

## The Readiness and Limitations of E-Government in Yemen

Anas Al-Aghbari<sup>a</sup>, Waheeb Abu-ulbeh<sup>a</sup>, Othman Ibrahim<sup>a</sup>, Faisal Saeed<sup>a,b</sup>

<sup>a</sup>Department of Information Systems, Faculty of Computing, Universiti Teknologi Malaysia, Malaysia

<sup>b</sup>Information Technology Departments, Sanhan Community College, Yemen

\*Corresponding author: anasmma1981@hotmail.com

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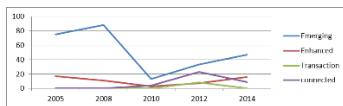
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### Graphical abstract



### Abstract

E-government refers to the use of Information technology to efficiently enhance government services that are provided to citizens, employees, businesses and agencies. The achievement of high level of E-government readiness is increasingly heralded as one of the top priorities for the countries in the world, especially in developing countries. Yemen is one of the developing countries that seeks to improve E-government implementation and services. Currently, Yemen government decided to revive the E-government by 2014–2015; but many challenges stand on the way from achieving this goal. This paper surveyed the E-government readiness ranking for Yemen from 2003 to 2014 using three factors, which are e-readiness rank, online services index and telecommunication infrastructure index; and compared the ranking of all factors with neighbored countries. In addition, this paper investigated the challenges that limit improving E-government in Yemen. These challenges are divided to three categories: organizational, technical and adoption challenges.

**Keywords:** E-Government; E-Readiness; E-Government Challenges

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### 1.0 INTRODUCTION

Information and Communication Technology is considered one of the top characteristics of the present age<sup>1</sup>; and every new development in ICT has impacted our lives<sup>2</sup>. Recently, E-government has become one of the fastest evolving and significant applications in ICT<sup>3</sup>, and the use of E-government refers to enhancing the government services efficiency that are provided to citizens, employees, businesses and agencies<sup>4-6</sup>. The functions of E-government can be categorized into; Government to Citizens, Government to Business, Government to Government and Government to Employee. The E-government aims to increase the effectiveness and efficiency of the public sector at the national, regional and local levels<sup>7-8</sup>. The most important purpose of E-government is to develop citizen-centric government catering to online-voting, licensing, student financial aid, tax transactions, incorporation services, online-licensing, which are catered to involve even previously apathetic citizens.

To apply successful E-government, countries are required to get readiness of infrastructure, technical skills and good online services. E-readiness<sup>5</sup> is a measure of the degree to which a country, nation or economy may be ready, willing or prepared to obtain benefits which arise from information and communication technologies<sup>9,10</sup>. There are many governments that have good rankings in E-government laid down advantageous E-government initiatives and have developed and used ICT technologies to disseminate information and services to their citizens<sup>4,6,8</sup>, while other governments still at the infancy stage of their E-government adoption and implementation<sup>8</sup>. For instance, Yemen, which is a

developing country, tries to enhance its E-government readiness rank and also attempts to determine the most suitable E-government model to provide the citizens with the best services and satisfy their requirements.

Based on the conducted review, a little work has been done to study the E-government readiness index and challenges in the context of Yemen. Therefore, in this article, the related researches from 2003 are explored to highlight the main challenges in this field. The paper is organized into six sections including the introduction as the following: methodology, E-government readiness index, overview of E-government in Yemen and the discussion and conclusion.

### 1.1 METHODOLOGY

The methodology contained two steps which started by reviewing the United Nations (UN) reports to know the readiness of E-government in Yemen compared with neighboring countries (GCC). The second step is reviewing the studies related to E-government challenges in Yemen.

- 1- This paper started by reviewing all UN reports from 2003 until 2014 to summarize the E-readiness and its indicator's ranking in Republic of Yemen. After that, the paper compares the Yemen ranking with the neighboring countries, Gulf Cooperation Council (GCC).
- 2- Review E-government studies in Yemen by using a relevant set of keywords and phrases, such as: electronic government, E-government, online services, information

technology. To choose related articles that studied the challenges, barriers and issues in context of E-government in Yemen.

## ■1.2 E-GOVERNMENT READINESS INDEX

E-government Readiness Index reflects the readiness of a country, city or government agency in terms of E-government development<sup>11</sup>. The index can be described as the generic capacity of the public sector to make use of ICT for providing services and quality information to the public along with effective communication tools that promotes human development<sup>12</sup>.

Models of E-readiness assessment determine and evaluate the readiness of a society and economy influenced by IT. Nevertheless, in terms of developing tools and surveys, a mere few global/regional surveys have been developed to assess E-government; for instance, the UN department of economic and social affairs (UN-DESA) e-readiness index, the Brown University E-government ranking, the World Economic Forum (WEF)'s network readiness index (NRI), the International telecommunication union (ITU)'s ICT development index (IDI) and the economist intelligence unit (EIU) e-readiness rankings<sup>12</sup>.

Every model has a distinct method to measure e-readiness. The studies<sup>13,14</sup> explained some assessment models for E-government readiness and highlighted the following points:

- 1- The Economist Intelligence Unit is concerned with country's ICT infrastructure and the consumers, businesses and government's ability to use ICT to their advantage. Specifically, the indices comprise of connectivity and technology infrastructure, business environment, consumer and business adoption, legal environment, social and cultural infrastructure, government policy and vision and supporting e-services.
- 2- The World Economic Forum (WEF) network readiness index (NRI) gauges the level of the nation/community's preparation to participate and leverage IT developments with the following indices; environment sub-index, readiness sub-index, usage sub-index, and impact sub-index.
- 3- UNDESA E-government readiness index is a composite measurement of the country's capacity or inclination to employ E-government for ICT-centered development. The indices include web measure index, telecommunication infrastructure index, and human capital index.

In addition, there are several reports that explained the e-readiness of the countries around the globe including Yemen. In fact, UNDESA reports explained E-government index in Yemen more clearly in all sub-indices with indicators from 2003-2014. So, in this paper UNDESA will be used to investigate the e-readiness ranking in Yemen.

### 1.2.1 Web Measure (Online Services) Index

Online service index measures the amount of service that is provided online by the governments. These services also evaluate the usage and satisfaction of the citizens with the inclusion of online services that are responding to people's demands, specifically vulnerable groups in order to determine whether e-infrastructure is playing its part in minimizing the digital divide or not<sup>15</sup>. The UN uses five stages in measuring online services of E-

government readiness, which are emerging, enhanced, interactive, transactional and connected.

### 1.2.2 Telecommunications Infrastructure Index

The significant initial step in introducing E-government is to develop the required IT infrastructure<sup>16</sup>. Specifically, telecommunications infrastructure index measure compares six major indicators which reflect the capacity of the country's ICT infrastructure. These indicators are: internet users, online population, mobile phones, TVs, telephone lines and broad banding.

### 1.2.3 Human Capital Index

Human capital index is a composite of the adult literacy level and the combination of primary, secondary and tertiary gross enrolment ration, with two third of the weight appropriated to adult literacy and the remaining one third to gross enrolment ratio.

## ■1.3 E-GOVERNMENT OVERVIEW IN YEMEN

Yemen is a developing nation located in the southern part of the Arabian Peninsula, bounded by Saudi Arabia and the Arabian Sea on the north, Oman on the West and the Red Sea on the West. It has a total area of approximately 555,000 sq. km, and has a population of 21 million.

### 1.3.1 A Review of ICT Sector in Yemen

The National Information Center (NIC) was established in 1995 to play the role of establishing development policies in the information field. NIC started to take significant actions towards the development of information infrastructure by 2000 as it adopted several projects to this end; for instance, the National Strategy for Information, the National Information Network, the Informatics Institute and the Yemeni e-library. Moreover, it also published data and information to its citizens and institutions.

According to the Ministry of Telecommunication's proposal to employ an ICT strategy, the name of the Ministry was amended to the Ministry of Telecommunications and IT in 2003. As part of the national strategy to support integrated development plans for the years 2001-2005, the plan to provide and facilitate ICT services met government approval. This is reinforced by the Ministry's announcement of the initiating a national program for IT (E-government) in 2002.

### 1.3.2 Internet Connectivity

Since 1995, the Republic of Yemen's connection to the outside world was facilitated through fiber optic network through a sea cable extending 226 km to Djibouti and to other Arab countries, South-East Asia and Europe.

However, the internet service was launched the following year by a single provider "TeleYemen", a company owned by the British Cable and Wireless Company and the Yemeni government with a 51% and 49% division respectively. Moreover, since its launching in 1996, the dial-up remained the means for Internet access. The number of subscribers in mid-2008 was noted to be 224,310, showing a significant increase from 109,127 in 2005. This was followed by the introduction of the ISDN in 2001 at a speed of 64 Kb/s and then at 128 Kb/s<sup>18,17,19</sup>.

Towards the end of 2003, the company ownership was transferred to the government and it became the Public Telecommunication Corporation. A year before its incorporation,

the company initiated work towards being the second provider of internet services and ever since, it has monopolized the provision of service by granting license to other Internet providers. This creates positions for new providers to enter the market and contribute to the network accessibility enhancement.

The ADSL service was launched in 2005 at a speed of up to 512 Kb/s and by mid-2006, the number of subscribers remained under 2781. This number increased to 13,512 in 2008 indicating that the service dissemination was not as expected owing to the relatively high cost. To date, the service tariffs are determined based on the information size. For example, the maximum capacities 5, 7, 9, 11 GB entail monthly fees of 2000-3500-5500 and 7500 Yemeni Rials respectively, at speeds of 158-256-512 and 1024. It is also allowed to provide leased line services with speeds from 64 Kb/s to 2 Mb/s<sup>18,17,19</sup>.

Towards the end of 2006, the Ministry of Telecommunications and IT launched the wireless internet services (Wi-Fi), with an initial <sup>17</sup> hot points in Sana'a and Aden. By the end of 2007, the number of sites hosted by the YemenPortal.net numbered 915 sites in comparison to only 185 sites two years before. In 2000, the public internet cafes numbered 50, but by 2007 it increased to 925 cafes, at an average of 6 Internet-enabled computers for every café. Furthermore, the Ministry of Telecommunications and IT has finalized the technical study for the establishment of the wireless internet project (WiMAX)<sup>19</sup>.

#### ■1.4 E-GOVERNMENT READINESS INDEX IN YEMEN

E-readiness refers to the measure of the readiness of the country's e-business environment. It consists of several factors that show the amenability of the market to Internet-based opportunities (The Economist Intelligence Unit, 2005).

In 2003, a project called the "E-government" was launched in Yemen with an approximate budget appropriation of \$60 million. The project aimed to provide e-civilian services such as application for ID cards. Nevertheless, owing to some insurmountable issues, the project ended in failure. By 2012, the Yemeni government decided its revival and re-launching in 2014-2015<sup>20</sup>.

In the present time, Yemen still struggling to adopt IT services in government institutions, and to establish projects as a first stage to facilitate E-government and these include the National Program for Information Technology, better known as the Yemeni E-government project<sup>21</sup>.

##### 1.4.1 E-government Readiness Ranking for Yemen

The UN Secretariat's Department of Economic and Social Affairs is an important conduit between global policies in the realm of economic, social, environmental and national activities. Various reports have been bi-yearly issued by the UN since 2003 to 2014 with the objective of highlighting the composite index of e-government readiness according to website assessment, telecommunication infrastructure, and endowment of human resource. Specifically, the UN Global E-government Survey 2003 conducted an assessment of 191 UN member states and focused on the adoption of e-government by examining the linkage between government to citizens (G2C) and citizens to government (C2G) dimensions.

Meanwhile, the E-government Readiness Survey 2004 conducted an assessment of the willingness and the readiness of governments around the globe to leverage ICT in improving the access and quality of social services to the citizens for the purpose of sustaining human development. Such a survey involved over 50,000 features of E-government websites obtained from 191 UN Member States. According to the survey findings, developing

countries are not capable of leveraging E-government potential owing to their limited ICT and educational infrastructure<sup>12</sup>.

As for the E-government Readiness Survey 2005 assessed over 50,000 e-government websites of 191 UN Member States in terms of features, to determine the readiness of such governments in leveraging ICT potential to enhance the use, and access of social services. The survey findings revealed that majority of countries succeeded in solidifying their online presence and in developing their services to mature areas of e-service delivery<sup>22</sup>.

This is followed by the fourth UN E-government survey in 2008 where a comparative assessment of the 192 UN Member States were conducted to satisfy the increasing citizens' and businesses' demands for effective government services and quality products. This survey sought to offer governments with a gauging mechanism that highlights their strengths and weaknesses in the e-government realm. Specifically, it assessed the government to citizen (G2C) and government to government (G2G) e-government dimensions. It also touched upon the government to business (G2B) aspect but in a limited way<sup>23</sup>.

In the UN E-government Survey conducted in 2010, the focus was on global financial and economic crisis and the survey findings showed progress in the linkage between e-government supply and demand despite more room for improvement on a global scale. Governments were advised to explore places where citizens were not aware of e-government services and are thus, disinclined to use them – the major reasons being ineffective marketing and the ICT initiatives design as efficiency measures (automated complex functions involved in income tax collection, registration in schools and social benefits processing) with little to no feedback from beneficiaries<sup>24</sup>.

The above survey is followed by the UN Survey 2012 which assessed the progress of e-government and showed successful attempts to go beyond service delivery and developing a framework for a smart, inclusive and sustainable growth for the future.

In the present climate characterized by recession, some countries have better capabilities to continue their investments in ICT infrastructure and service improvement while others evaluate their marginal utility of investment, taking low user uptake of services into consideration and re-analyzing service portfolios in places with low demand for online services. Several countries having low infrastructure and human capital level retained their low levels of e-government development while facing the crucial issue of digital divide<sup>15</sup>.

The UN E-government Survey of 2014 entitled "E-government for the Future We Want", addresses the multiple aspects and challenges faced by the current societies. The survey publication in all eight chapters focuses on the e-government aspects in order to promote sustainable development. By this time, all the 193 member states of the UN have succeeded in forming online presence compared to 18 with no online presence back in 2003 and three countries in 2012. Despite the minimal increase in email use from 2012 to 2014, to over two-thirds of countries, it is expected to show more growth in the future, particularly for the purpose of provision of information and notification<sup>25</sup>.

So, The United Nations E-government Surveys is the main references for readiness and ranking for e-government in Yemen. In 2002, Yemen launched a 10-year e-government programme with a budget of USD 50 to 60 million which aimed to provide better access to services to disadvantaged groups, increasing access to telephone services and moving to electronic financial transactions. The Internet was introduced in Yemen in 1996 and its usage increased gradually between 2000 and 2010, with a big jump in the number of Internet users from 420,000 in 2010 to 3,691,000 in 2012 representing 14.9 per cent of the total population. Despite big improvement in Yemen's e-services, the awareness and usage

among the population is still relatively low. According to a 2013 study, 29.4 per cent of the citizens were not aware of e-government services, 47.6 per cent were aware but not using them and only 22.3 per cent reported using the services. Awareness and usage is also much higher among men than women. Countries such as Yemen that have recently made a significant investment in e-government, also need to focus on providing ICT-literacy training, as well as to

raise awareness of the benefits of e-services, including through social media, to ensure high adoption and maximum benefits of e-governments services. As a result of ongoing improvements, Yemen's rank increased from 167 to 150 in the global ranking, between 2012 and 2014<sup>25</sup>. Table 1 explained the E-government ranking from 2003 until 2014.

**Table 1** Yemen E-government readiness rank from 2003-2014

Year	2003	2004	2005	2008	2010	2012	2104
Yemen rank	151	154	154	164	164	167	150

#### 1.4.2 Indicators for E-government Readiness in Yemen

In the UN report, which is the mine reference of this study, E-government Index contains three indices which are: Online Services Index, Telecommunication Infrastructure Index and Human capital index.

Table 2 shows the E-government Index for Yemen from 2003 until 2014 in online services, telecommunication infrastructure and human capital.

**Table2** E-government readiness indices in Yemen from 2003-2014

Year	Online services index	Tel Infrastructure index	Human capital
2003	0.044	0.039	0.48
2004	0.054	0.040	0.0490
2005	0.0962	0.0413	0.5000
2008	0.0736	0.0286	0.05446
2010	0.0476	0.0298	0.05739
2012	0.1765	0.1011	0.4642
2014	0.3071	0.1249	0.3840

#### Online Services Index

Online services index assesses the ability to deliver the services to the citizens. Also, measures the online presence of national websites, along with those of the Ministries of Health, Education, and Finance. Due to certain un-operational links and outdated index contents, Yemen received low points on online service index. For each ministry, there is a private website which is not linked to the portal. Hence, the low online service index was attributed to these problems.

Figure 1 shows the fourth stage of online service data in Yemen based on United Nations E-government Survey from 2003 to 2014 including emerging information services, enhanced information services, transactional services and connected services.

Figure 1 compares the rates of online services indices (emerging, enhanced, interaction, Transaction and connected) from 2005 and 2014. It can be seen that the rates for emerging, enhanced and interactive are high in 2005 and 2008, which can be attributed to the government's decision to start implementing E-government in 2002. But due to certain problems, these stages reached their lowest levels in 2010. In the other hand, the value for the transaction and connected was zero in the same years. But in 2010 the rate connected increased to 4.

As mentioned earlier, the government decided to revive the E-government by 2014 – 2015. Therefore, Figure 2 shows high rates achieved in all stages in 2012 and 2014 transaction and connected

which decreased in 2014. The online services percentages presented in the above figure indicated the challenges faced by Yemen that limited its development of E-government.

#### 1.5 COMPARING E-READINESS BETWEEN YEMEN AND NEIGHBORING COUNTRIES

Yemen received low Readiness Rank in all indices compared to many countries around the world. Although, Yemen and Gulf Cooperation Council countries (GCCC) are quite similar in the environment and culture, but they have different rankings. This section compares E-readiness Rank and indices between Yemen and Gulf Cooperation Council countries (GCCC) that mentioned in UN report. Gulf Cooperation Council countries (GCCC) is located near Yemen, but there are significant differences between them in global ranking between 2005 and 2014 are evident as shown in Figure 2.

The observation of Figure 2, there are increasing in the ranking for Gulf Cooperation Council countries (GCCC) in all years except Kuwait which decreased in 2012. In 2014 three countries only increase the level of readiness include Yemen which increased in 2014 from 167 to 150 after obtained low level of E-government index in the years 2005, 2008 and 20012. However, the figure showed that Yemen still one of the lowest countries in term of E-government readiness.



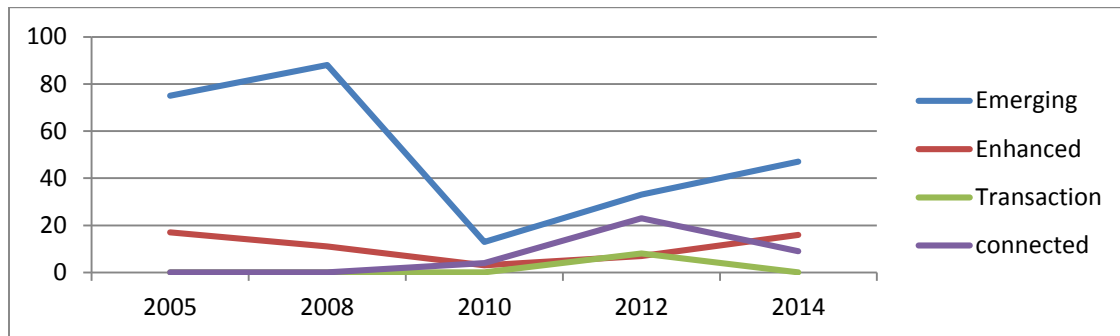


Figure 1 Online services index in Yemen from 2005 -2014

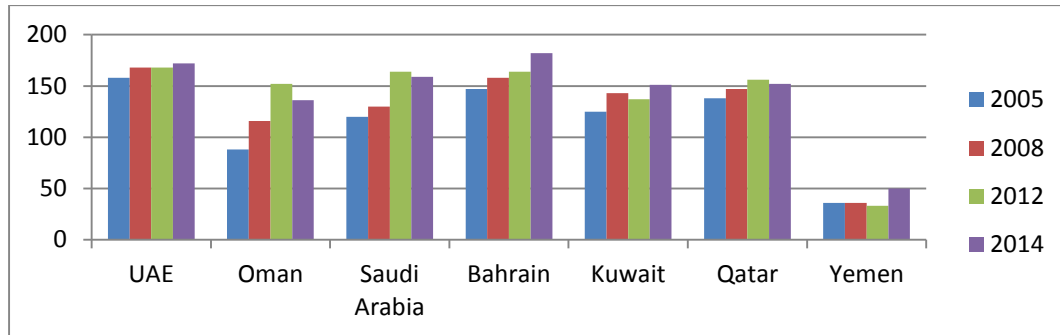


Figure 2 E-government rank for Yemen and Cooperation Council countries (GCC) in 2005, 2008, 2012 and 2014

### 1.6 E-GOVERNMENT CHALLENGES IN YEMEN

The implementation of many e-government projects, however, seems to have failed to achieve its full potential due to the complex nature of e-government<sup>26</sup>. However, E-government program does not have challenges in preparation step only, but also difficult to execute successfully. In the survey of Success and Failure Rates of E-government by Heeks (2003), only 15 percent of E-government projects in developing countries are successful, 35 percent are total failures and 50 percent partial failures<sup>27</sup>.

Yemen is seeking to develop its ICT sector for sustainable overall development<sup>28</sup> but there are many obstacles and challenges to successful E-government implementation, including financial, planning, political objectives, and lack of citizen acceptance and/or interest<sup>29</sup>.

The challenges that are facing the implementation and deployment of E-government in Yemen and revealed two kinds of challenges: organizational challenges, which refer to the challenges revealed by the participants; these include barriers, resistance due to fear of losing jobs, leadership commitment, E-government ownership, and training of all government employees, and Technical Challenges of E-government such as building a national infrastructure, training IT professionals, security, and Internet infrastructure<sup>30</sup>.

Ali A. Al-wazir in 2012<sup>31</sup> examined the assessment and solution for E-Government development in Yemen and indicated that the characteristics of the current reality of E-government development indicator in Yemen and its sub-indices highlights many challenges facing the task of E-government in the current stage which are: lack of budget, changes of priorities where the project has low priority and lack of qualified human resources to manage and implement the project. They suggested that Yemeni government should focus on improving the online services by rebuilding the national portal to be able to give citizens needed

services. Also, the government must integrate citizens' needs to E-government strategy and the process of service development in order for citizens to achieve maximum benefits from their E-government promises.

Similarly, Asma Al-hashmi 2013<sup>28</sup> looked into the user awareness of E-government in Yemen and the results from the questionnaire responses revealed that only 30% of the citizens are aware of these E-government services, only 22% avail from these services, and 48% do not avail from them, indicating a good topic for research.

In addition, the impact of culture on e-readiness in terms of E-government in Yemen society was studied by Al-Eryani<sup>32</sup> and the finding showed a gap between genders in e-readiness in Yemen due to the culture where males are offered more opportunities in terms of education, job, income and experience in computers and Internet which influences E-government adoption and use.

However, in the past 8 years, an increasing number of studies focused on the E-government challenges in Yemen. As explained above, many researchers believe that the challenges have to be addressed to improve E-government in Yemen.

There are many studies on E-government challenges conducted in developing and developed countries divided the challenges to three categories or more for example: Furuho<sup>33</sup> examined the E-government initiatives and conclude that E-government initiative faces serious challenges which are described in many articles and these challenges seem to fall into three categories: management, infrastructure, and human factors<sup>33</sup>.

In this paper, we have analyzed the challenges from some studies on E-government in Yemen that focus on supply side and demand side, and all these challenges are divided to three categories which are: organizational, infrastructure, and adoption. Table 3 summarized the challenges in all studies.

**Table 3** E-government challenges summary in Yemen

<b>Authors</b>	<b>Topic</b>	<b>Organizational Challenges</b>	<b>Technical Challenges</b>	<b>Adoption Challenges</b>
<b>Alsohybe,2007, [34]</b>	The implementation of E-government in the republic of Yemen: an empirical evaluation of the technical and organizational readiness	1- resistance due to fear of losing jobs, 2- leadership commitment, 3- E-government ownership,	1- building a national infrastructure, 2- training IT professionals,	1- trust online transaction 2- Security
<b>AL-raimi, 2009 [35]</b>	Towards a Sustainable E-government Infrastructure Initiative: The Case of Yemen	Difficulties of management IT.	1- Internet infrastructure	
<b>Al-Hagery,2010 [36]</b>	Basic criteria for the purpose of applying E-government in the Republic of Yemen	1- Lack of law .	1- Lack of infrastructure and limited resources 2- Lack of staff training	2- Lack of citizens' income and the high price of Internet 3- High rate of illiteracy among the population as well as increasing the number of citizens who are unable to use the computer 4- Lack of awareness in E-government and technology 5- the complexity of Most traditional systems of government
<b>Ali A. Al-wazir, 2012 [31]</b>	E-government Development in Yemen: Assessment and Solutions	1- Lack of IT budget. 2- Lack of leadership. 3- resistance to change ,	1- Lack of IT skills. 2- Lack of infrastructure and the disruption of the structure of the national economy.	
<b>Al-eryani, 2013 [32]</b>	The Impact Of The Culture On The E-Readiness For E-government In Developing Countries			1- Deferent between man women 2- Computer experience and Internet experience 3- poor quality education, 4- low income 5- big differences between urban and rural 6- Trust Expectancy scale is still one of the weaknesses 7- high belief in E-government 8- Era requirement.
<b>Asma Al-hashmi, 2013 [28]</b>	Evaluating the Awareness of E-government in the Republic of Yemen			1- Low of the awareness 2- Yemeni culture affects the participation of females in using E-government.
<b>Al-wazir, 2014 [37]</b>	Factors Influencing E-government Implementation in Least Developed Countries: A Case Study of Yemen		1. Internet network 2. Information system	1- Awareness 2- Compatibility 3- Trust 4- Experience 5- Security 6- Website design and Website content

In these studies, there are many challenges mentioned by more than one study. For example, trust and low income with high price for internet in adoption challenges mentioned by three studies. In addition, the technical challenges (infrastructure and training) were mentioned by more than three studies. In the next section, these challenges are summarized and discussed.

### 1.7 DISCUSSION

As mentioned in the previous sections, Yemen had low ranking in E-government readiness in last developing countries, for example the ranking of Yemen in 2014 is 150 from 193 countries based on UN 2014 report<sup>25</sup>. In comparison to the neighbored countries (Gulf Cooperation Council countries) (GCC) that have similar environment and culture, we found that Yemen is in the last position. So, Yemen can improve the E-government readiness if it can solve the challenges that influence E-government.

Table 6 contains some studies that explained the challenges that limit the development of E-government in Yemen. The challenges are divided to three categories as shown in Tables 4-6.

#### 1.7.1 Organizational Challenges

Organizational challenges can be summarized into following points: resistant to change, leadership, management, cost of development, cooperation between agensis and law as shown in Table 4.

Table 4 E-government organizational challenges summary in Yemen

Challenges	Authors					
	Alsohybe,2007, [34]	AL-raimi, 2009 [35]	Al Hagery,2010 [36]	Ali A. Al-wazir, 2012 [31]	Al-eryani, 2013 [32]	
Resistant to change	√				√	
Leadership	√			√		
management		√				
Law			√			
Cost of development				√		
Cooperation between agensis						

In Table 4, most of studies in 2012 mentioned all organizational challenges. Resistant to change and leadership only mentioned as challenges in 2007 and also available in 2012, while management mentioned in 2009 but it has faded in recent years. Therefore, we can say that, all challenges mentioned in Table 4 except Management are considered the main organizational challenges for E-government in Yemen. That is because strong leadership with vision is crucial for the successful implementation of any type of E-government project and the government should clearly articulate its vision and motivate all stakeholders to share that vision<sup>26,38</sup>.

#### 1.7.2 Technical Challenges

Technical challenges can be summarized into two points: infrastructure and training and IT skills as shown in the Table 5.

Table 5 E-government technical challenges summary in Yemen

Challenges	Authors			
	Alsohybe,207 [34]	AL-raimi, 2009 [35]	Al-Hagery,2010 [36]	Ali A. Al-wazir, 2012 [31]
Infrastructure	√	√	√	√
Training and IT skills	√		√	√

From Table 5, we can notice that the infrastructure and training are the most important technical challenges which reported by the previous studies. That is because government must develop an effective telecommunication infrastructure to deliver E-government services. Therefore technical skills for implementation, maintenance, designing and installation of ICT infrastructure, as well as skills for using and managing online processes, functions and customers, are compulsory to successful E-government implementation<sup>38</sup>.

#### 1.7.3 Adoption Challenges

Adoption challenges are summarized to 13 challenges: Internet cost and low income, ability to use, awareness, trust, security, complexity, different between female and male, big different between urban and rural, and poor education as shown in the Table 6.

Table 6 shows the E-government adoption challenges that affect the use of E-government in Yemen and different challenges discussed by the authors. The most repeated challenges by more studies are trust which mentioned by three studies following by awareness and increase the number of unable of use computer and internet that mentioned by three studies. The high cost and low income, security and different between man and women mentioned by two studies.

However, According to case studies from different countries, there are many challenges and issues that need to be addressed for successful implementation of E-government. Adoption is an important aspect for the success of E-government initiatives in developing countries and the government decision makers, therefore, need an understanding of the factors that would encourage the use of electronic service delivery channels rather than more traditional service delivery methods. To date, there has been a little research exploring factors that determine the adoption of E-government services by citizens in developing countries, especially in the Arab world<sup>39-40</sup>.

Identifying the factors that influence the adoption of E-government services is essential for governments and government must understand what are the factors that could affect the successful adoption of IT<sup>41</sup>.

There are distinct factors that command the adoption of E-government, and these factors depend on the local context of any country. But there is no clear classification of these adoption factors<sup>42</sup>.

**Table 6** E-government adoption challenges summary in Yemen

Challenges	Authors					
	Alsohybe,2007 [34]	Al-Hagery,2010 [36]	Ali A. Al-wazir, 2012 [31]	Al-eryani, 2013 [32]	Asma Al-hashmi, 2013	Al-wazir, 2014 [37]
Internet cost and Low income		√		√		
IT literacy		√		√		√
Awareness		√			√	√
Trust	√			√		√
Security	√					√
Complexity		√				
Different between female and male				√	√	
big different between urban and rural				√		
Poor education				√		
Compatibility						√
Higher belief in E-government				√		
Website Design						√
Website Content						√

**1.8 CONCLUSION**

This paper surveyed E-government ranking in Yemen by reviewing the UN reports from 2003 until 2014 and comparing it with neighbored countries. The findings showed that, Yemen has the lowest ranking compared with other countries for all factors. In addition, this paper surveyed the challenges that limit developing E-government by reviewing the studies conducted in E-government in Yemen and summarized the challenges. This paper divided the challenges to three categories: organizational, technical and adoption challenges. The organizational challenges are summarized to: resistance to change, leadership, management, cost of development, cooperation between agensis and law, while the technical challenges are addressed in two points: infrastructure and training and IT skills. The third challenge is the E-government adoption that included six challenges: internet cost, low income, awareness, culture, digital divided and trust. It can be seen that, each of these challenges can be considered as a fresh research area to be studied. In future, we will investigate on E-government adoption challenges in Yemen, such as Internet cost and low income and IT literacy , awarenness, trust, security, complexity, different between female and male, big different between urban and rural, poor education, compatibility, higher belief in E-government, website design and website content.

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