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# Backend Challenges and Issues for Electronic Government

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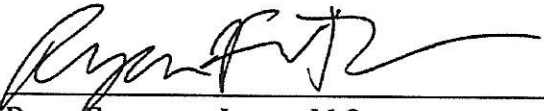
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*Title of Thesis: Backend Challenges and Issues for Electronic Government*

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## 1.0 Introduction

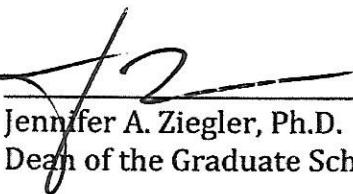The term electronic government (also called e-government, or eGov) refers to multidisciplinary projects that are complex in nature. Since the beginning of the Internet revolution many countries have adopted e-government as a step toward enhancing the delivery of public or governmental services to citizens by what are called e-services. A typical request for a service is initiated and passes through an electronic service ("e-service") portal, or a front office. The term front office application usually system can be defined as designates software seen and used directly by an end user. This software provides the capabilities needed to collect the user inputs and provides effective services. The main purpose of front end application in the e-government is doing business with government easier by providing online access to a range of services. The user input or service request will be fulfilled by the back-office, which can be defined as the internal operations of an organization that that don't interface with clients and citizens but can help manage and control users' input and provide them the appropriate output. Although e-government has many benefits, including cost reduction, enhancing governmental organizations' efficiency, assisting a government's economic policy, and helping the environment by reducing air and noise pollutions, there are a variety of challenges which might be critical to successful implementation of an effective e-government system, like e-government design and development, users or targeted users, public organizations and citizens' / customers' readiness to use and implement the e-governments' technologies, and finally security and infrastructure.

## 2.0 What is e-Government?

Adding the letter –e- to any of today's practices has become a custom to denote that the work is performed electronically, increasingly this also means the use of the Internet. Governments worldwide acknowledge the potential of the Internet, information technology (IT), information and communication technologies (ICT s), and other technologies by offering efficient and effective public services through e-government. E-government often called eGov, digital government, connected government, or online government. E-government has been identified by Palvia and Sharma (2007) as a

> "Generic term for web-based services from agencies of local, state and federal governments. In e-government, the government utilizes various technologies to facilitate government operations, include citizens, and deliver government services. The interaction may be in the form of obtaining information, filings, or making payments and a host of other activities and transactions through the World Wide Web" (Palvia and Sharma, 2007).

The Center for Technology in Government (CTG) defined the e-government as the use of information technology to support government operations, engage citizens, and provide government services. The same source explained that there are four key dimensions that reflect the functions of government itself. The first dimension is e-services, which can be defined as the electronic delivery of government information, programs, and services often (but not exclusively) over the Internet. The second dimension according to CTG is e-democracy, which is the use of electronic communications to increase citizen participation in the public decision-making process.

E-commerce is the third dimension of implementing the e-government. CTG defined e-commerce as the electronic exchange of money for goods and services. In government, this cover processes like citizens paying taxes and utility bills, renewing vehicle registrations, and paying for recreation programs, or government buying supplies and auctioning surplus equipment. The last dimension is e-management and it can be defined as the use of information technology to improve the operation of government, from streamlining business processes to maintaining electronic records, to improving the flow and integration of information. Ellatif and Ahmed (2013) explained that the e-management elements are hardware, software, communication networks and management concepts and mechanisms of their application.

Al-Mamari, Corbitt and Oyaro (2013) defined the e-government as "the use of ICTs, especially Internet and web technology, by a public organization to support or redefine the existing and/or future relations with stakeholders in the internal and external environment in order to create added value" (p. 199). This definition makes information and communication technologies vital components of e-government and highlights the close relationship between e-commerce and e-government. The Organization for Economic Co-operation and Development (OECD) defines e-government as "the use of information and communication technologies, and particularly the Internet, as a tool to achieve better government" (OECD, 2003). In this description, the Internet is defined as a requirement and a primary medium for e-government. It also emphasizes that ICT and the Internet should be viewed as tools for better government. Alshihi (2006) in his book titled *Critical Factors in the Adoption and Diffusion of E-government Initiatives in Oman* defined e-government as

> The use by government agencies of information technologies (such as Wide Area
> Networks, the Internet, and mobile computing) that have the ability to transform

relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions (Alshihi, 2006).

According to Rabaiah (2009, p. 39), official governments' understanding of e-government can be different from one country to another. The following table shows examples on how e-government was defined by few countries. The source of the table is (Rabaiah, 2009, p. 15).

| Country | Description |
|---------|-------------|
| Belgium | E-Government is a way to enhance the quality of public services offered to citizens and businesses by utilising the opportunities of modern technologies, the Internet, and the new modes of communications (ICT). |
| Germany | E-Government is the use of Information & Communication Technologies (ICTs) to make public administrations more efficient and effective, promoting growth by cutting red tape. This is something which anyone who has spent hours waiting in line in a government building can appreciate |
| Korea | The use of ICTs, and particularly the Internet, as a tool to achieve better government State must take a stance as guarantor (of individual freedoms, the authenticity and enforceability of dematerialized procedures and actions, the security of actions carried out by public servants, etc.) and the Government wishes to confirm this position clearly both in the formulation of the decisions taken and in their methods of application. |
| Egypt | The use of ICTs, and particularly the Internet, as a tool offer distinguished governmental services which results in better policies and services and better participation of the citizen |
| UK | E-Government, is not a conventional IT strategy which proposes technical solutions to a set of business needs. E-government sets a strategic direction for the way the public sector will transform itself by implementing business models which exploit the possibilities of new technology. |
| Japan | Japan thinks of e-government as part an overall society development and that e- Government is about electronic administration and offering eServices |
| New Zeeland | E-Government is an all-of-government approach to transforming how agencies use technology to deliver services, provide information, and interact with people, as they work to achieve the outcomes sought by government |

*Table 1- Government Definitions of e-government*

By reviewing all the definitions mentioned earlier, all of them agree that the e-government is utilizing the IT structure and web technologies to provide efficient and effective governmental services to the citizens and businesses. In addition, all of the definitions focus on the benefits of delivering the governmental and public services electronically. Finally, all of the definitions agree

that front-end and back-end (back-office) which will be explained in detail in the following sections, are essentials of designing and constructing e-government applications.

## 2.1 Front Office

The front-office "also known as front-end-"is explained by Janowski (2005) in government as "the government as its constituents see it, meaning the information and service providers, and the interaction between government and both citizens and businesses" (p. 58). The same source showed that there are two requirements for the successful front-office implementation of e-government: online service and citizens' engagement. Online service can be explained as any information and / or services provided over the Internet. These services not only allow users to communicate with each other, but they also provide access to a huge amount of information. Online services can range from simple to complex. A simple online service may just help users gain required information through a search engine, while on the other hand, a complex online service could requires a set of validations and access privileges like driver's license or identification card renewal, vehicle record request and banking systems – this would include operation like transferring amounts or inquiring on available balance.

The second factor for the front-end components, as explained by Janowski, is citizen engagement. Information and communication technologies can be utilized as a tool not only for providing information to the citizens, but also for consulting and engaging citizens when making policy. The same source explained that this can be accomplished by reaching a wider audience, tailoring information to the target audience, engaging citizens through consultation and participation, facilitating the analysis of citizen contributions and providing feedback to citizens (Janowski, 2005). In order to attract citizens to contribute to and use the system, The Japanese Ministry for Posts and Telecommunications and the Ministry of Health and Welfare provide some

guidelines for accessible websites. Accessible websites refers to websites that are free of barriers that prevent users with disabilities to interact with or access to website.

## 2.2 Back Office

The 'Back-office' includes the internal operations of an organization. These are seen by clients and citizens, they can help manage and control users' input and provide them the appropriate output. Janowski explained that there are a few issues for the proper implementation of back-office functions in e-government. These include organizational change, leadership and coordination, inter-agency collaboration and private-public partnership. For example organizational change could include adoption a new work style that requires data sharing and communication between several entities, or several agencies who are asked by the upper management to partner deliver services according to the needs of citizens not according to their current work structure.

Coordination and collaboration between agencies is another key issue for the back-office as was explained by Janowski. Central coordination may be required to facilitate sharing information between several governmental agencies and implementing the proper security issues. Moreover, these entities need to take action to avoid duplication of efforts between governmental agencies by applying common approaches to data presentation, as one item, is a key factor. The central coordination office needs to engage to promote sharing information and best practices between offices by creating common portals for online registration for projects, seminars, research, systems or software analysis studies and publications. Coordination and collaboration between agencies can be achieved through several categories. The following section explains the categories of coordination between several entities.

## 3.0 E-Government Categories

Agreement between multiple sources - AlShihi (2006), Palvia and Sharma (2007), Joseph (2009) and Al-Hadidi (2010), demonstrate that e-government activities should be classified into four main groups: government to citizen (abbreviated by G2C), government to business (abbreviated by G2B), government to government (abbreviated by G2G), and government to employees (abbreviated by G2E). Each category has its own services and operations and targets a specific type of end user and customer base. According to the same sources, each category will depends on two main factors, the needs of the end user and the capacity of information and communication technology (ICT).

# 3.1 Government to Citizen (G2C)

The first category to be discussed is government to citizens (G2C). G2C deals with the relationship between the government and citizen as shown in figure 1.
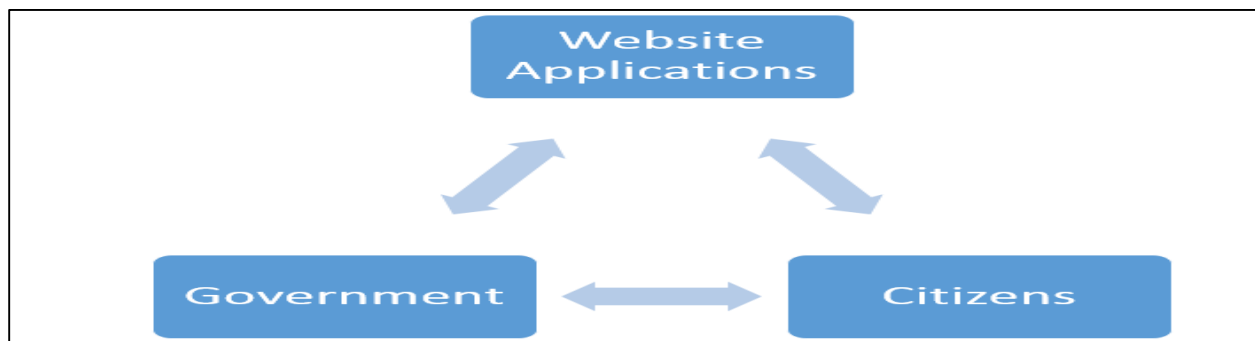


*Figure 1 Government to Citizen Category*

It provides the citizens and others access to government information and services. "G2C involves initiatives designed to facilitate people's interaction with government as consumers of public services and as citizens. This includes interactions related to the delivery of public services as well as to participation in the consultation and decision-making process" (Driss and Moulin, 2014, p.

47).  OECD showed that the majority of government services fall into this category. The main objective of this category is to give end users multiple web portals and communication channels for fulfilling their daily governmental transactions and operations.  There are many electronic transactions and operations that can be found in this space, like applying for birth or death certificates, applying for licenses and permits, applying for governmental jobs, and accessing public information.  "An example of this is Government Online (GOL) project in Canada that provides a client-centered service delivery across different delivery channels such as the Internet, in person, and by telephone" (AlShihi, 2006, p. 11).  The main purpose of GOL is to provide Canadians with modern electronic services anytime and anywhere in their preferred language.

## 3.2 Government to Business (G2B).

The second type of e-government activity is government to business (G2B). G2B deals with the relationships between the government and the private sector, commonly called business. Business needs to connect to the government public services using the Internet or website, as shown in figure 2.



Figure 2 Government to Business Category

G2B enables the private sector to complete the transactions and operations with the government electronically.  These functions can include renewing business licenses, downloading tenderers' information and uploading quotations.  OECD explained in detail that tourism portals are a good

example of an e-government system that benefits both foreign and local businesses.  Local and foreign tourism companies can set their business plans and strategies by accessing governmental websites.

## 3.3 Government to Government (G2G).

Government to government (G2G) is the third e-government classification. The main goal of the G2G application is to enhance inter-government organizations' processes by streamlining collaboration and coordination (Huang et al, 2005).  G2G supports e-government initiatives by enhancing the communications, data and information sharing and access between multiple governmental organizations. By applying this category, governments are able to reduce the IT expenditures.  Moreover, G2G uses well-built single solution which is less cost, easier for everyone and has greater control. To summarize, several government agencies can access and share data and information that might be useful for all of them as figure 3 shows.



Figure 3 - Government to Government Category

Higher Education Admission Center (HEAC) in the Sultanate of Oman is one of the examples uses G2G.  The center was established in 2005 to regulate admission of general certificate students at higher education institutions according to their wishes and marks obtained and the admission terms specified by the aforementioned institutions.  Several governmental entities use the same software to process admission requests. General certificate students' details

are loaded from Ministry of Education databases. Governmental higher institutions' vacancies and admission requirements are loaded from their databases.

## 3.4 Government to Employees (G2E).

The last e-government category to be explained is government to employees (G2E), which is shown in figure 4. The main purpose of G2E is to improve effectiveness and efficiency between governments and their employees by improving the employees' satisfaction and reducing employees' transaction delays.



*Figure 4 - Government to Government Category*

There are several examples used by governmental agencies to enhance the G2E systems used in payroll processing, pension calculation and end of service calculations. G2E reflects the information and services provided by the public sector to its employees. Moreover, allowing employees to query for their training history, requesting a leave or inquiring about their leave balances and leave history are other examples for this category. Some organizations develop a webpage for interacting between the organization and its employees. This is essentially the same operational roles filled by Human Resources Departments in both private and public sectors. Sultan Qaboos University in the Sultanate of Oman developed a portal for allowing employees to interact with the different applications like payroll, leave, training, etc. as shown in figure 5.

*Figure 5- G2E Example – SQU Portal*

# 3.5 E-government's Categories Summary.

Electronic coordination and collaboration between different entities can be achieved by four main categories. The following table summarizes the e-government categories explained earlier.

| Category | Uses | Examples |
|---|---|---|
| Government to Citizen (G2C) | Allows citizens and others to access government's information and services | Applying for birth or death certificates. |
| | | Applying for license and permits. |
| | | Applying for governmental jobs. |
| | | Accessing public information. |
| Government to Business (G2B) | Deals with the relationship between the government and the private sector | Renewing business licenses. |
| | | Downloading tenderers' information. |
| | | Uploading quotations. |
| Government to Government (G2G) | enhances inter-government organizations' processes (government helping government) | Higher Education Admission Center (HEAC) in the Sultanate of Oman |
| | | Submitting electronic documents between federal agencies. |
| Government to Employees (G2E) | improves effectiveness and efficiency between governments and governmental employees by improving the employees' satisfaction and reducing employees' transactions delays | Employee training history or request for attending a new training or workshop. |
| | | Employee leave history or request for a new leave. |
| | | Employee previous salary and salary details |
| | | Inquiry about previous employee evaluations. |

*Table 2- e-government categories*

## 4.0 E-Governance and E-Commerce

Palvia and Sharma (2007) contend that e-government is only a subset of e-governance. Same authors believed that

e-governance is a broader concept and includes the use of ICT by government and civil society to promote greater participation of citizens in the governance of political institutions, e.g., use of the Internet by politicians and political parties to elicit views from their constituencies in an efficient manner, or the publicizing of views by civil society organizations which are in conflict with the ruling powers. (p. 3).

According to Kettani and Moulin (2014), "E-Governance encompasses a series of necessary steps that government agencies need to develop and administer to ensure the successful implementation of e-government services to the public at large" (p. 46). The same source explains that e-governance has three main goals: improving government process, connecting citizens to the electronic citizens or e-services and building interactions with and within civil society. Kettani and Moulin (2014) explained that government can gain three benefits from e-governance: "Governance that is cheaper: producing the same outputs at lower total cost. Governance that does more: producing more outputs at the same total cost. Governance that is quicker: producing the same outputs at the same total cost in less time" (p. 55).

Yang and Shundong (2014) defined e-commerce as "an electronic transaction which is the sale or purchase of goods or services between businesses, households, individuals, governments and other public or private organizations, conducted over computer" (p. 2). They also explained that the main benefit is to facilitate business activities between customers and businesses. Moreover, they believe that e-commerce breaks down constraints of time and space for business and customers. In addition, e-commerce encouraged new businesses to be established because of

lower transaction cost and better market understanding. Yang and Shundong (2014) explained that in 1995, e-commerce was first proposed by IBM and in 1999 the success of Amazon helped other in an e-commerce boom.

According to Yang and Shundong (2014), there are six component of e-commerce, (as shown in figure 6). The first component is the network and it carries all commercial business information and commercial activities. The customer is the second component and it can be businesses or individuals. The third component is a Certification Authority (CA) whose main function is issuing and managing digital certificates. Sending goods and items that cannot be delivered online is achieved by the fourth component, which is a Distribution Center. E-banks are the fifth component and they are responsible for providing banking facilities and activities to buyers and sellers on a 24/7 basis. The final component detailed is the Commercial Administration and it includes all departments that have direct or indirect relation with buying and selling transactions like economic management department, statistics department, customs, customer relationship department, etcetera.
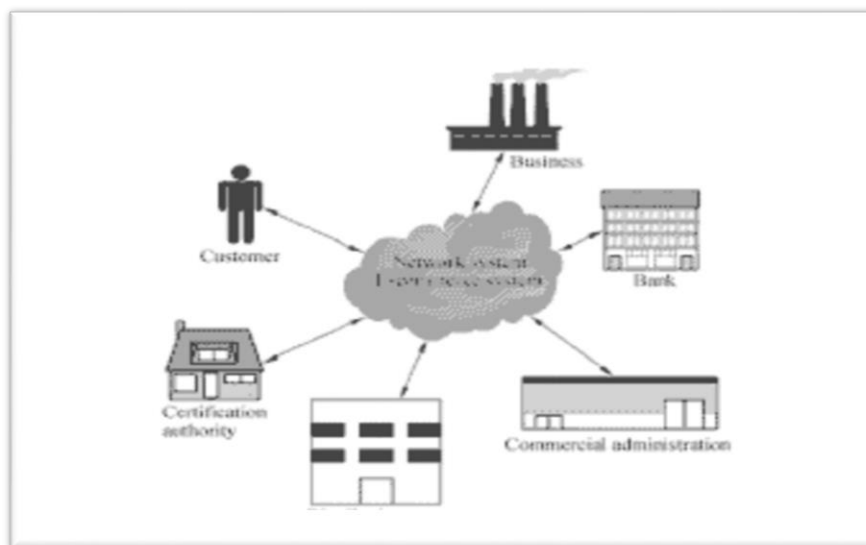


*Figure 6- Components of e-Commerce*

## 5.0 E-Government Experiences

Since the beginning of e-government, many countries have adopted the electronic public services for the citizens, government and business. According to Schuppan (2009), industrial countries and developed countries have been initiating e-government strategies and projects as they seeking best practice solutions with which to build effective and efficient solutions. The same source explained that the developing countries need additional effort to implement the e-government, versus industrial-developed countries.

Rabaiah (2009), explained that there are several goals for each government to various public services.

> One can immediately see that seeking leadership in e-government, promotion of citizenship/democracy, better services, better government, moving government online, and government transformation are common ultimate goals for e-government. Seeking leadership may explain partially why governments dedicate ample resources to implement e-government projects. Other countries simply do not want to be left behind what has become a global phenomenon. (Rabaiah, 2009, p. 66).

The following table (table 3) explains some of the ultimate goals for a government engaging in these efforts:

| Ultimate Goal | Countries |
|---|---|
| Leadership in e-Government | Austria, Singapore, Canada, Korea, New Zealand, Japan, Australia, UK, Finland |
| Government Transformation | UK, New Zealand, Malaysia, Jordan |
| Better services, better government | Australia, Belgium |
| Promotion of Citizenship/Democracy | Brazil, Korea |
| Move government online | Canada, UK |
| Modern and efficient administration | Austria, USA |
| Better connection with citizens | Canada, Singapore |
| Public administration | France |
| Delight/Satisfy citizens | Singapore |
| E-Business/E-Commerce - based | UK |

*Table 3- Government Goals of e-government*

The section will illustrate several industrial and developed countries' experience with e-government.

## 5.1 United States of America (USA)

`       The United States of America is also known as United States (U.S.) or America.  United States is a federal republic contains fifty states and five major territories.  The capital city of the United States is Washington D.C. and the largest city is New York.  The total area of the United States is 9,857,306 square kilometers which is about 3,805,927 square miles. According to 2010 census, the total population for the Unites States is 309,348,689 and it is estimated to reach 322,369,319 by the end of 2016.

The United States was one of the first countries to implement the e-government.  Several electronic websites were created to facilitate the daily governmental operations and activities. According to ITU, the number of Internet subscribers increased at a very high rate, from 64.76% of the population in 2004 to 87.36% of the population in 2014 (available in table 1).  USA.gov is the official Internet portal for US federal government that provides government information and connects citizens to government (figure 7).  It provides a single point of entry to all US government

services. Citizens can access information from the portal in several ways, like web, e-mail or telephone. In addition to USA.gov, GovLoans.gov is another example of electronic services provided by the government of the US. It provides the users the required information about federal loans that best satisfy their needs. According to Alshihi (2006), there are mainly five types of loans: agriculture, business, education, housing, and veterans.

Fang explained that e-government is based on seven principles in US. The principles are; easy access, re-engineered systems, automated systems, one-stop service, service by customer not by provider, privacy protected and embraced and finally access to the physically challenged
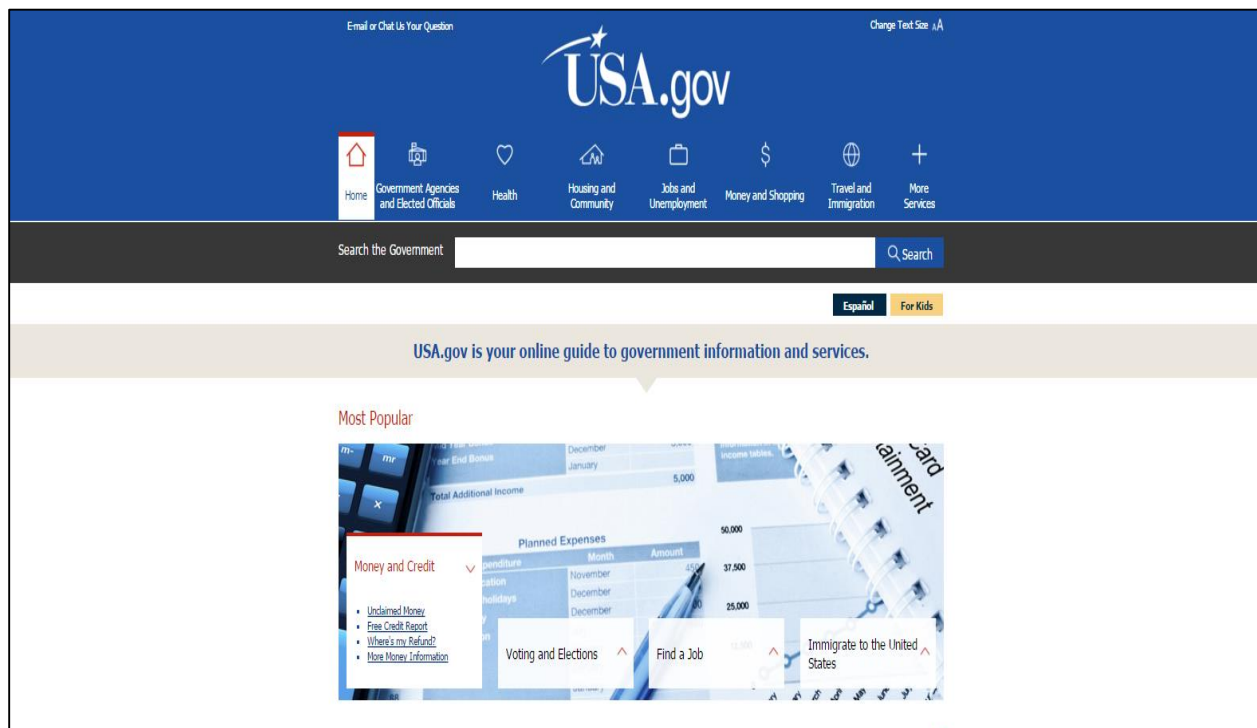


*Figure 7- USA.Gov website*

## 5.2 Commonwealth of Australia

Commonwealth of Australia commonly known as Australia. It is one of the developed countries and it the 12th largest economy in the world. Canberra is the capital city of Australia and Sydney is the largest city. The total area of Australia is 7,692,024 square kilometers which is

about 2,969,907 square miles. According to 2011 census, the total population for Australia is 21,507,717 and it is estimated to reach 24,067,700 by the end of 2016.

Australia is another country that implemented the e-government technology in several governmental / public organizations.  By the end of 2014, according to the ITU, the percentage of subscribers to the Internet was 84.56% with about a 20% increased from 2005.  According to Fang, there were several commitments made by the Australian government to deliver all appropriate Commonwealth services digitally. They also undertook to establish a government information center that provides access to information about government services.

One example of this initiative was electronic tax handling.  E-tax is one of the services provided by the Australian government to help taxpayers to prepare and file their income tax returns.  It was launched by the Australian Taxation Office in 1997.  The Australian government provides the citizen with a downloadable application for the purpose of tax calculation.  According to the Australian Taxation Office website (accessed on 03-30-2016), the main purpose of the application is to provide citizens with accurate and updated information to help them understand their rights and entitlements and meet their obligations. According to OECD, AUD gained 15.5 million in accrued benefits over a five-year period ending in 2004.

Job Search (www.jobsearch.gov.au available in figure 8) is another service provided by the Australian government to its citizens. Job Search is an online employment service that enable candidates to apply for a job and helps public and private organizations advertise for different job opportunities.  The Department of Employment and Workplace Relations introduced the system at the end of 1996.

*Figure 8- jobsearch.gov.au*

## 5.3 Republic of Iceland

Republic of Iceland commonly known is Iceland is located between the North Atlantic and the Arctic Ocean. The capital and largest city in Iceland is Reykjavik and the national language is Icelandic. The population of Iceland is 313,183 according to 2012 census with a density of three people per square kilometer. The total area of Iceland is 102,775 square kilometers which is about 39,699 square miles. Iceland maintains a strong diplomatic and commercial relations with all nations and has a strong relations with the United States, Canada, Germany and other NATO nations.

According to the ITU's statistics (see table 4), Iceland had the largest number of the Internet subscribers in the world in 2014. 98.16% of the population are connected to the Internet in Iceland. Iceland's government opened iceland.is which is a comprehensive information and service portal,

in 2007. The European Communities publications issued an article in 2007 with the title of *eGovernment in Iceland* in which explained that "the national portal has three main objectives, better access to information and services, lower cost of both accessing and providing the service and increased quality of the service" (p. 3).

Income tax applications (http://www.rsk.is), Job search services provided by labor offices (http://www.vinnumalastofnun.is) and social security benefits (http://www.vinnumalastofnun.is) are a few examples of websites provided by the government to citizens. The same source showed that "Businesses have been allowed to submit electronic tax returns since 1997, and individuals since 1999. In 2006 92% of individuals and 95% of businesses filed their taxes electronically" (eGovernment in Iceland Island, 2007, p. 17). According to the same source, the social security benefits website includes links to several public websites like unemployment benefits, child allowances and medical cost (reimbursement or direct settlement) and student grants.

## 5.4 Sultanate of Oman (Oman)

The Sultanate of Oman (in short Oman) is a Middle Eastern country located in the southeastern quarter of the Arabian Peninsula and covers a total land area of 309,500 square kilometers and about 1,700 kilometers of coastline. Oman implemented great efforts in creating IT knowledgeable citizens through several strategies. One of the strategies is by making computer literacy one of the required courses in all schools from grade one to grade eleven in the basic education to give the students the opportunities to learn computer and applications skills. "Education clearly plays a critical role in helping Oman's two major aims - developing awareness and building capacity - to be achieved" (Alhadidi,. 2010, p. 28). Moreover, a governmental agency called Information Technology Association (ITA) was established in May 2006. According to the same source, the association was established to be an administratively and financially independent

association responsible for implementing Oman's digital society strategy. One of the ITA objectives was to connect all governmental organizations to a secure network and to be able to provide citizens, governmental entities and businesses enterprises (private sector) with most of required services and information electronically. The number of Internet subscribers in Oman increased from less than 7% in 2004 to more than 70% in 2014.

Now ITA is managing Oman's e-government service portal which contains many governmental applications in Arabic and English (www.oman.gov.om) available in figure 8. The website contains many governmental services like searching for jobs, reserving commercial names, paying electricity bills and online visa application services. Moreover, the website provides links to many services that can be found in different governmental organizations like the Ministry of Housing, the Ministry of Civil Services and the Royal Oman Police (ROP). According to the website the goals of electronic Oman (eoman) is to improve effectiveness in public responses, coordinated policy responses to complex issues, enhance efficiency by reducing duplications of processes and procedures by effective program management and create a platform to demonstrate the government's positive trust that citizens can be valuable partners in co-creating public value, including service delivery.

*Figure 9- e-oman Service Portal*

# 5.5 Internet Connections around the World

The successful implementation of e-government depends on many factors, which will be elaborated later in this document. Providing citizens with good Internet connection and user friendly applications will increase the number of users, which in the end will affect the e-government positively. Governments applied some of the success factors to increase the number of citizens connected to the Internet. The following table includes the percentage of Internet users in a few developed and developing countries in the period from 2008 to 2014.

| Country | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------|------|------|------|------|------|------|------|
| Iceland | 91 | 93 | 93.39 | 94.84 | 96.21 | 96.55 | 98.16 |
| Australia | 71.67 | 74.25 | 76 | 79.49 | 79 | 83 | 84.56 |
| USA | 74 | 71 | 71.69 | 69.73 | 79.30 | 84.20 | 87.36 |
| UK | 78.39 | 83.56 | 85 | 85.38 | 87.48 | 89.84 | 91.61 |
| Oman | 20 | 26.80 | 38.83 | 48 | 60 | 66.45 | 70.22 |
| Singapore | 69 | 69 | 71 | 71 | 72 | 81 | 82 |
| Sweden | 90 | 91 | 90 | 92.77 | 93.18 | 94.78 | 92.52 |
| Malaysia | 55.80 | 55.90 | 56.30 | 61 | 65.80 | 66.97 | 67.50 |
| Japan | 75.40 | 78 | 78.21 | 79.05 | 79.50 | 89.71 | 90.58 |
| China | 22.60 | 28.90 | 34.30 | 38.30 | 42.30 | 45.80 | 49.30 |
| Spain | 59.60 | 62.40 | 65.80 | 67.60 | 69.81 | 71.64 | 76.19 |
| France | 70.68 | 71.58 | 77.28 | 77.82 | 81.44 | 81.92 | 83.75 |

*Table 4- Percentage of Individuals using the Internet (Source ITU)*

## 6.0 E-Government Pillars

Rabaiah's studies in 2009 showed that there are five main pillars of e-government, which are reform, technology, collaboration, leadership and people (also shown in figure 10). Each pillars plays a vital role in meeting the e-government's desired output or goals. The success of e-government is depends on each pillar according to Rabaiah, This means if one of the pillars fails, then the whole concept of e-government is at high risk of failure.

All of the pillars were used by Rabaiah to generate critical success factors for applying e-government. He explained that some of those success factors have been identified as critical factors for the governments that have been successful in e-government. Table 3 contains some of the success factors gathered and analyzed by Rabaiah, combined with country for which they might be critical.

| Success Factors | Countries |
|---|---|
| Reform (structure, processes, laws…etc.) | Finland, Australia, Denmark, Austria, Malaysia, USA, India, The Netherlands |
| Efficient and robust use of technology | Finland, The Netherlands, Australia, Austria, Canada, Malaysia |
| Collaboration | France, The Netherlands, EU, Denmark, Austria, Canada |
| Political leadership/ownership | The Netherlands, Denmark, Malaysia, India |
| Availability of skilled staff and capacity building | Germany, Austria, Finland, Malaysia |
| Rules and responsibilities (organizational) | Germany, The Netherlands |
| Public-Private Partnership (PPP) | Denmark, India |
| Monetary resources | Palestine, Malaysia |
| Citizen-centricity | Austria, Canada |
| Integrated infrastructure | Denmark, USA |
| Robust infrastructure development | Singapore, India |
| Adopt successful models and best practices | Denmark, USA |
| Central development of basic components | Germany |
| Capacity assessment for implementation | Denmark |

*Table 5- Critical Success Factors of e-government – Source Best-Practice Framework for Developing and Implementing E-Government*
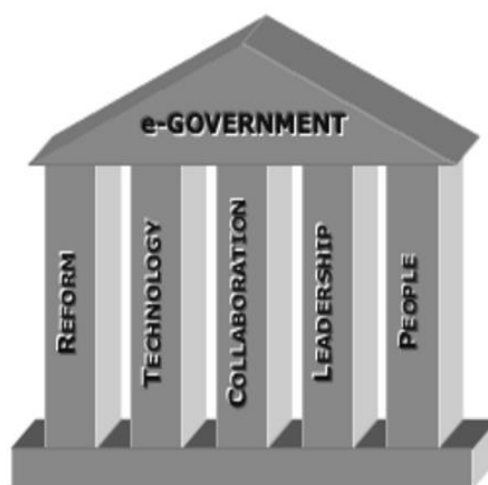


*Figure 10- Pillar of e-government government – Source Best-Practice Framework for Developing and Implementing E-Government*

## 7.0 E-Government Building Blocks

Rabaiah (2009) explained that there are three main building blocks in e-government. Firstly, the technical component is the most important block in implementation of e-government and without it, the e-government cannot succeed. The technical component contains different services like portals, databases, intra-governmental secure networks, knowledge management infrastructures, form servers, e-payment tools, e-procurement systems and e-archiving applications.

The second building block is the organizational components. This requires organizational changes to be introduced. In this component several frameworks need to be modified and enhanced. Some of the frameworks in the organizational components, according to Rabaiah, are the organizational framework, the legal framework, the echnical framework, the implementation framework and the security framework (Rabaiah, 2009, p. 82).

The third building block for an e-government effort is policies, standards and guidelines. These documents are essential for electronic public services because they control transactions and operations from different applications used by a single government. Rabaiah (2009) explained this building block include concepts like interoperability standards, reusability, legal standards and electronic signature systems.

The following table summarizes the e-government building blocks and the components associated with each block.

| Building Block | Components |
|---|---|
| Technical | Portals |
| | Database |
| | Intra-governmental |
| | Secure Network |
| | Knowledge Management Infrastructure |
| | Form Server |
| | e-payments |
| | e-procurements |
| Organizational | Organizational Framework |
| | Legal Framework |
| | Technical Framework |
| | Implementation Framework |
| | Security Framework |
| policies and standards guidelines | Interoperability Standards |
| | Reusability |
| | Legal Standards |
| | Electronic Signature |
| | Legislation |

*Table 6 - – Source Best-Practice Framework for Developing and Implementing E-Government*

## 8.0 Advantages of E-Government

AlShihi (2006) explained that the Internet was originally used mainly for educational and information sharing purposes, whereas today the Internet is used to facilitate day-to-day operations. E-government is an important application of the Internet and is used by public and governmental organizations to encourage broad use of computers and to facilitate communication and interactions with its institutions, citizens and businesses. It is also used to enhance the efficiency and effectiveness of the services offered and to reduce costs for both users and the service providers. AlShihi summarized that e-government should not be thought of as the solution, but rather as a tool that enables aims and ambitions (AlShihi, 2006, p. 15). E-government has many benefits and advantages as described by OECD (2003) like improving efficiency and reducing time for services. It helps achieve specific policy outcomes and it can contributes to

economic policy objectives. It can also be a major contribution to reform. Finally, e-government can help building trust between governments and citizens.

E-government is improving efficiency and services by enabling the information and related communication technologies to process a huge number of transactions, as has been explained in OECD (2003). The same source explained that e-government enables data and information retrieval at a high speed with less effort. It enables greater sharing of data within and between governments, citizens and business. It helps achieve the organizations' goals by enabling government to appear as a unified organization and to provide seamless online service. "The government employed e-government to enhance the effectiveness and efficiency of government operations by improving public service quality and quality of information shared between different agencies" (Al-Mamari, Corbitt and Oyaro, 2013, p. 199). According to Zhao, José and Waxin (2012), the Dubai's government a part of the United Arab Emirates, utilized the benefits of e-government to improve the efficiency in services and information sharing for better customer satisfaction. The same source explained that sharing the resources (including information base, infrastructure or operating system) between several departments can enable high efficiency of governments in the operations and technical processes.

The governmental services' and operations' efficiency can be accomplished by several methods. Archmann and Iglesias (2010) explained that applying the technologies in the governmental organizations reduces the bureaucracy and the administrative burden on citizens and for businesses. According to the same source, communications technology enables availability of several channels for delivering the public services, which increase convenience for citizens and businesses alike. The same source explained in detail that better service can be accomplished at the same cost or or lower cost. "EU institutions have recognized the importance of investing efforts

in and prioritizing the development of eGovernment and ICT, given the central role of these technologies in supporting  he current trend towards greater efficiency in both public and private sectors" (Archmann, and Iglesias, 2010, p. 29).  Chen Y, Chen H, Huang and Ching (2006) study showed that "potential savings of implementing e-government could be as much as $110 billion and 144 billion English Pounds in the U.S. and Europe, respectively" (p. 23).

In addition, e-government helps achieve specific policy outcomes by helping stakeholders to share information and ideas to advance specific policy outcomes.  For example, the OECD's experts (2006) explained that online information can boost the use of educational or training programs.  Similarly, sharing of information in health care can improve resource use and patient care.  E-government facilitates environmental policies by sharing information between central and sub-national government (OECD, 2006).

According to OECD (2006), e-government can improve economic policy outcomes and can be a major contributor to reform.  It reduces corruption and increases the trust of government in managing online services because systems generally provide services in standard procedures which are – in most of the time – clear to citizens.  It promotes information society and electronic commerce objectives.  In short, e-government improves transparency and facilitates information sharing.

In addition, the environment can benefit from the e-government technology which benefited the society and government as well.  The number of people using their own vehicles or public transportations for completing the governmental transactions and operations will be reduced.  This will reduce the amount of air pollution caused by the vehicles and other transportation methods as a result of using gasoline.  According to Ronald and Roy (1998), air pollution created by diesel cars can cause lung cancer, as explained below:

Air pollution from motor vehicles, in particular diesel cars, becomes increasingly important. Quantitative estimates of lung cancer risks from exposure to diesel engine particulate emissions have been done using data from the chronic bioassays with rats (p.54).

The above studies showed that lung cancer can be reduced by reducing the air pollution caused by vehicles. Fulfilling the governmental transactions electronically can reduce the amount of vehicles on the roads, which at the end means reducing the pollution.

In addition to the air pollution reduction by using e-government technology, e-government reduces the amount of noise caused by the vehicles, like car alarms, honking horns, car stereo and highway or street traffic, which is considered as another type of pollution affecting the humans.

Moreover, the e-government software packages are enhancing the 'go-green' or paperless concept as described in the United Nation E-Government Survey (2014). The amount of paper used in the daily governmental transactions can be reduced by using the e-government technologies. Most if not all of the paper forms required for fulfilling governmental transactions can be completed, sent and received electronically - without need of printing a single sheet of paper for any transaction. Also, total administrative costs by applying go-green technology can be reduced (United Nation E-Government Survey, 2004). The same source explained in detail how the e-government technology can enhance the go green concept. The same source claims that administrative costs can be reduced:

E-government and online service delivery are increasingly seen in the region as a means to reduce costs while providing better and more user-friendly services to citizens and businesses, as well as being a part of the governments' efforts to go

green. There is a renewed focus on the impact and cost-effectiveness of e-government in the region with countries such as the United Kingdom, the Netherlands and Denmark having implemented ambitious e-government efficiency and effectiveness programs. The United Kingdom has embarked on a number of high profile initiatives to reduce the upfront expenditure on e-government whilst increasing its impact. The country makes 'digital efficiency' calculations and has established a Government Digital Service, a new team within the Cabinet Office tasked with transforming government digital services through an investment of US $113 million per year to be offset by multiple savings, such as saving US $5.9 billion by cutting the costs of paying work and pension benefits online. The Netherlands has already met the ambitious goal it set in 2004 to reduce the country's overall administrative costs by 25 per cent and is aiming for a further overall government saving of US $1.8 billion by 2018 through an e-government enabled whole-of-government approach. (United Nations - New York, 2014).

The above information demonstrate effort made by some countries to implement the 'go green' concept.  It also explaines the amount of financial saving those countries achieved by reducing the overall administrative costs by applying the technologies.

Last but not least, e-government can help build trust between governments and citizens. This can be done - as has been explained by AlShihi (2006) - by enabling citizens to engage in the policy process, promoting open and accountable government, and helping to prevent corruption. OECD (2003) showed that it can help an individual's voice to be heard in the mass debate and can aid the public by promoting creative and constructive thought about public issues.

OECD conducted a deep study of e-government initiatives in its members' countries (OECD member countries listed in table 2) and listed the advantages of e-government as follows. First, it improves efficiency in processing huge quantities of data. Secondly, it improves services through better understanding of users' requirements and by enabling users to interact with public transactions without the need to understand complex government structure and relationships. Thirdly, it helps achieve specific policy outcomes by enabling stakeholders to share knowledge, ideas and information. Fourthly, it contributes to economic policy objectives by reducing corruption and establishing greater trust between government and citizen. Fifthly, e-government contributes to governments' reform by facilitating information sharing. The last advantage was explained by OECD for the e-government is that it helps building trust between governments and their citizens.

| Country | Ratification Date | Country | Ratification Date | Country | Ratification Date |
|---|---|---|---|---|---|
| Australia | Jun 7, 1971 | Austria | Sep 29, 1961 | Belgium, | Sep 13, 1961 |
| Canada | Apr 10, 1961 | Chile | May 07, 2010 | Czech Republic | Dec 21, 1995 |
| Denmark | 30 May 1961 | Estonia | Dec 9, 2010 | Finland | Jan 28, 1961 |
| France | Aug 7 ,1961 | Germany | Sep 27, 1961 | Greece | Sep 27, 1961 |
| Hungary | May 7, 1996 | Iceland | Jun 5 ,1961 | Ireland | Aug 17, 1961 |
| Israel | Sep 7, 2010 | Italy | Mar 29, 1962 | Japan | Apr 28, 1964 |
| Korea | Dec 12, 1996 | Luxemburg | Sep 7, 1961 | Mexico | May 18, 1994 |
| Netherlands | Nov 13, 1961 | New Zealand | May 29, 1973 | Norway | Jul 4, 1961 |
| Poland | Nov 22, 1996 | Portugal | Aug 4, 1961 | Slovak Republic | Dec 14, 2000 |
| Slovenia | Jul 21, 2010 | Spain | Aug 3, 1961 | Sweden | Sep 28, 1961 |
| Switzerland | Sep 28, 1961 | Turkey | Aug 2, 1961 | UK | May 2, 1961 |
| US | Apr 12, 1961 | | | | |

*Table 7- OECD members' countries*

To conclude, there are several groups which can benefit from use of e-government: government itself, businesses and citizens. It helps the government in law and policy making and performing better regulations. It helps the government to perform services in efficient and effective ways which enhances the country's image with its citizens, simplifies bureaucratic procedures, enhances information management security, reduces the operational and administrative costs and creates better integration of benefits. In addition, by utilizing IT and ICT

to create digital public services, governments' IT infrastructure will be enhanced. The second area is business and this can be achieved by making it easier to operate with governmental organizations and will enhance the transparency between government and business. Moreover, the foreign investment can be increased, which means reducing monopoly and opening the door for competition to reduce prices with the same or even better quality. The information system sector will benefit if the governments utilize the ICT for its operations and transactions. Citizens can benefit from cost and time saving because governmental services will be available anytime from any place having access to information systems. This will also shift accessing governmental information, which means better quality of life. With availability of governmental electronic applications, citizens will be get equal access regardless of their social disparities. Citizens will benefit also by saving the environment and reducing air and noise pollutions, as previously discussed.

## 9.0 Challenges of E-Government

**T**here are some technical and non-technical issues and challenges for e-government projects. Those issues and challenges need to be closely managed, monitored and controlled in order to have the best possible outcomes.

# 9.1 Design and Development

The first consideration is, e-government design and development. "Planning and control are perhaps the most important issues in e-government. E-government systems require rigorous planning to avoid partial or total failures, involving public and private parties to effectively control the design, development and integration processes" (AlShihi, 2006, p. 16). Nowadays, creating a website by any type of organization – public or private - is less important than maintaining the

quality of those websites. Good planning and effective controls can help public organizations design and develop online applications and programs that encourage use. "The key question today is not whether organizations, including those in the public sector, have websites, but what the quality of those sites and the scope is of services currently being provided online" (AlShihi, 2006, p. 30).

The Developers e-governmental applications need to make sure that those application can be used in mobile phones and PDA. According to Schnoll, (2015, p. 106) mobile government (m-government) is a subset of e-government that support mobile and wireless technologies users like mobile phones, PDA or laptops. According to the same source the number of mobile and wireless devices increased and governments required to build applications and software for this type of users.

## 9.2 Users

Users or targeted users are another challenge for implementing a successful e-government. Users or targeted users can be a challenge in two ways. The first factor of the users challenges are users' needs. The government of United Kingdom defines the Users' needs as "the needs that members of the public, businesses or customers have of government" (Government Digital Service, 2016). The second factor of users' challenges are users' knowledge and it refers to the information and experience own by users that make them able to use the software applications. For the first factor which is users' needs, the gathering and analyses of user's requirements is an essential component in the system development life cycle. AlShihi and Fulton agree that successful implementation of the software application needs to have a strong relationship between developers and targeted users. "Online services should be designed according to the user needs" (AlShihi, 2006, p. 19). Many studies comprehend the importance of users in developing e-

government applications.   In addition, before applying or implementing any public online applications, governments should treat their citizens as customers because e-government is not about only the technology; it is about people making these technologies achieving the desired results. "Governments must treat the public first as citizens and then as consumers of government services" (AlShihi, 2006, p. 19).

The second issue is the user community, level of knowledge, experience and overall comfort with connected systems.  Governments, especially at the planning of automated public services, need to ensure that the technology skills of the citizen are such that they can use the systems effectively. In order to reduce the risks governments should provide intensive free IT training for the citizens. The Sultanate of Oman is one of the countries providing this type of training through a governmental organization called Information Technology Authority (ITA), which was established by a royal decree on 2006 (ITA website).  Governments also need to encourage citizens to utilize the online services by creating constructive advertisements on the importance of using digital technologies in their daily operations.  In addition, governments need to prepare generations of citizens that are capable of using computers and technologies by introducing information systems classes in school from elementary school through high school.

## 9.3 Internet Cost

The price or cost of Internet service is another consideration that may affect the successful implementation of an e-government strategy.  The cost of the Internet connectivity varies widely from one country to another.  According to the International Telecommunication Union (ITU) (2003), the cost of fast Internet connection –commonly known as broadband – in general is less expensive in urban cities because of the high level of competition between Internet service providers and the availability of infrastructure. The following diagram (Figure 11) was published

by ITU (2003) and it shows the broadband subscription prices in several countries.   By reviewing

the diagram we can find out that Japan has the cheapest Internet prices among the countries listed,

with the total cost of 24.19 USD per month.  Moreover, the Japanese need to pay less than 0.01%

of their monthly income to subscribe for 100 kilobytes per second which is also the cheapest rate

among the countries included in the research.  According to the same diagram, the highest internet

broadband price was recorded in Australia with a total cost of 91.72 USD per month which makes

0.55% of Australian monthly income.  Danish citizens needed to pay 1.55% of their monthly

income to get the Internet service which is about 46.63 USD.  The cost of broadband in United

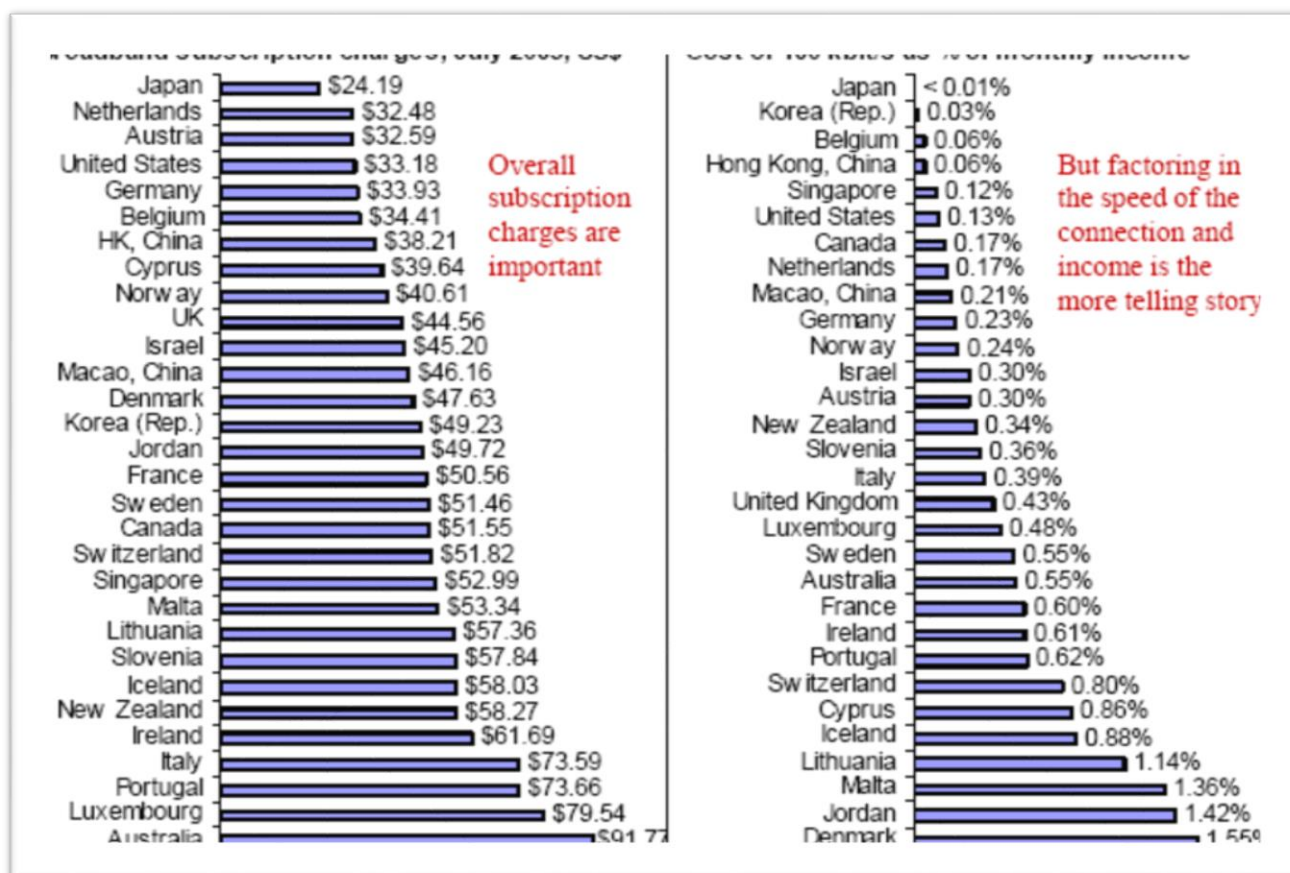States was 33.18 USD which makes about 0.13% of the American average monthly income



*Figure 11- Broadband Prices – Source ITU Research*

Because of expensive monthly charges for the Internet connection, in some countries a high number of citizens cannot get the Internet services even when the Internet links are available. According to the Information and Communication Technology magazine, "three in five of the world's people are not connected to the Internet" (ICTworks, 2014). The same source indicated that out of research done in forty six countries around the world, the basic Internet subscription cost is more than the average monthly income of 40 percent of the citizens.

The UN e-government survey-2008 notes that as a proportion of monthly income, internet access in the United States is 250 times cheaper than in Nepal and 50 times cheaper than in Sri Lanka. In the United States, 50 per cent of the people use the internet compared to a global average of 6.7 per cent. In Indian sub-continent, it is a mere 0.4 percent. Studies have shown that even in developed countries online transactional systems have achieved modest and, in many cases, extremely low usage levels. (Electronic Development and Environment Information System)

There are many ways which will reduce the cost of the Internet. First, as ICTworks suggested, is to allow competition among providers. The same source explained that

"Competition alone, or the introduction of a particular number of players in a market, is not a sufficient condition to ensure affordable access to broadband services in emerging and developing countries. Well-rounded policies and regulations that stimulate both supply of and demand for broadband are a must" (ICTworks, 2014).

Second, reducing the Internet service cost can be accomplished through policies that minimize investment risk for the projects that might facilitate the citizens' regular use. This can be achieved by allowing different network operators and Internet service provider to share the same

infrastructure resources. ICTworks suggested to create public-private partnerships (PPPs) to promote and encourage infrastructure projects like the Internet and network projects. Last but not least, according to the same source "governments play a key role in securing the benefits of infrastructure investment in non-commercially attractive areas. The experiences of the government of Morocco, Pakistan and Colombia demonstrate how targeted subsidies are harnessed to bolster local content and services. Another direct approach to fostering demand is to reduce taxation on the telecommunications sector" (ICTworks, 2014).

## 9.4 Infrastructure

Infrastructure is another challenge for successful implementation of e-government. The IT infrastructure can be defined as a composite of hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment. It allows an organization to deliver IT solutions and services to its employees, partners and/or customers and is usually internal to an organization and deployed within owned facilities. Each component in an information technology infrastructure can have one or more subcomponents which are essential to running online applications. The hardware component can include computers, servers, switches, routers or hubs. The software components should have the required software for facilitating daily operations like enterprise resources planning (ERP) or customer relationship management (CRM). The network component in the IT infrastructure consists of security related assets like firewalls, Internet connection and the level of network.

Infrastructure can be expensive to construct and control. Some governments outsource the construction of the infrastructure to reduce the expenses but some government prefer build and operate it themselves. "Outsourcing can be an attractive option for an organization that wants to control its costs or take advantage of expertise" (Beisse, 2013, p. 51). Outsourcing the

infrastructure helps the government focus its resources on enhancing the public services and leave the rest to someone who is specializes in it. In addition to the cost reduction of the outsourcing, it has the risk sharing motivation and helps organization focusing in the core business. According to Alshihi, the most important factor in the IT infrastructure can be the security. Government needs to ensure best security tools in their online applications in order to attract users to use the applications. In order to ensure the electronic information security, the government should make sure of the availability of high reliability and performance of communication links.

# 9.5 Data Quality (DQ)

Maintaining data quality among different governmental and private organizations is another challenge which can affect the successful implementation of e-government. Nicoletti, Bernardo and Palgrave (2015) studied data quality in multiple organizations. Their studies discovered that data quality is a major challenge. For the organizations studied, they found that as much as twenty five percent of data collected by organizations was inaccurate. Forty three percent of the organizations are not even able to maintain accurate information for their daily transactions and operations. "Organizations will never be able to fully realize the potential of big data analytics if they cannot make up for the possible inaccuracy of data." (p. 209). To further discuss this challenge, Colace, De Santo and Moscato (2015), explained that data quality can be defined by three measures; accuracy, precision and timeliness.

Accuracy refers to whether the values stored for a specific attribute are correct. The same source defined precision as the "degree which further measurement or calculation show the same or similar results" (Colace, De Santo and Moscato, 2015 p. 85). The same source defined the data timeliness as the availability of the data at the required time. Data might be accurate, precise and complete at the time of insert into a database, but the data may change over time and that can mean

inaccurate and incompleteness at query time.  An example of this is a person's birth place might be correct to be Soviet Union at 1970,  but if the query was performed more  recently then the Soviet Union is not an option and the country should have been updated to one of the following countries:  Belarus, Bulgaria,  Czech  Republic, Hungary, Moldova, Poland,  Romania, Russia, Slovakia or Ukraine.  This means ensuring data timeliness is an essential part of updating master data or lookup tables like countries' names master which at the end lead to data quality improvement.

Jonathan and Andrian (2000) explained in detail several methods that can be utilized for error detection, like statistical (using mean, standard deviation or range).  Microsoft Excel provides easy and built-in functions and formulas to find the statistical figures required for data cleaning. The second error detection method explained by the same source is clustering.  Clustering is used to identify the outlier by using clustering based on Euclidian distance.  The same source suggested not using the clustering algorithm for a huge amount of records because it has computational complexity which required a lot of computational time.   Another method that was explained is pattern-based. The main purpose of pattern-based is identifying records or fields that do not belong to existing patterns in data.   The association rules method described by Jonathan and Andrian. "Association rules with high confidence and support define a different kind of pattern. As before, records that do not follow these rules are considered outliers" (Jonathan and Andrian, 2000, p. 4). In the transactional database association rule is the process of finding rules that will predict the availability of a value based on the availability in other value in the same transaction.  There are many programing tools available for the data cleaning and data mining used by data analysts. Some of the open source tools are Weka (figure 12), R programing, Orange (figure 13) and MLTK (figure 14).
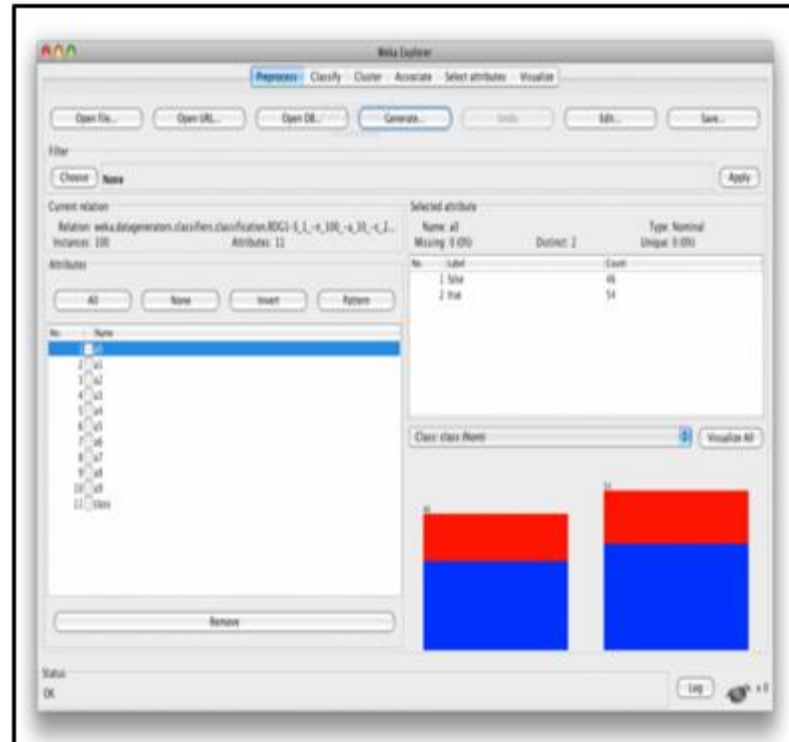
*Figure 12- Weka Application*
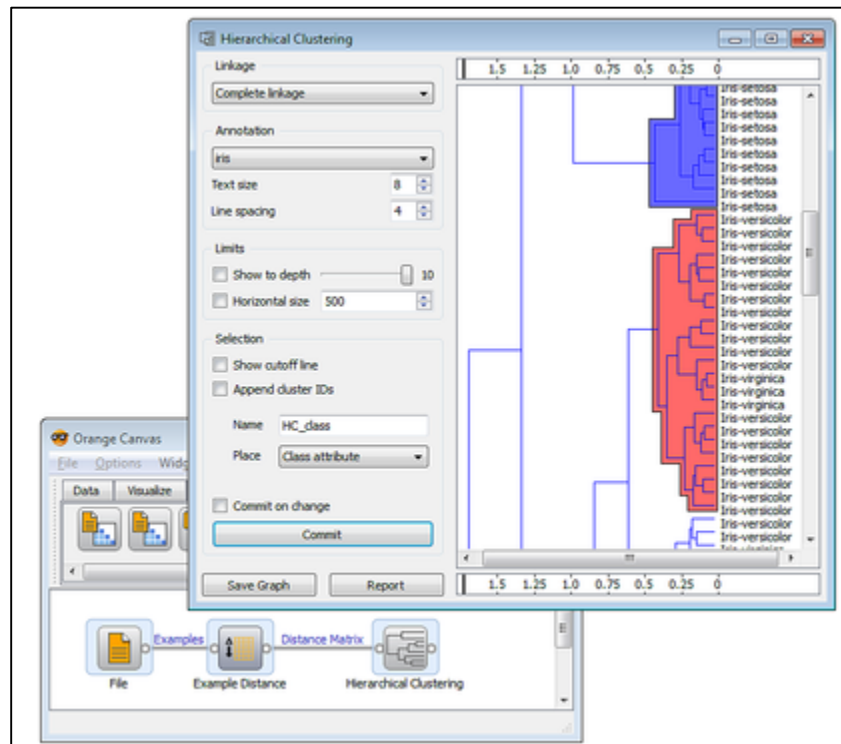


*Figure 13- Orange Application*
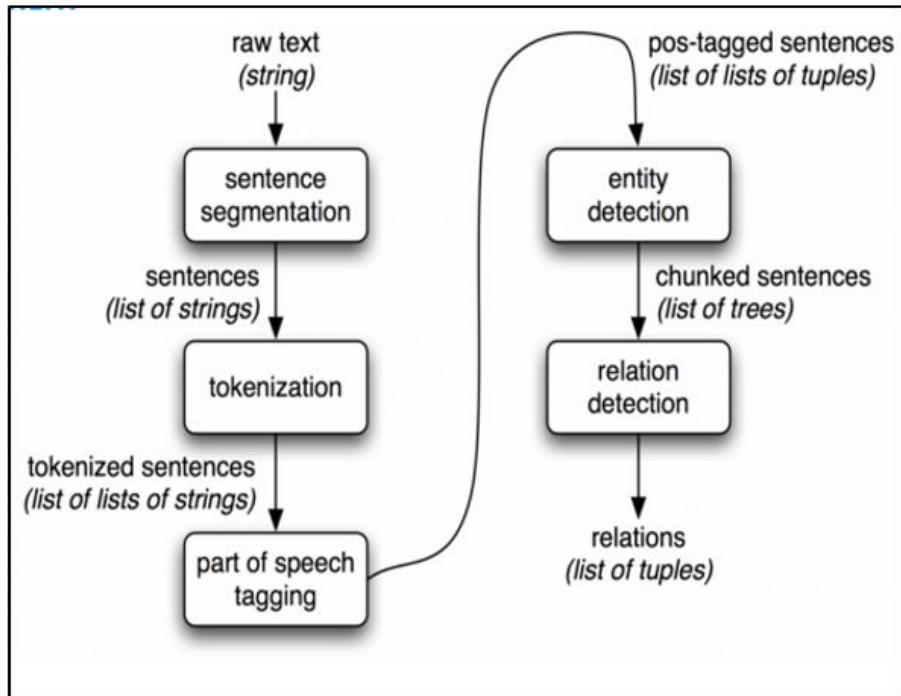
F*Figure 14- MLTK Application*

Teorey, Lightstone and Nadeau (2010) explained that regular data cleaning is one of the tools required to maintain data quality. Data cleaning is the process of improving the quality of data by removing errors and inconsistencies from data. The same source explained that data cleaning can have many actions like detecting missing data, inconsistent data, homonyms, synonyms, and data with different units. Maintaining data and information updated and can help reduce the information and data challenge. Kimball and Ross (2013) study showed that cleaning data are critical for system operations.

Bad data or errors in data can have many sources. Hellerstein (2008) explained in detail four different sources of bad data. The first source was explained is data entry errors where the information is extracted by humans from speech via phone calls or by keying the data from written or printed sources. Measurement errors are the second source of bad data as explained by Hellerstein: "In some cases these measurements are undertaken by human processes that can have

errors in their design" (Hellerstein, 2008, p. 2). Distillation errors are the third source and it refers to preprocessing and summarizing the data before uploading them to the database. The last source of errors in data is data integration errors, where data are migrated from a previous database to an existing database.

In order to achieve a high rate of data quality and maintain clean data in a database, Hellerstein (2008) suggested several methodologies be implemented. The first approach is to construct a well data entry interface design with proper keys, constraints and referential integrities to minimize committing dirty data to the database. Also, a well-designed interface can predict the allowable values for each field. For example, for the age field, 200 years should be considered as bad data and the system should refuse it. Another example, the system should refuse the value of 01-01-2020 in the date of birth field if the user tries to enter it today. This means that date of birth field should not be greater than system date  Validation of the data type and data length in the interface should also be deeply considered (for example, the system should refuse committing more than ten numbers for a local telephone number in US). The second approach described in the same book is organizational management. This approach includes streamlining processes for data collection and automating data capture, both of which can minimize opportunities for errors. Another approach was explained in the same source is to use exploratory data analysis and cleaning:

> Exploratory Data Analysis (sometimes called Exploratory Data Mining in more recent literature) typically involves a human in the process of understanding properties of a dataset, including the identification and possible rectification of errors. Data profiling is often used to give a big picture of the contents of a dataset, alongside metadata that describes the possible structures and values in the database.

Data visualizations are often used to make statistical properties of the data (distributions, correlations, etc.) accessible to data analysts (Hellerstein, 2008, p3)

# 9.6 Regular Modernization

Technology change is another challenge which can affect the successful implementation of e-government initiatives and systems. Unfortunately, several studies have shown that some organizations –especially public or governmental organizations – prefer to use a legacy systems and decline to modernize their software applications in a timely fashion. The Center for Electronic Governance at the United Nation University –UNU- defined a legacy system as "a computer system or program which continues to be used because of the cost of replacing or redesigning it". The same document explained that legacy systems are old and generally large. Old system refers that the programming languages used for the software application are outdated or obsolete. Old systems enhancements or troubleshooting generally is difficult. Also, it is expensive to find vendor support for enhancing old software applications. Legacy systems generally can suffer from compatibility issues with newly purchased systems. Some organizations prefer to use legacy systems for many reasons including difficulties of defining the scope of new applications, often this is a problem of older applications which are complexities and they have a poor documentations. Another reasons for preferring the legacy systems is the cost of redesigning and deploying a new application.

In order to solve this issue, the IT specialist need to explain to their organization how dangerous is to continue using legacy systems. Old software applications are at risk of corruption at any time because of the many years of maintenance. *The Wall Street Journal* explained that legacy systems are causing many organizations to lose the ground in the market place because the software applications are not global which means they are not serving the clients or citizen

efficiently and effectively. Moreover, organizations need to be informed that it is extremely difficult to find trained staff who are capable of maintaining and enhancing legacy systems. Organizations -most of the time- consider upgrading from a legacy system to a modern outsourced application when they try to minimize their software application development and maintenance efforts.

> If a SaaS provider – SaaS stands for Software as a Service and it can be explained as a software distribution model where software applications are hosted by a service provider or a software company and made accessible to clients or customers through the network or the Internet- can offer, say, 85 percent or more of the functionality a company needs "out of the box," CIOs should seriously consider it. This does not mean the conversion is less complex; organizations will still need to address the new system's functional gaps. In addition, moving to a SaaS provider will task CIOs with migrating data to the provider's system, securing data, and integrating it with other application systems as necessary. Legacy systems' lack of business capability, combined with the retirement of the baby boomers who developed, implemented, and maintained them, will likely force CIOs to address them. And as they consider future technology investments, they should look to confirm they're making decisions that won't imprison their companies tomorrow."(The Wall Street Journal).

Even if the legacy systems are running efficiently and they meet the organization's current needs and requirements, they will not help the organization's grow and accommodate future needs. Organizations needs to use the modern software applications to prevent the possibility of the

software applications failure or not performing the proper daily electronic transactions and operations at any time.

## 9.7 Readiness

Readiness is the last challenge to be discussed. E-government readiness is commonly defined as the willingness of countries to utilize the Internet and other information technologies in providing public services electronically. Adegboyega, Janowski and Estevez (2007) explained that "e-Readiness measures how well a society is positioned to utilize the opportunities provided by Information and Communication Technologies (ICT). ICT infrastructure, human capital, regulations, policies and Internet penetration are all crucial component of e-readiness" (p 1). Al-Hadidi (2010) pointed out that "E-government vision requires a community that is information and technologically literate to access the information they require." (p.106). Anders (2011) explained that there are several studies summarized that some of the IT projects have not successfully meet goals and objectives regarding budget, time and functionality. The same source showed that the most important reason is the organization is not ready to implement a given IT project. The source showed that limited knowledge of IT adoption and its organizational impact may discourage management from an IT project. The employee-related dimension can affect the organization's IT readiness and can be defined as the skills capabilities of the employees to handle the IT project. Al-Hadidi explained the organizations' IT readiness can be evaluated by eight main factors, which are knowledgeable citizens, skilled workforce, macro economy, digital infrastructure, industry competitiveness, culture, ability and willingness to invest, and cost of living. Janowski (2005) explained that the organizations' leadership plays vital role in ensuring the IT readiness by motivating people, creating incentive for action, breaking down barriers to change and putting the right administrative mechanisms for e-government.

Palvia and Sharma (2007) documented that the top fifty countries that implemented the required infrastructure to digitalize the governmental services. In their study, they depended on the ranking provided by the UN report (2005). The report included the country and an index of IT readiness using a 0-1 scale where zero means that the country is not ready at all in implementing IT for the public services and one means that the country is fully ready to implement the e-government technology. The United States and Denmark achieved the highest index with values of 0.9062 in US and 0.9058 in Denmark. The Republic of Korea and Singapore were the top Asian countries in the readiness factors with a value of 0.8728 and 0.8505. Table 3 shows the e-government readiness index as of 2005.

| Rank | Country | Index | Rank | Country | Index |
|------|---------|-------|------|---------|-------|
| 1 | United States | 0.9062 | 26 | Slovenia | 0.6762 |
| 2 | Denmark | 0.9058 | 27 | Hungary | 0.6536 |
| 3 | Sweden | 0.8983 | 28 | Luxembourg | 0.6513 |
| 4 | United Kingdom | 0.8777 | 29 | Czech Republic | 0.6396 |
| 5 | Republic of Korea | 0.8727 | 30 | Portugal | 0.6084 |
| 6 | Australia | 0.8679 | 31 | Mexico | 0.6061 |
| 7 | Singapore | 0.8503 | 32 | Latvia | 0.6050 |
| 8 | Canada | 0.8425 | 33 | Brazil | 0.5981 |
| 9 | Finland | 0.8231 | 34 | Argentina | 0.5971 |
| 10 | Norway | 0.8228 | 35 | Greece | 0.5921 |
| 11 | Germany | 0.8050 | 36 | Slovakia | 0.5887 |
| 12 | Netherlands | 0.8021 | 37 | Cyprus | 0.5872 |
| 13 | New Zealand | 0.7987 | 38 | Poland | 0.5872 |
| 14 | Japan | 0.7801 | 39 | Spain | 0.5847 |
| 15 | Iceland | 0.7794 | 40 | Lithuania | 0.5786 |
| 16 | Austria | 0.7602 | 41 | Philippines | 0.5721 |
| 17 | Switzerland | 0.7548 | 42 | United Arab Emirates | 0.5718 |
| 18 | Belgium | 0.7381 | 43 | Malaysia | 0.5706 |
| 19 | Estonia | 0.7347 | 44 | Romania | 0.5704 |
| 20 | Ireland | 0.7251 | 45 | Bulgaria | 0.5605 |
| 21 | Malta | 0.7012 | 46 | Thailand | 0.5518 |
| 22 | Chile | 0.6963 | 47 | Croatia | 0.5480 |
| 23 | France | 0.6925 | 48 | Ukraine | 0.5456 |
| 24 | Israel | 0.6903 | 49 | Uruguay | 0.5387 |
| 25 | Italy | 0.6794 | 50 | Russian Federation | 0.5329 |

*Table 8- E-government Readiness Index 2005: Top 50 Countries*

To increase a country's readiness index, the responsible governments needs to conduct continued training and workshops for people who don't know how to use computer applications and software and to reduce the lack of digital applications and software knowledge.  Also, governments need to re-engineer their different organizational business processes under a joint standard to ensure the good performance of the services.  Government IT decision makers need to provide different service channels for the users, so that online governmental application can be used with different methods like personal computers, mobile phones, tablets, kiosks, and call centers in case there is any problem with connectivity.  Last but not least, governments need to evaluate the electronic services periodically to fix the issues and problems and enhance the existing features and applications.

## 10.0 Conclusion

Electronic government is the term reflecting the use of information and communication technology in public administration in an attempt to ease access to governmental information and services for citizens, businesses, and government agencies. Although electronic government helps governments, business and citizens handle day to day activity, assisting a government's economic policy, saving our environment by implementing go-green concepts and reducing the air and sound pollution. There are few challenges and issues that need to be addressed and controlled in order to be successful in implementing the e-government technology such as challenges associated with e-government design and development, users or targeted users challenges, maintaining data quality among different governmental organizations challenges, infrastructure or security, and governmental and citizen readiness for implanting the e-government.  As the number of electronic services provided by government increase and as the number of electronic government users - public organizations and citizens – like wise increase, new benefits and advantages might be

discovered and need to be explained. On the other hand, new issues, risks and challenges needs to be explained, administrated and controlled. Future researches to address the e-government challenges, propose solutions and recommend actions are needed to achieve best performance of the e-government. On the other hand, new researches and studies needs to be published to encourage the governments, specifically business and citizens to utilize the Internet, Information Technology (IT), Information and Communication Technologies (ICT s), and other web-based telecommunication technologies to use and implement efficient and effective public services through e-government.

# 11.0 References

Abramson, M. A. and Morin, T. L. (2003). E-government: A progress report. In: Abramson, M.A and Morin, T. L. E-government 2003, Rowman & Littlefield Publishers Inc, USA.

Alhadidi, A (2010). An Exploratory Study on Adoption and Diffusion of m-Government Services in the Sultanate of Oman.

AlShihi, H, (2006). "Critical Factors in the Adoption and Diffusion of E-government Initiatives in Oman".

Al-Mamari, Q., Corbitt, B., & Oyaro Gekara, V. (2013). E-government adoption in Oman: motivating factors from a government perspective.Transforming Government: People, Process and Policy

Archmann, S., & Iglesias, C. (2010). eGovernment: A Driving Force for Innovation and Efficiency in Public Administration. EIPAScope, 2010(1), 29-36.

Center for Technology in Government website (http://www.ctg.albany.edu/publications/reports/future_of_egov?chapter=2). Accessed on 02/04/2016

Chen, Y. N., Chen, H. M., Huang, W., & Ching, R. K. (2006). E-government strategies in developed and developing countries: An implementation framework and case study. Journal of Global Information Management, 14(1), 23.

Colace, F, De Santo, M, and Moscato, V. eds. (2015) Data Management in Pervasive Systems.

Eldis Magazine Website available online on (http://www.eldis.org) Accessed on 02/08/2016

Beisse, F (2013). A Guide to Computer User Support for Helpdesk and Support Specialists.

Fang, Z. (2002). E-government in digital era: concept, practice, and development. International journal of the Computer, the Internet and management, 10(2), 1-22.

Fulton, B. (2003). Leveraging Technology in the Service of Diplomacy: Innovation in the Department of State.

Huang, W., Siau, K. and Wei, K. K. (2005). Electronic Government Strategies and Implementation, Idea GroupF Publishing, PA.

Information Technology Association website (www.ita.gov.om) Accessed on 11/02/2015.

Information and Communication Technology magazine (ICTworks) website (http://www.ictworks.org/about) Accessed on 02/08/2016)

Janowski, T. (2005). Introduction to Electronic Government. Center for Electronic Governance. United Nations University.

Hellerstein , J.M. (2008). Quantitative Data Cleaning for Large Databases.

Higher Education Admission Centre website (http://www.heac.gov.om) Accessed on 03-28-2016.

Joseph, R. C. (2009). Government-to-Business (G2B) perspectives in E-government. Northeast Decision Sciences Institute Proceedings, 192-199.

Kettani, D, and Moulin, B. (2014). E-Government for Good Governance in Developing Countries. London, GB: Anthem Press, 2014.

Kimball, R, and Ross, M. (2013). The Data Warehouse Toolkit : The Definitive Guide to Dimensional Modeling.

Nicoletti, B. (2015). Palgrave Studies in Financial Services Technology : Digital Insurance. Basingstoke.

Organization for Economic Co-operation and Development -OECD- (2003) The e-Government Imperative, OECD publications, France. Available from http://www.keepeek.com/Digital-Asset-Management/oecd/governance/the-e-government-imperative_9789264101197-en#page1 Accessed on 10-14-2015.

Palvia, S. C. J., & Sharma, S. S. (2007). E-government and e-governance: definitions/domain framework and status around the world. Foundation of e-government, 1-12.

Pizzella, P. (2005). GovBenefits.gov: A Valuable E-Government Tool for Citizens. The Public Manager, 34[2], 37-42.

Qin, Z, Chang, Y, and Li, S. (2014). Advanced Topics in Science and Technology in China. E-Commerce Strategy.

Rabaiah, A. (Ed.). (2009). Best-Practice Framework for Developing and Implementing E-Government. Bruxelles,

Ronald, H.E, and Roy, H.M, eds. Air Pollution and Health. Cambridge, GBR: Royal Society of Chemistry

Schnoll, H.J.(2015). E-Government: Information, Technology, and Transformation.

Schuppan, T. (2009). E-Government in developing countries: Experiences from sub-Saharan Africa. Government Information Quarterly, 26(1), 118-127

Sunita, & Narang, M. (2014). E-governance: A move towards better governance.The International Journal of Business & Management.

Teorey, T.J., Lightstone, S.S., and Nadeau, T. (2010). Database Modeling and Design.

United Kingdom Government Services and Information website (www.gov.uk) Accessed on 04-01-2016

United Nation E-Government Survey (2014), E-Government for Future we want.

Zhao, F.,Scavarda, J.A., & Waxin, M. F. (2012). Key issues and challenges in e-government development: An integrative case study of the number one eCity in the Arab world. Information Technology & People, 25(4), 395-422.