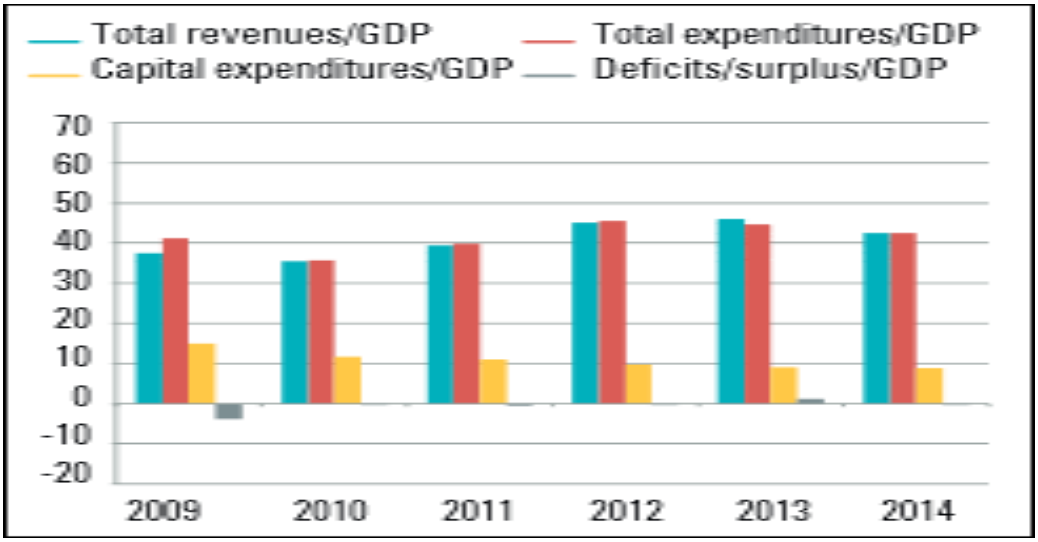

Fig 2: GDP readings from 2009 to 2014

3.2 TOWS Matrix

Weihrich (1982) has developed TOWS as an extension of SWOT analysis to make it more applicable and reality grounded. It is used for analyzing external environment (threats and opportunities), along with internal environment (weaknesses and strengths) for drawing strategies and visions. It has combination of the external and internal factors that would result a new strategy as shown in Table 1. Mainly there are four different combinations are developed (Ravanava & Charantimath, 2012; Weihrich, 1982; Hassan and Sallahuddin, 2014):

- SO-strategies: this is where governments utilize and reinforce its internal strength factors for exploiting available opportunities in external environment.
- WO-strategies: this is where governments reduce internal weaknesses that act as obstacles and barriers for external opportunities implementation or diffusion.
- ST-strategies: this is where governments use internal strength factors to minimize external factors threatening affects in performance or competitiveness.

- WT-strategies: this is where governments eliminate internal weaknesses for avoiding any breakthrough or prevalence of external threats.

Table 1: TOWS Matrix for e-Government in Oman

SO	WO
Network strategy: Expanding available broadband capacity through the enhancement of investments in infrastructure and networks with better security and privacy.	**Broad band speed strategy**: Conducting external innovations specially in ICT would enhance the strategy and increase local education and experience and to have solid marketing campaigns
ST	**WT**
Human capital strategy: The government should focus on the empowerment of skilled human capital in order to enhance training and education within local citizens.	**Funding strategy and Goal focusing**: Government must approach different kinds of funds in order to minimize weakness especially in ICT development in infrastructure and network. Moreover, all agencies under government should consider implementation under one umbrella and to conduct steering committee work

4. Suggestions and Conclusions

Previous both types of analysis (primary data and secondary data) showed that Oman faces many critical aspects and issues that need to be addressed and discussed carefully. Apparently, many of the issues are more considered as cultural and country-specific aspects than technical in nature. Unfortunately, these factors would act as inhibitors to the adoption and growth. Subsequently, this may hold back the development and growth (Navqi and Al-Shihi, 2009).

Omani government needs to consider different basic factors illustrated and defined by United Nations and other benchmarking agencies. It will be more effective and efficient if the implementation of e-Gov. system is in proper manner. Thus, e-Gov. system is playing an essential and important role in the transformation process in modernizing work instruments, enhancement of governance and improving government-citizens relationship. Based on the above discussion, well training and educational system would enhance talented human capital and attempts which seems to be reducing in the last 4 years especially in ICT sector in Oman should return back to be considered the strength points sector because it still facing some challenges. "The most important issue in implementing successful e-Gov. is the citizens' acceptance and usage. The citizens need to be trained and educated to use the e-portal services available in the corresponding structure. (Mohammed and Sriram, 2014).

For instance, lack of efficient leadership, lack of resources, bad internet quality and slow speed of the internet connection. Thus, successful implementation of e-Gov. in Oman is highly dependent on the commitment level from the political authority, the infrastructure readiness and the awareness level in the government and the public to reduce change and transforming resistance. Effective e-Gov. system is attached with proper planning continuous assessment due to the changes at both external and internal environments. Thus, SWOT analysis and TOWS matrix should be studied regularly in the future in order to keep proper monitoring system with the emerging innovations in the country and neighborhood situations.

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