



**INVESTIGATION OF HUMAN CAPITAL INDEX MEASUREMENT IN THE  
MIDDLE EAST COUNTRIES**

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**JUNE 2015**

**INVESTIGATION OF HUMAN CAPITAL INDEX MEASUREMENT IN THE  
MIDDLE EAST COUNTRIES**

**A THESIS SUBMITTED TO  
THE GRADUATE SCHOOL OF NATURAL AND APPLIED  
SCIENCES OF  
ÇANKAYA UNIVERSITY**

**BY  
MOHAMMED KAREEM HUSSEIN**

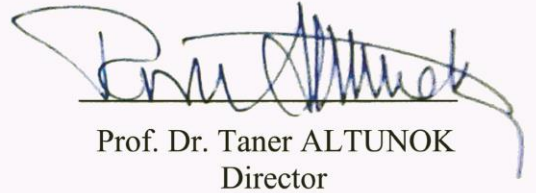
**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF  
MASTER OF SCIENCE  
IN  
THE DEPARTMENT OF  
MATHEMATICS AND COMPUTER SCIENCE  
INFORMATION TECHNOLOGY PROGRAM**

**JUNE 2015**

Title of the Thesis : **Investigation of Human Capital Index Measurement in the Middle East Countries.**

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## **ABSTRACT**

### **INVESTIGATION OF HUMAN CAPITAL INDEX MEASUREMENT IN THE MIDDLE EAST COUNTRIES**

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Program

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June 2015, 56 pages

The field of e-government has become one of the most developed and most important applications of Information and Communication Technology (ICT) around the world in recent years due to its positive impact on citizens, government and society because it refers to delivering government public services using ICT.

The e-readiness assessment and e-government performance measurements for a country rely on the availability of necessary infrastructure, online services and readiness of a community to use e-government applications. This study focuses how the Human Capital Index (HCI) fits into e-government performance measurements in Middle Eastern countries.

In parallel to the background, literature review and analysis data of Middle East countries in HCI, investigation in HCI for Middle East countries and potential issues that effect on HCI in those countries are done. Also, the impact of HCI proportion on the e-government performance is addressed.

The findings reveal impact of HCI on evaluating the e-government performance; geographical area and population also affect the adoption of e-government. Additionally, the level of ICT and computer literacy is relatively poor in Middle Eastern countries.

This research has limitations which include the sources of information, exclusive economic and legal issues and a limited number of measurement methods. Finally, the research opens HCI's weight into discussion in the evaluation of e-government performance although it is clear that whenever HCI increases in a country, it leads to an increase in e-government performance with the investigated measurement methods.

**Keywords:** E-government, Performance, Information and Communications Technology , Human Capital Index, E-readiness.

## ÖZ

# ORTADOĞU ÜLKELERİNDE BEŞERİ SERMAYE ENDEKSİ ÖLÇÜMÜ İNCELENMESİ

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Tez Danışmanı: Yrd. Doç. Dr. Ö. Tolga PUSATLI

Haziran 2015, 56 sayfa

E-devlet, günümüzde, tüm dünyada bilgi ve iletişim teknolojilerinde (BİT) en çok gelişen ve en önemli uygulamalar arasına katılmıştır. Bu, vatandaşlar, devletler ve toplum üzerindeki olumlu etkileri sayesinde olmaktadır çünkü devletin kamu hizmetlerini BİT kullanarak sunmaktadır.

Bir ülkenin e-hazırbulunuşluk değerlendirilmesi ve e-devlet başarımleri ölçümlenmesi, gerekli altyapı ile çevrimiçi hizmetlerin ulaşılabilirliğine ve toplumun e-devlet uygulamalarını kullanmasındaki hazırbulunuşluğuna dayanmaktadır. Bu çalışma, beşeri sermaye endeksinin (BSE), Orta Doğu ülkelerinin e-devlet başarımleri ölçümlenmesine nasıl uyduğuna odaklanmıştır.

Konuya ilişkin altyapı bilgileri, literatür taraması ve Orta Doğu ülkelerinin BSE verilerinin incelenmesine paralel olarak, söz konusu ülkeler için BSE araştırması ve gene bu ülkelerin BSE'ni etkileyecek olası durumlar araştırılmıştır. Bunlara ek olarak, BSE'nin e-devlet başarımleri üzerindeki etkisi çalışılmıştır.

Bulgular, BSE'nin e-devlet başarımleri üzerindeki etkisini göstermektedir; aynı şekilde, coğrafi konum ve nüfus e-devleti kabullenmeyi etkilemektedir. Ek olarak, BİT ve

bilgisayar kullanım seviyesi Orta Doęu lkelerinde greceli olarak zayıf bulunmuştur.

Bu araştırmayı sınırlayan unsurlardan, bilgi kaynakları, ekonomi ve yasal konuların hariç tutulması ve sınırlı sayıda ölçümlene yönteminin incelenmesi sayılabilir. İncelenen ölçümlenelerde BSE'nin yükselmesiye ülkenin e-devlet başarımı yükselmektedir; ancak, çalışma, BSE'nin e-devlet başarımında dięer ölçütlerin ağırlığında alınması tartışmaya açmıştır.

**Anahtar Sözcükler:** E-devlet, Performans, Bilgi ve İletişim Teknolojileri, Beşeri Sermaye Endeksi, E-hazırbulunuşluk



## **ACKNOWLEDGEMENTS**

I would like to express my sincere gratitude to Assist. Prof. Dr. Ö. Tolga PUSATLI, for his supervision, special guidance, suggestions, and encouragement through the development of this thesis.

It is pleasure to express my special thanks to my family who stood by my side during difficult times and then to all my friends.

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## **LIST OF ABBREVIATIONS**

<b>EGDI</b>	E-Government Readiness Index
<b>E-government</b>	Electronic Government
<b>G2B</b>	Government-to-Business
<b>G2C</b>	Government-to-Citizen
<b>G2G</b>	Government-to-Government
<b>HCI</b>	Human Capital Index
<b>ICT</b>	Information and communications technology
<b>ITU</b>	International Telecommunication Union
<b>OSI</b>	Online Service Index
<b>PC</b>	Personal Computer
<b>TII</b>	Telecommunication Infrastructure Index
<b>UN</b>	United Nations
<b>UNDP</b>	United Nations Development Programme
<b>UNICEF</b>	United Nations Children's Emergency Fund
<b>WEF</b>	World Economic Forum

## **CHAPTER 1**

### **INTRODUCTION**

The revolution of ICT in recent years, which includes the spread of mobile phones, reliance on email correspondence and the widespread of information on websites, has enabled the development of many applications such as e-learning, e-commerce, e-health and e-government.

In the current information age, ICT has a profound effect on most people's daily lives, including the socio-economic, political and cultural aspects of society around the world. These changes and developments in the world have stimulated governments to adopt e-government. The phenomenon of e-government started in the early 1990s. It refers to the use of ICT to provide services electronically to society in order to enhance and improve the efficiency, accountability, interactivity, transparency and accessibility to public services and access to information for citizens, businesses and other stakeholders. In this chapter, we will provide the motivation for the research (Section 1.1), describe the statement of the problem (Section 1.2), present the purpose, scope and research question (Section 1.3), and finally, we will outline the structure of the thesis (Section 1.4).

#### **1.1 Motivation**

E-government is now attracting the attention of researchers, non-profit organizations and independent research organizations that are endeavoring to outline the various frameworks and models for understanding the adoption and evaluation of e-government performance. It has become one of the most investigated applications of ICT in recent years. Moreover, these organizations provide a host of statistics and annual surveys of e-government issues in order to facilitate for governments and

public sector organizations to benefit from the experiences of their investigations within the scope of e-governments.

## **1.2 Statement of the Problem**

The e-government phenomenon can face great challenges and many problems still surround its spread and adoption in many countries.

The research problem in this study is identified through two main sources:

- The literature is examined in order to build the research background of e-government in addition to understanding the problems facing Middle Eastern countries, and in order to identify the gap in those countries in the Human Capital Index (HCI), such as portals, interoperability, literacy rates, Internet users, awareness, training, mobile phone interaction, culture and intention to use e-government services.
- The analysis study was conducted in Middle Eastern countries. In Chapter 3, we present our analysis of the available data from United Nations e-government surveys.

The findings from the literature review and the analysis data highlighted several issues, which will be explained in Chapter 4. The research specifically does not investigate other factors that may affect the spread or success of e-government services, such as the Online Services Index (OSI) or Telecommunications Infrastructure Index (TII), and we will rule out all of the legal and economic issues, which could contribute to increasing the gap between e-government adoption and implementation, as mentioned in the limitations section.

## **1.3 Purpose and Scope**

Although e-government has increased transparency and improved communication with linking institutions, it allows beneficiaries to access information and services that are allowed by portals.

On the contrary, the adoption of e-government services by the citizens has been lower than expected to some extent in most countries.



Many countries have been focusing on strategic plans to enhance their e-readiness and have decided how to improve them by following indicators set by global institutions such as the UN, ITU, WEF, the EU and OECD so as to evaluate e-government performance. Furthermore, they have neglected focusing on potential issues that affect e-government projects, particularly those relating to human capital. Moreover, they have neglected focusing on how these issues affect the spread and use of e-government services.

Due to the expansion of the field, we have narrowed the scope to focusing on more specific subjects. In this thesis, we will investigate in detail the HCI for Middle Eastern countries and the potential issues that affect delivery as well as the potential issues that affect e-government projects, particularly those relating to human capital in those countries.

Hence, the research question of this study is formulated thus:

- How does the HCI fit into e-government performance measurement in Middle Eastern countries?

#### **1.4 Thesis Outline**

The research presents a detailed examination of the background, literature review, data analysis, findings and discussion of the critical factors of e-government adoption. This section summarizes the content of the chapters.

##### **Chapter One: Introduction**

Chapter One is an overview of the research with clear statement of the motivation, research problem, purpose, scope, and research questions. Moreover, this chapter highlights the importance of the research. In the end, the outline of this search is provided.

##### **Chapter Two: Background and Literature review**

This chapter includes two sections. First, the background of e-government is a detailed presentation in terms of concepts, definitions, perspectives and performance measurements. Thereafter, the literature review section is presents an understanding

of the challenges of adopting and using e-government services in addition to the literature covering the situation of e-government in Middle Eastern countries. Finally, Chapter Two concludes with a discussion section.

### **Chapter Three: Analysis of Data**

Chapter Three explains the reasons for adopting the HCI in UN surveys. Furthermore, an analysis is conducted of the data gathered from UN surveys about Middle Eastern countries. The chapter analyses the factors of the Human Capital Index. Moreover, it explains how the geographical distribution of populations has a remarkable influence on the adoption of e-government. Finally, the chapter concludes with a discussion of this analysis of the data in the light of seeking answers to the research questions.

### **Chapter Four: Conclusion**

This chapter provides a description of data findings. The findings cover the collected data of UN surveys as well as limitations, future studies in order to answer the research questions as set out in Section 1.3.

## **CHAPTER 2**

### **BACKGROUND AND LITERATURE REVIEW**

This chapter aims to clarify the concept of e-government and the classification of the beneficiaries of e-government services. We will discuss methods of evaluating the performance of e-government by world standards. Three performance measurements were taken in e-government, which are the World Economic Forum (Section 2.1.2.1), the International Telecommunication Union ITU (Section 2.1.2.2) and United Nations surveys (Section 2.1.2.3).

Furthermore, we will explain the components of each measurement and explain the EGDI method of calculating the equations and rankings of countries by relying more broadly on the UN survey, which includes all of the Human Capital Index (HCI), Online Service Index (OSI) and the Telecommunications Infrastructure Index (TII) (Section 2.1.3).

#### **2.1 Background**

In this section, we will explain the e-government concept from several perspectives and our perspective on this concept, types of e-government delivery models and beneficiaries of electronic services, measurements of e-government performance and the indicators that depend on evaluations of e-government performance in the global measurements, such as the World Economic Forum, International Telecommunication Union, and United Nations surveys.

##### **2.1.1 E-Government**

There are many definitions of the concept of e-government as attention and focus on what the government, researchers or organizations to use it.

As stated by S. Alshomrani [2012], government interactions between ministries and government departments and institutions overcomes the challenges of geographical

area and time constraints, as well as interaction with citizens, companies and other organizations by using information technology and communications.

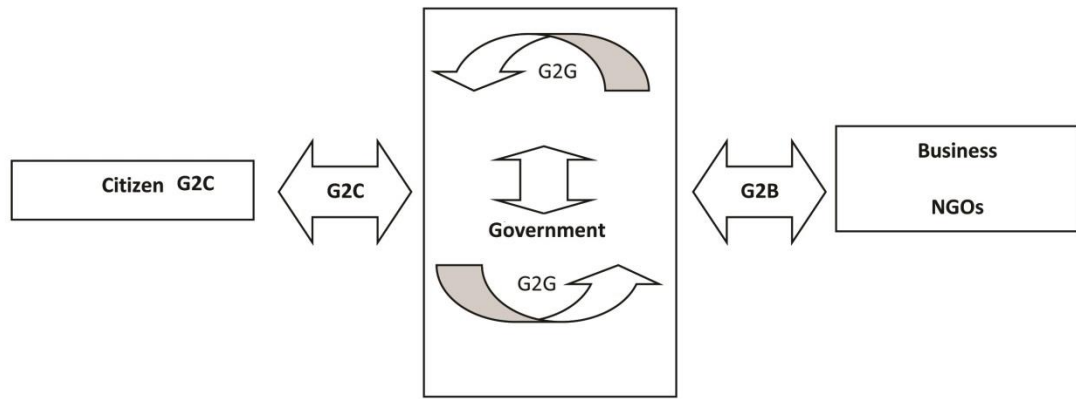
According to studies conducted by Dinesh Chandra Misra [2006], the researcher suggested that there are many perspectives to define e-government. Moreover, everyone can define the e-government term depending on view or usage. Two definitions of the term e-government were found.

**The first view** is as a department by the hierarchy of workers in institutions. The top level 1 of the pyramid sees e-government as e-services available on the Internet to meet the needs of citizens. Likewise, at least at level 2, the perception of it, e-government improves the services provided by the government to the community. At level 3, we see that it is a service available online. Finally, the last level 4 of the pyramid it sees it merely as computerization.

**The second view** of e-government is as one of the requirements needed by the government to improve the delivery of public services to the community.

E-government from our perspective is to transform traditional services and transactions into electronic services by using ICT across various channels to provide access for the beneficiaries, in less time, with more efficiency and at a higher speed in the execution of a transaction.

The primary goals of e-government can fall into three main groups that are prominent in e-governance concepts. These are citizens, businesses/interest groups and government. Three types of connections in e-government are government-to-government (G2G), government-to-business (G2B) and government-to-citizens (G2C). There are other different classifications of connections among government, business or citizens, but these three types can be found in most approaches. Figure 1 shows the relationships between the many actors of e-government.



**Figure 1** Interactions between main groups in e-government

Figure 1 shows the shares of interaction between government and citizens in two directions. The G2C arrow shows the interaction between citizens and the government, which receives information from citizens. Moreover, it provides them with information. The same case applies to G2G (the interaction between government departments and institutes) and G2B (the information between business and the government).

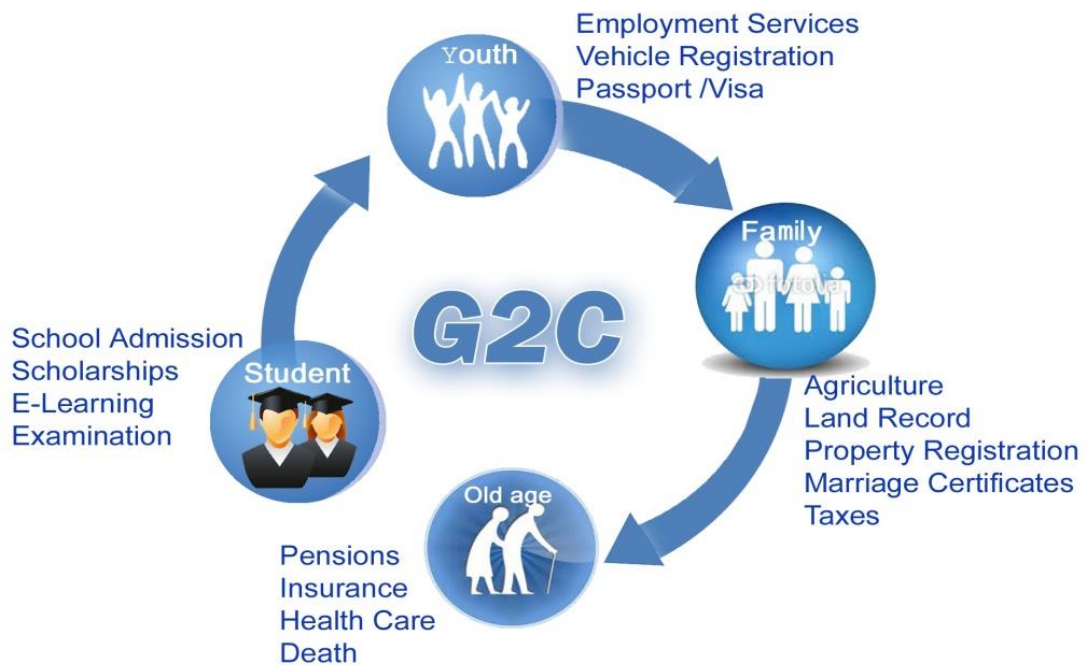
Government-to-citizen (G2C) is the electronic interaction between citizens and government services. It also enables citizens to interact with government institutions through electronic services, such as paying taxes, obtaining driver's licenses, applying for appointments as well as the dissemination of information and alerts to citizens and more [3]. Most electronic services provided by the government to citizens allow citizens access to information and services at any time and in any location through many channels, such as mobile phones, PCs or tablets. Figure 2 shows the channels used with e government services.

Moreover, the main objective of G2C is to provide services to citizens, promote interaction with the services, increase transparency and provide access to laws, regulations and government legislation. This leads to reductions in time and costs required to complete a transaction through the provision of e-government services to citizens.

On the other hand, e-government can also provide a wide range of services according to age group. Figure 3 shows some of the services, such as registration, renewal of a license or payment of fines or submission of comments to government officials.

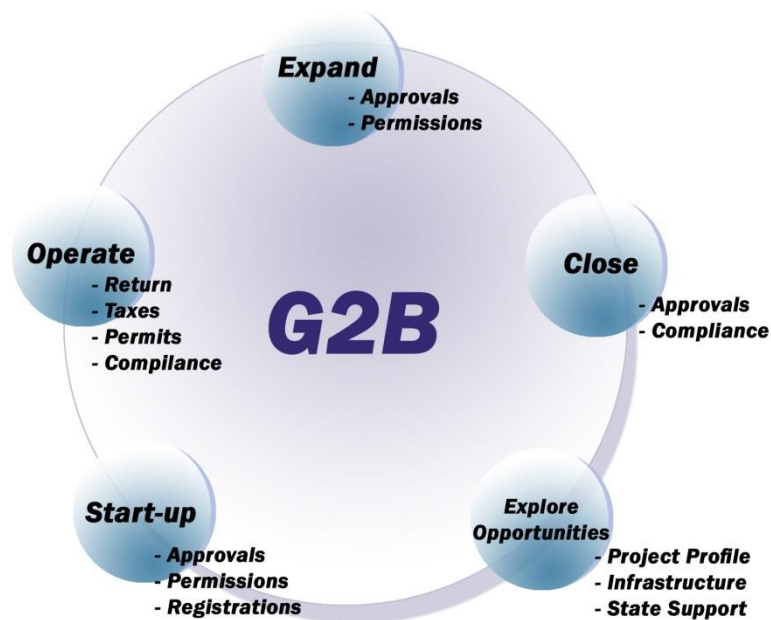


**Figure 2** Multiple channels of access to G2C services



**Figure 3** G2C services through life

Government-to-business (**G2B**), which is the relationship between the government and business, may be two way. The first direction is government to business (**G2B**). Examples include government auctions or electronic sales for companies. The second trend is between business and government (**B2G**), including selling or offering services to government departments and institutions that need to deal with private companies [3]. Examples include registering new companies through websites and the completion of transactions online. Moreover, governments departments competent in buying and selling can place events on their own websites, thereby allowing the business sector to bid or buy from such events. Figure 4 shows a number of e-services provided by government to businesses.



**Figure 4** G2B e-services

Government-to-government (G2G) refers to online relationships between governmental organizations, including those within one or various institutions as well as state or local organizations. G2G provides services more effectively between government departments. It also allows them to communicate and collaborate over the Internet to share information, databases, skills, resources and to promote efficiency and effectiveness in the performance of their operations.

## **2.1.2 Performance measurement in e-government**

Currently, the use of information technology has increased around the world to achieve efficiency in the provision of services within government and private institutions. In order to compare the success or failure rates of the performance of services, they have to rely on a number of indicators to know how to calculate the rate of success or failure and to work on the formulation of business strategies to achieve the required efficiency. This comparison also includes countries in the provision of electronic services for users so that there should be some indication of a comparison between the levels of service delivery between countries. In the next section, we will review some of the global measurements of the performance of e-services.

### **2.1.2.1 World Economic Forum**

We took the World Economic Forum as one of the measurements of e government because the components of the Networked Readiness Index are also dependent on the Human Capital Index for the use of ICT and the readiness for ICT.

The World Economic Forum is a non-profit foundation which was established in 1971. It includes 1,000 members of strategic industry partners, regional and global growth companies and technology pioneers such as strategic partners, industry partners, regional partners, foundation members, global agenda councils, global growth companies, global leadership fellows, technology pioneers, the Schwab foundation, young global leaders, global shapers, women leaders, civil society and academic networks. The goals of the forum include commitment to improving the state of the world, identifying challenges, finding solutions and procedures in partnership with political leaders, businessmen and academics. It provides annual reporting to its partners and members pertaining to all global, regional and industrial issues and future-oriented communities such as Rethinking Arab Employment, The Future of Government, The Global Gender Gap Report 2014, Future of Government Smart Toolbox, and The Global Information Technology Report 2014. [4].



**Environment sub-index:**

**Political and regulatory environment:** This includes evaluating the legal framework for information technology such as the efficiency of the law-making process, independence of the judiciary and the protection afforded to property rights.

**Business and innovation environment:** This measures the presence of the availability of venture capital for financing innovation related to projects, availability of technology and a skilled labor force.

**Readiness sub-index:** This is the index that measures the degree of readiness of the community to take advantage of information technology infrastructures, communications and digital content. It includes the following variables:

**Infrastructure and digital content pillar:** International Internet bandwidths, mobile network coverage, electricity production, secure Internet servers and accessibility of digital content.

**Affordability and cost of accessing ICTs:** Cost of accessing ICTs by mobile telephony or fixed broadband Internet and the level of competition in the telephony and Internet sectors that determine this cost.

**Skills:** Measured ability of society to effective ICT captured by the quality of the rate of secondary education enrollment, the educational system, and the level of adult literacy.

**Usages sub-index:** The capacity to use ICTs and their actual use in their daily activities by individuals, business and government.

**Individual usage:** This measures using the Internet, households with a personal computer (PC), fixed broadband subscriptions, mobile broadband subscriptions, households with Internet access, the number of mobile phone subscriptions, and the use of social networks.

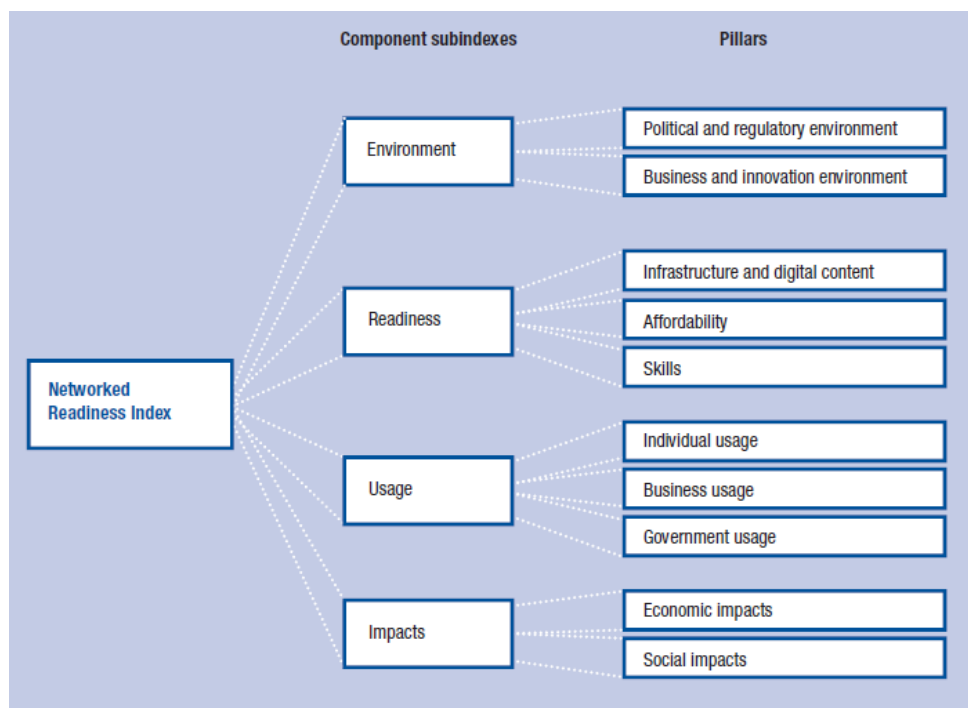
**Business usage:** This measures the extent of staff training available and captures the extent of business Internet use and the efforts of firms in an economy to integrate ICTs internally.

**Government usage:** This measures the number of services provided by the government to citizens via the Internet as well as using ICT.

**Impact sub-index:** This measures the impact of the use of information and communication technology and its effects in the economic and social sphere.

**Economic impacts:** The measure of the impact of information and communications technology on the economy, such as novel organizational practices, new products or processes, measuring the overall shift of an economy toward more knowledge-intensive activities and innovations in the shape of patents.

**Social impacts:** This refers to the extent of the improvements provided by Information and Communication Technology to services provided online by the government to its citizens. This includes the field of environment, health, civic participation and education.



**Figure 5** The Networked Readiness Index structure, [5]

### **2.1.2.2 International Telecommunication Union (ITU)**

We took ITU in our research as a measurement because ITU is the basis of an important source to rely on data that contains the statistics of states in addition to United Nations reports for the performance of e-government readiness and readiness for use of the ICT. However, ITU is included in the index of human capital as the skills and the usage of ICT, as we will explain in this section.

Established in 1865, ITU was the center of advances in communications beginning with the telegraph to the modern world, including the Internet and mobile phones. ITU in 1947 became an agent for the United Nations which specialized in information and communication technologies. Members of the ITU include public and private sectors with a current membership of 193 countries, and more than 700 entities from the private sector and academic institutions. ITU's areas of action include achieving equitable communications for everyone (such as affordable, ubiquitous broadband networks), ICTs, sustainability and climate change, cyber security activities, the digital divide, Internet policy and governance, gender equality and the empowerment of women and girls through ICTs, youth, as well as innovation and academia.

The development indicators for ICT were founded by the International Telecommunication Union, whose reports and surveys are supported in many global statistics. Their reports are based on the 11 indicators, which are divided into three categories: access, use and skills. Moreover, they include ICT readiness, mobile telephony, fixed-telephony, households with computers, international Internet bandwidth, and households with Internet. Usage indicators include Internet users, mobile broadband and fixed (wired)-broadband.

Other indicators given less weight include capability or skills indicators. These include three indicators, namely gross secondary enrolment, gross tertiary enrolment and adult literacy, [6].

### **2.1.2.3 United Nations survey**

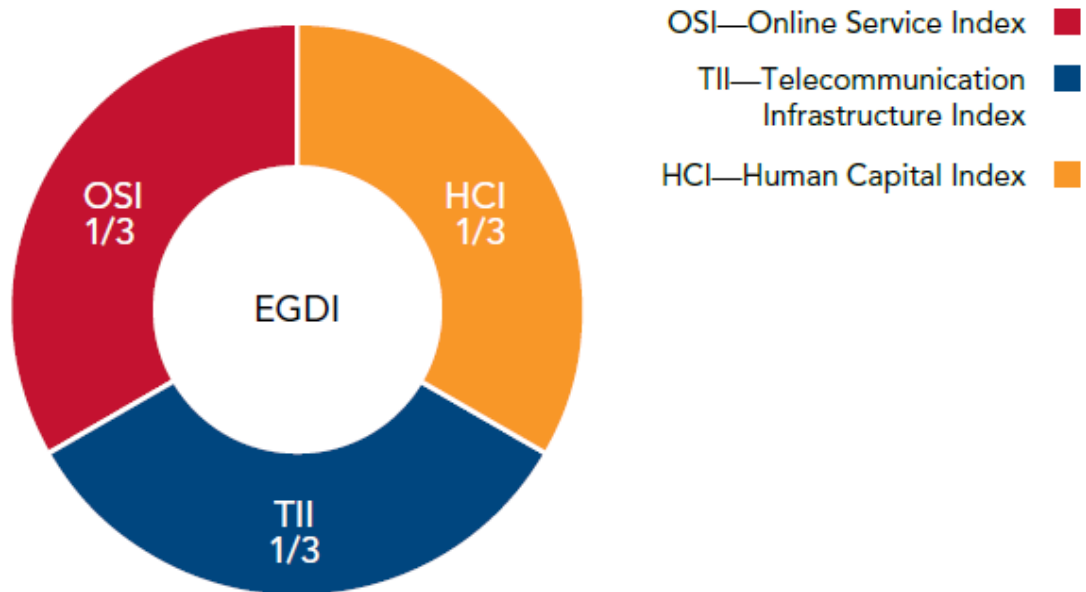
One of the most holistic surveying evaluations of the performance of e-governments and which efficiently evaluates the impact of information technology and communication is the United Nations survey. It focuses on how to use ICT in the government to provide electronic services to the community. Furthermore, it works on the ranking of countries according to sequences in the provision of electronic services depending on the location of the E-Government Development Index (EGDI). It issues a report every two years. There are reports from 2002 to 2014 to discover the strengths and weaknesses of each country and to benefit from the experiences of other countries to improve the delivery of electronic services to the community. There are 193 member states in the survey, which occurs every two years. The EGDI depends on three components: online service, technological infrastructure and human capital [7].

In this research, we concentrate more on the UN measurement surveys on states in order to assess their respective performances of e-government transition.

### **2.1.3 E-Government Development Index (EGDI)**

In this section, we will address and clarify the E-Government Readiness Index (EGDI), which is a composite measure of the readiness and capacity of countries to use e-government by using ICT. It covers all members of the UN. EGDI components derive from three dimensions: the Online Service Index (OSI), the Telecommunications Infrastructure Index (TII) and the Human Capital Index (HCI). Each of these dimensions has a component that can be analyzed separately. However, each dimension takes one-third of the weight assigned to OSI, TII, and HCI. Figure 6 shows the components of EGDI [8]. Mathematically, EGDI is:

$$\text{EGDI} = \frac{1}{3} (\text{OSI normalized} + \text{TII normalized} + \text{HCI normalized})$$



**Figure 6** Components of the E-Government Development Index (EGDI), [8]

### 2.1.3.1 Human Capital Index (HCI)

Human capital index, one of the three criteria of the E-Government Development Index (EGDI), according to United Nations E- government Human Capital Index takes one-third from the other criteria to evaluate the ranking of electronic government performance. However, the major sources for data of human capital indicators include the United Nations Scientific, Educational and Cultural Organization [8].

All this data is collected from the UNDP Human Development Report and the UNDP survey [9], as seen in Figure 7, and from other trusted official resources from the public report of the World Bank websites (Figure 8) [10] and UNICEF. Figure 9 shows the content of education used with the Human Capital Index [11].

Table 1: Human Development Index and its components								
HDI rank	Human Development Index (HDI)	Life expectancy at birth	Mean years of schooling	Expected years of schooling	Gross national income (GNI) per capita	Human Development Index (HDI)	Change in rank	
	Value	(years)	(years)	(years)	(2011 PPP \$)	Value		
	2013	2013	2012 <sup>a</sup>	2012 <sup>b</sup>	2013	2012	2012-2013	
<b>Very high human development</b>								
1	Norway	0.944	81.5	12.6	17.6	63,909	0.943	0
2	Australia	0.933	82.5	12.8	19.9	41,524	0.931	0
3	Switzerland	0.917	82.6	12.2	15.7	53,762	0.916	0
4	Netherlands	0.915	81.0	11.9	17.9	42,397	0.915	0
5	United States	0.914	78.9	12.9	16.5	52,308	0.912	0
6	Germany	0.911	80.7	12.9	16.3	43,049	0.911	0
7	New Zealand	0.910	81.1	12.5	19.4	32,569	0.908	0
8	Canada	0.902	81.5	12.3	15.9	41,887	0.901	0
9	Singapore	0.901	82.3	10.2 <sup>b</sup>	15.4 <sup>c</sup>	72,371	0.899	3
10	Denmark	0.900	79.4	12.1	16.9	42,880	0.900	0

Figure 7 Top ten Human Development Index and its components [9]

	Prevalence of child malnutrition, underweight	Under-five mortality rate	Maternal mortality ratio	Adolescent fertility rate	Prevalence of HIV	Primary completion rate	Youth literacy rate	Labor force participation rate	Vulnerable employment	Unemployment	Female legislators, senior officials, and managers
	% of children under age 5	per 1,000 live births	Modeled estimate per 100,000 live births	births per 1,000 women ages 15-19	% of population ages 15-49	% of relevant age group	% ages 15-24	% ages 15 and older	Unpaid family workers	% of total labor force	% of total
	2005-11 <sup>a</sup>	2011	2010	2011	2011	2011	2005-11 <sup>a</sup>	2011	2007-11 <sup>a</sup>	2007-11 <sup>a</sup>	2007-11 <sup>a</sup>
Afghanistan	..	101	460	103	<0.1	..	..	49	..	..	..
Albania	6.3	14	27	16	..	..	99	60	..	13.8	..
Algeria	3.7	30	97	6	..	94	92	44	..	10.0	..
American Samoa	..	..	..	..	..	..	..	..	..	..	..
Andorra	..	3	..	..	..	63	..	..	..	..	..
Angola	15.6	158	450	153	2.1	..	73	70	..	..	..
Antigua and Barbuda	..	8	..	..	..	98	..	..	..	..	..
Argentina	2.3	14	77	55	0.4	..	99	61	19	7.2	..
Armenia	5.3	18	30	34	0.2	83	100	59	38	28.6	22
Aruba	..	..	..	28	..	..	99	..	4	5.7	40
Australia	..	5	7	13	0.2	..	..	66	9	5.1	37
Austria	..	4	4	10	0.4	..	..	61	9	4.1	27
Azerbaijan	8.4	45	43	32	<0.1	93	100	65	55	5.4	7
Bahamas, The	..	16	47	29	2.8	..	..	74	..	13.7	52
Bahrain	..	10	20	15	..	..	100	71	2	..	..
Bangladesh	41.3	46	240	70	<0.1	..	77	71	..	5.0	..

Figure 8 The indicators in the people section [10]

**TABLE 5 | EDUCATION**

Countries and areas	Youth (15–24 years) literacy rate (%) 2008–2012*		Number per 100 population 2012		Pre-primary school participation		Primary school participation				Secondary school participation					
	male	female	mobile phones	Internet users	Gross enrolment ratio (%) 2008–2012*		Net enrolment ratio (%) 2008–2011*		Net attendance ratio (%) 2008–2012*		Survival rate to last primary grade (%) 2008–2011*   2008–2012*		Net enrolment ratio (%) 2008–2011*		Net attendance ratio (%) 2008–2012*	
			male	female	male	female	male	female	male	female	admin. data	survey data	male	female	male	female
Afghanistan	-	-	54	5	-	-	114	81	-	-	-	84	-	-	43	21
Albania	99	99	108	55	58	57	-	-	-	-	98	100	-	-	84	82
Algeria	94 x	89 x	103	15	74	75	112	106	98	97	95	93 x	-	-	57 x	65 x
Andorra	-	-	74	86	103	99	-	-	-	-	-	-	-	-	72	74
Angola	80	66	49	17	103	105	137	112	93	78	32	83 x	15	12	21	17
Antigua and Barbuda	-	-	199	84	77	84	102	95	87	85	-	-	85	85	-	-
Argentina	99	99	143	56	74	76	119	117	-	-	95	-	80	88	87 y	91 y
Armenia	100	100	107	39	41	47	101	104	-	-	96	100 x	85	88	67	76
Australia	-	-	106	82	79	78	105	105	97	98	-	-	85	86	-	-
Austria	-	-	161	81	100	100	99	98	-	-	99	-	-	-	-	-
Azerbaijan	100	100	107	54	27	26	96	95	88	86	74 x	72 x	87	85	83 x	82 x

**Figure 9** Education – primary school participation [11]

According to the United Nations E- Government Survey, the components of the Human Capital Index in 2003, 2004, 2008, 2010 and 2012 include two indicators: gross enrolment and adult literacy.

**Adult literacy rate:** The measured adult literacy rate is the percentage of people aged over fifteen years who can write, read and have basic numeracy skills. However, it takes two-thirds of the weightings from the Human Capital Index in the UN survey.

**Gross enrolment:** Gross enrolment is a measure used to total the number of people who registered in at primary, secondary or tertiary levels regardless of age, and is expressed as a percentage of the population in the same age group for the same level of education. Furthermore, the gross enrolment takes one-third of the weighting assigned to it.

The equation to calculate the Human Capital Index for ‘any particular country is done by using one-third of the weighting assigned to the gross enrolment ratio and two-thirds of the weightings assigned to the adult literacy rate and taking the result of this equation:

$$\begin{aligned} \text{Human capital composite value} = \\ & \frac{2}{3} \times \text{adult literacy} \\ & + \frac{1}{3} \times \text{gross enrolment} \end{aligned}$$

Then, to calculate the Human Capital Index, we take the Human capital composite value for a country, subtract the minimum of the human capital composite value in the survey and divide it by the domain of the composite values for all countries in the survey.

For example, Qatar has a human capital composite value at 0.8438, and its minimum human capital composite value is –3.2354. Its highest human capital composite value is equal to 1.2752. Therefore, the Human Capital Index value for Qatar is given by:

$$\text{Qatar} = \frac{[0.8438 - (-3.2354)]}{[1.2752 - (-3.2354)]} = \mathbf{0.9044}$$

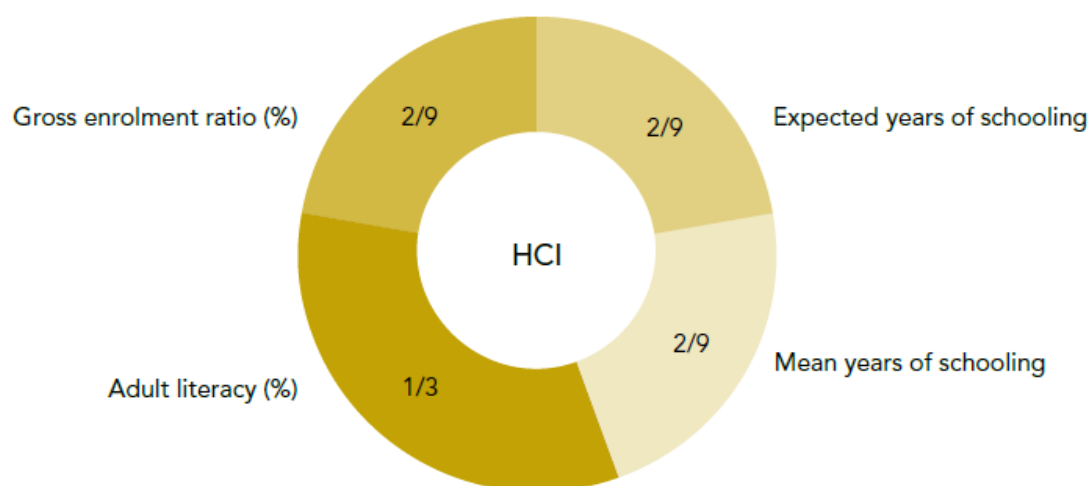


To improve the measurement of education among adult populations in 2014, the UN survey added two more new components with the Human Capital Index, namely 'Expected years of schooling' and 'Average years of schooling.'

Commissioned by the Division for Public Administration and Development Management (DPADM) to evaluate the new human capital components, new components that strengthened the Human Capital Index were found.

**Expected years of schooling:** This is the number of years of education after which students of a certain age can expect to graduate from school, assuming that the probability of the student's time of starting at a specific age is equal to the current age at time of registration.

**Mean years of schooling:** This is the average years of schooling until graduation for people who are 25 years and over, with the exception of repeating years to graduate. Due to the addition of two new components to the Human Capital Index, the proportion of adult literacy and gross enrolment ratio are changed. One-third weights define the adult literacy rate and two-ninths weight define the mean years of schooling, the expected years of schooling and the gross enrolment ratio (Figure 10).



**Figure 10** HCI components and the proportion for each component

However, the equation to calculate the Human Capital Index also changed when compared with the previous survey:

$$\begin{aligned} \text{Human capital composite value} = & \\ & \frac{1}{3} \times \text{Adult literacy rate} + \\ & \frac{2}{9} \times \text{Gross enrolment ratio} + \\ & \frac{2}{9} \times \text{Expected years of schooling} + \\ & \frac{2}{9} \times \text{Mean years of schooling} \end{aligned}$$

### 2.1.3.2 Telecommunications Infrastructure Index (TII)

The Telecommunications Infrastructure Index (TII) is an average composite of Internet users, fixed broadband subscriptions, wireless broadband subscriptions, fixed telephone subscriptions and mobile cellular subscriptions indicators. Table 1 shows the components of TII during the years of the surveys.

TII 2003	TII 2004	TII 2005	TII 2008	TII 2010	TII 2012	TII 2014
Internet users	Internet users	Internet users	Internet users	Internet users	Internet users	Internet users
Online population	Online population	Online population	Fixed broadband subscriptions	Fixed broadband subscriptions	Fixed broadband subscriptions	Fixed broadband subscriptions
Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Fixed Internet subscriptions	Wireless broadband subscriptions
Fixed telephone subscriptions	Fixed telephone subscriptions	Fixed telephone subscriptions	Fixed telephone subscriptions	Fixed telephone subscriptions	Fixed telephone subscriptions	Fixed telephone subscriptions
Mobile cellular subscriptions	Mobile cellular subscriptions	Mobile cellular subscriptions	Mobile cellular subscriptions	Mobile cellular subscriptions	Mobile cellular subscriptions	Mobile cellular subscriptions
Television sets	Television sets	Television sets	/	/	/	/

**Table 1** Components of TII during the years of the surveys

The sources of the Telecommunications Infrastructure Index (TII), and the major source of data in each case, are the International Telecommunication Union (ITU) and the World Bank database. The value of the Telecommunications Infrastructure Index in 2003 is an average of six components of the indicator. Table 2 shows some numbers of the TII component:

$$\text{Index value} = (\text{current value} - \text{lower value}) / (\text{higher value} - \text{lower value})$$

Quote of the UN survey 2003		
(per 1000 persons)	Higher value	Lower value
PCs	760	0
Internet users	607.6	0
Telephone lines	921	0
On-line population	699	0
Mobile subscribers	1013	0
TVs	875	0

**Table 2** Some number in TII component from survey 2003

For example, United Arab Emirates has 341.8 telephone lines per 1000 persons, so to obtain the telephone lines index value:

$$\text{Telephone lines index} = (341.8 - 0) / (921 - 0) = 0.371$$

Other indexes are obtained similarly. However, the government can use other channels of ICT, such as TV and radio, to increase knowledge and service delivery to the community. For the purpose of determining the measurement in the 2003 survey, we consider the spread of Internet users, personal computers, on-line population and telephone lines in that time more importance than TVs, mobile phone to deliver e-government service.

Therefore, the Telecommunications Infrastructure Index appoints a 20% weight to the PC index the Internet user index, the Telephone line index and the on-line population index and 5% to the Mobile user index and TV index. In 2003, 2004 and 2005, the equation to calculate the Telecommunications Infrastructure Index was:

$$\begin{aligned} \text{Infrastructure Index} = & \\ & \frac{1}{5} (\text{PC index}) + \\ & \frac{1}{5} (\text{Internet user index}) + \\ & \frac{1}{5} (\text{Telephone line index}) + \\ & \frac{1}{5} (\text{On-line population index}) + \end{aligned}$$

$$\frac{1}{10} (\text{Mobile user index}) + \frac{1}{10} (\text{TV index})$$

However, the equation to calculate the Telecommunications Infrastructure Index in 2014 also changed when compared with the previous survey:

$$\begin{aligned} \text{Telecommunication infrastructure composite value} = & \\ & \text{Arithmetic Mean (Internet user)} \\ & + \text{Telephone line} \\ & + \text{Mobile subscription} \\ & + \text{Wireless broadband subscription} \\ & + \text{Fixed broadband} \end{aligned}$$

Where:

**Internet users:** The percentage of people who can access the World Wide Web.

**Personal computer (PC) users:** the numbers of broadband subscribers with a digital subscriber line, cable modem, or other high-speed technology.

**Telephone Line:** This indicator is defined as the number of fixed-telephone subscriptions per 100 subscriptions.

**Mobile cellular subscriptions:** Subscriptions in the mobile phone that provides access to the mobile phone network service, the following may include the price paid or monthly subscriptions

**Fixed broadband:** Is the number of subscribers in the domain (Cable, DSL, Fiber/LAN, other high-speed technology) per 100 inhabitants.

### 2.1.3.3 Online Service Index (OSI)

This model is based on four stages – Emerging, Enhanced, Transactional, and Connected – that determine the level of development of countries and their presence on the Internet.

**Stage 1 Emerging information services:** At this stage, linking government websites and ministries with each other facilitates government departments and citizens' access to information or news online through the Internet pages of the national government and ministries, and at this stage it provides information without user intervention.

**Stage 2 Enhanced information services:** Government websites deliver enhanced one-way e-communication between the government and the citizen. Users can download forms and search for documents on government websites. In addition, these websites provide tips, such as audio and video. Some limited e-services can be provided for citizens on websites, such as submitting personal information or submitting requests for non-electronic forms.

**Stage 3 Transactional services:** Government websites that allow two-way interaction with their citizens provide options to exchange information successfully. Additionally, some government websites that process non-financial transactions allow the downloading and uploading of forms, licenses, online tax filing, e-voting, permits and applying for certificates. Moreover, they can be handle financial transactions if money is transferred via a secure network to government.

**Stage 4 Connected services:** This is the most advanced level of e-government initiatives and its presence on the Internet can be characterized by the integration of any link with all users of e-government services (G2G, G2C, G2B). This is a two-way interaction between the government and users interactively as well as between government institutions and users.

These sites have citizens interact more with the government where they are able to participate actively in decision-making processes. The user can electronically access and use all e-services in the portal.

The collection of information and the work of statistics for the Online Service Index (OSI) are carried out by sending invitations to member states to submit their websites addresses (URL), for all government ministries and the national portal.

Calculating the value of the total number of points scored by each country is normalized to the range of 0 to 1. The online index value for a given country is equal to the actual total score less the lowest total score divided by the range of total score values for all countries. For example, Qatar has a score of 114, and the lowest score of any country is 0 and the highest is equal to 153, then the online services value for Qatar would be:

$$\text{Online Service Index (Qatar)} = (114 - 0) / (153 - 0) = 0.7451$$

## **2.2 Literature Review**

In this section, we obtained some studies that relate to their impact on the performance of e-government, and thus lead to its impact on the resulting countries within the world rankings for e-governments and some of the solutions put forward by those countries. Moreover, we will clarify every section and the relationship to the components of the EGDI.

### **2.2.1 Portal**

A portal is a gateway to all e-services that are offered to users on the Internet by governments. However, a portal at stage four is in the OSI section, as mentioned in Section (2.1.3.3). We took some countries as examples in this section to explain the weaknesses and how they can be solved, as in Yemen. Moreover, we took the Dubai portal as a success example as to how they provide services on a portal according to user categories. Furthermore, it explains which websites are established on the Internet and at which levels in the OSI stages.

In Yemen, the national project in information technology established the portal web site with the address <http://www.yemen.gov.ye/portal> to link all government websites at the portal of Yemen to provide an easy way for users to visit, obtain information and use the services of the government. However, it was reported in 2012 that there are problems on the portal of Yemen [Ali A. Al-wazir, Zhao Zheng].

1. Many links do not work, including links such as:
  - Payment of bills for basic services with address  
**http://www.e-bill.post.ye**
  - Employment Ministry of Civil Service enquiries and requests for service with the address  
**mocsi.gov.ye/modules.php?name=appserver&file=appnum**
  - Driving License Order Service  
**www.moi.gov.ye/moi1/AServices1/moror/d2.aspx?sid=1**
2. Many ministries or institutes of the government have a website on the Internet. However, not all are linked to the portal. Moreover, there is a paucity of continuous updating of data of websites.
3. The website of the portal is only in the Arabic language. Figure 11 shows the portal of Yemen.

At the time of writing, we visited the website and found that the problem still exists.

**The reasons for this problem are according to [14]**

There is a lack of qualified human resources to implement and handle the project as well as a failure to allocate a sufficient budget for the project.

For this case, Yemen receives low points in the evaluation of the Online Services Index in the UN survey. Table 3 shows the Online Service Index value of components of Yemen [7].

<b>Yemen</b>	
Online Service Index	0.3071
Emerging information services	66
Enhanced information services	18
Transactional services	12
Connected services	35

**Table 3** Online service index of Yemen [7]

As stated by Ali A. Al-wazir and Zhao Zheng [2012], to bring the government of Yemen to a high point in the OSI, they have to:

- Redesign the portal of Yemen to include all information that users or visitors need and an easy way to reach all information and services.
- Yemen as a country has a civilization as well as historical and cultural documents. Therefore, the Yemeni government should focus on this aspect and on the promotion of sites concerned with archaeological sites.

Therefore, they have to create a web site and link other ministries or institutes which deal with the civilization, historical and cultural links with the portal to provide documents and all information for the tourism of Yemen portal.



Figure 11 Official portals of Yemen governments [15]

The other study portal of the Dubai e-government website ([www.dubai.ae](http://www.dubai.ae)) was established in 2002 with the GIN project. In 2008, the portal of Dubai provided 2,300 services divided into four categories (visitors, businesses, citizens and residents). These categories are available in Arabic and English languages [16].

According to Alsanossi M Ahmed, et al. [2013], 70% of Libyan government ministries are online and provide information about their services on their websites. Many government ministry websites interact with visitors to those websites merely by electronic email. Moreover, 30% of the ministries provide online interactivity by



using their own the websites. Table 4 shows the ministries and their respective categories of OSI.

Another recent study on Kyrgyzstan's e-government initiatives shows some criteria for OSI in four stages (Table 5).

Institution	Informational level (stage I)	Communication level (stages II and III)	Transactional level (stages IV and V)	Stage	URL
Prime Ministry/official web site	Yes	No	No	I	<a href="http://www.pm.gov.ly/">http://www.pm.gov.ly/</a>
Minister of Local Government	Yes	Yes	No	III	<a href="http://www.lgm.gov.ly/">http://www.lgm.gov.ly/</a>
Minister of Justice	Yes	Yes	No	II	<a href="http://www.aladel.gov.ly/">http://www.aladel.gov.ly/</a>
Minister of Communications and Information Technology	Yes	Yes	No	III	<a href="http://www.cim.gov.ly/">http://www.cim.gov.ly/</a>
Minister of Labour and Retraining	Yes	Yes	No	III	<a href="http://www.labour.gov.ly/">http://www.labour.gov.ly/</a>
Minister of Health	Yes	Yes	No	II	<a href="http://health.gov.ly/">http://health.gov.ly/</a>
Minister of Interior	No	No	No		<a href="http://moi.gov.ly/">http://moi.gov.ly/</a>
Minister of Economy	Yes	Yes	No	II	<a href="http://www.ect.gov.ly/">http://www.ect.gov.ly/</a>
Minister of Education	Yes	Yes	No	III	<a href="http://www.edu.gov.ly/">http://www.edu.gov.ly/</a>
Minister of Foreign Affairs	Yes	Yes	No	II	<a href="http://www.foreign.gov.ly/">http://www.foreign.gov.ly/</a>
Minister of Defense	Yes	Yes	No	II	<a href="http://www.defense.gov.ly/">http://www.defense.gov.ly/</a>
Minister of Planning	Yes	Yes	No	III	<a href="http://www.planning.gov.ly/">http://www.planning.gov.ly/</a>
Minister of Social Affairs	Yes	Yes	No	III	<a href="http://www.sa.gov.ly/">http://www.sa.gov.ly/</a>
Minister of Finance	Yes	No	No	I	<a href="http://www.mof.gov.ly/">http://www.mof.gov.ly/</a>
Minister of Agriculture	Yes	Yes	No	III	<a href="http://www.agriculture.gov.ly/">http://www.agriculture.gov.ly/</a>
Minister of Industry	Yes	Yes	No	II	<a href="http://industry.gov.ly/">http://industry.gov.ly/</a>
Minister of Scientific Research and Higher Education	Yes	Yes	No	II	<a href="http://highereducation.gov.ly/">http://highereducation.gov.ly/</a>
Minister of Culture	Yes	Yes	No	II	<a href="http://culture.ly/">http://culture.ly/</a>
Minister of Housing	Yes	No	No	II	<a href="http://www.mhu.gov.ly/">http://www.mhu.gov.ly/</a>
Minister of Transportation	Yes	Yes	No	III	<a href="http://www.ctt.gov.ly/">http://www.ctt.gov.ly/</a>

**Table 4** Ministers of the Libyan government and the stages of OSI [17].

Criteria	Stage	Stage	Stage	Stage
	1.	2.	3.	4.
Multilingual interface	X	X		
The feedback page			X	X
Published answers to the citizens questions		X	X	
Facility of subscribing to the news		X		
Online polls and voting				X
Downloadable application forms		X		
Availability to complete form or send it online			X	
Availability of online discussion forum, blog or wiki			X	X
Online access to the databases		X		
Frequently Asked Questions (FAQ)	X	X		
Availability of the web site visitors' counter	X	X		
Presence of an opportunity to share the web site's content in social networks				X
Availability to comment the web site's content				X
Provision of paid online services			X	
Facebook page of the organization				X

**Table 5** Mapping of criteria to e-government development OSI stages [13]

### 2.2.2 Interoperability

In this section, we will discuss some examples of the role of linking government institutions with each other, such as how the United Arab Emirates provided services online. On the other hand, some countries lacked the provision to link government institutions with each other as is the case in Yemen and also to clarify some e services offered by government from any level depending on OSI in Section (2.1.3.3).

According to a study by Ali A. Al-wazir and Zhao Zheng [2012], one of the requirements of the government of Yemen is to connect every ministry and institute to one central database for the different types of e-government applications.

Moreover, the central database would act as a hosting for public information for all government institutions and departments. In addition, providing high speed and low time to deal with information is an easy way to update all information in all government departments and institutes. Therefore, a government needs to provide WAN infrastructure to connect every department and institute. However, this would have government institutes prepare to take modern data and network security measures.

<b>Yemen</b>	
Percentage of individuals using the Internet	17.45
Fixed telephone subscriptions per 100 inhabitants	4.63
Mobile-cellular telephone subscriptions per 100 inhabitants	58.25
Fixed (wired) broadband subscriptions per 100 inhabitants	0.7
Wireless broadband subscriptions per 100 inhabitants	0.2

**Table 6** Telecommunication infrastructure components of Yemen, 2014 [7]

According to Ali A. Al-wazir and Zhao Zheng [2012], the problems facing the Yemeni government are as in the conclusion and include the lack of provision for the network to connect all government departments and the institutes. On the other hand, some government offices do not have telephony networks. Furthermore, the telecommunication infrastructure in Yemen has a low point greater than other countries. Table 6 shows the telecommunication infrastructure components and index value components of Yemen.

In another study by N. Sethi [2008], the Dubai government linked every government department through the established GIN (Government Information Network) project, which started work at the end of 2005. This project provided many advantages to government departments, such as access to the Internet, linking departments and institutions with each other, high-speed sharing of documents and more security. However, more than 30 institutions participated in this project and one body supervised every one of these departments in Dubai. Finally, it facilitates the use of this system with the government portal to show any information and services that citizens may find necessary.

In another study, computerized records in Syria linked every government department to allow citizens to access information via the Internet without the need to travel to government offices [18].

### **2.2.3 Literacy rate**

One of the components of the Human Capital Index is the literacy rate criterion to evaluate the ranking of electronic government performance in UN surveys, as in Section 2.1.3.1.

Due to continued armed conflicts, wars and potential wars that threaten the region, negative effects on the level of adult education and literacy in Middle Eastern countries can be seen.

Slow progress in the field of literacy in Iraq was due to drawn-out armed conflicts, deteriorating security situations, economic sanctions, prolonged curfews, the destruction of schools and educational facilities, the physical degradation of learning environments and the inability of students to reach their schools. The lack of concrete statistics on the level of decline increased concern about the continuing deterioration in education and adult education and literacy for Iraq [19].

In another case in Lebanon, the level of enrollment in schools during the 1999-2000 school year was 98.3%. However, the dropout rate was 3.9% before the end of the school year, with no re-enrolment for the 2000-2001 school year [20].

The Ministry of Social Affairs figures attribute this issue to the following:

- The economic situation in the country and increases the unemployment rate in the community, which affects the ability of families to afford the costs of education for children;
- Lack of funding for government schools in some areas of the country, especially in rural areas;
- Lack of awareness about the importance of education from parents, which may be attributable to parental illiteracy; and

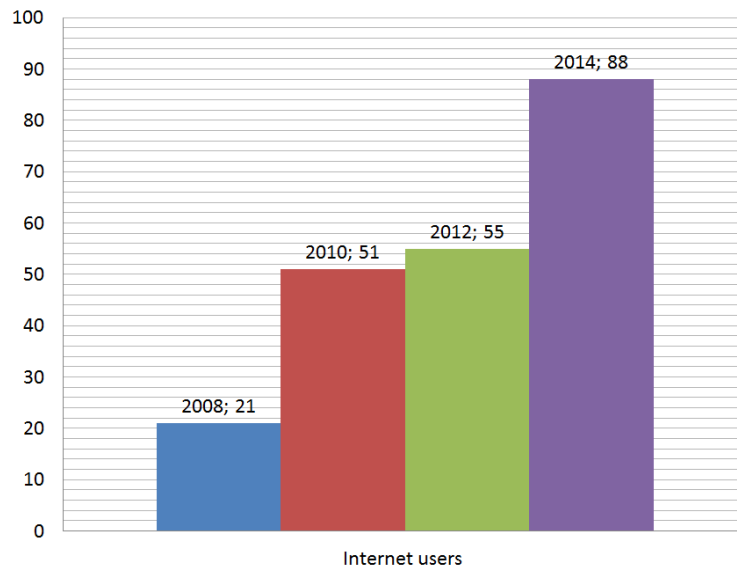
- Poor living conditions which cause many families to force their children to work rather than study.

#### **2.2.4 Internet users**

E-government services are offered by using the Internet or other e-applications. Internet users play an important role in evaluating the performance of e-government in UN surveys as mentioned in Section (2.1.3.2) and other international measurements.

Limited deployment uses of the Internet in Algeria, the proportion of whose users of this technology are widespread globally is still weak in Algeria even compared to neighboring countries, as reported in Morocco, for example, which sees a rate of 14.36% while it is only 5.33% in Algeria. This is one of the reasons that determine the prevalence of, and benefits from, the use of e-services provided by the Algerian e-government [36].

Elsewhere in Middle Eastern countries, we note that the proportion of Internet users in Bahrain reached 88% in 2014 while in 2012 it was 55%. Reports by the Telecommunications Regulatory Authority (TRA) of Bahrain and reports issued by international organizations showed that increased competition in the broadband market continues to deliver significant benefits to subscribers of broadband services (broadband) in Bahrain, and through the provision of various services and innovative technologies, lower prices and more attractive features, higher speeds and larger capacity data are provided. The satisfaction rate for consumers of broadband services and prices in Bahrain amounted to 87% in 2014 compared with 60% in 2011 and 36% in 2007. This increased the value for money paid by the subscriber for broadband services. According to the latest study results to compare prices, which were published by the Commission in May of this year, the broadband prices through fixed lines provided to individual consumers in Bahrain dropped by up to 38% between 2012 and 2013 and by up to 65% for the prices of broadband via mobile lines during the same period [37]. Figure 12 shows the ranking of Internet users in Bahrain.



**Figure 12** Bahrain internet users, UN surveys

### 2.2.5 Awareness and Training

One of the important points regarding distribution of e-government services and arrival for citizens is awareness. Where it is necessary that there be awareness about the system and services and what its benefits are, it will then be implemented successfully.

One of the challenges for the Jordanian government when using the e-government services in society is the knowledge of citizens about e-government projects and how to deal with those services. According to data obtained from Jordan, it was found that 55% of the citizens do not know about e-government projects provided in Jordan. At the same time, 41% of those citizens expressed interest in using e-government projects. However, the Jordanians were ready to use those services but there was a lack of awareness about those e-government services [22].

According to a study by A. O. M. Khazaaleh, [2012], the Jordanian government has to focus in order to develop and improve suitable programs to increase the level of awareness of their citizens regarding e-government services and their benefits. Furthermore, the Jordanian government has to improve and increase the experiences and skills in using ICT in the community that it will affect as well as increase the level of citizens who use e-government services.

In another case study in Egypt, awareness is one of the challenges to the success of e-government in Egypt. Hence, the government should customize programs to work to implement advertising campaigns for electronic services and focus attention on raising awareness in all sectors; this includes the use of advertising campaigns on television, radio, newspapers and other electronic media as well as an integration of educational materials projects with electronic services and work partnerships between the public and private sectors to share their experiences and skills [23].

In Sudan, we found a different situation [24]. The immigration of people who have skills in information technology and communications in Sudan to the Arab states or a European state is one of the problems faced by the government of Sudan when implementing e-government. It is necessary to train people to be aware and educated in the use of information technology, as there is a lack of staff who are experienced in ICT. This would offset any limits of awareness and also enhance the use of information technology.

### **2.2.6 Mobile Phones**

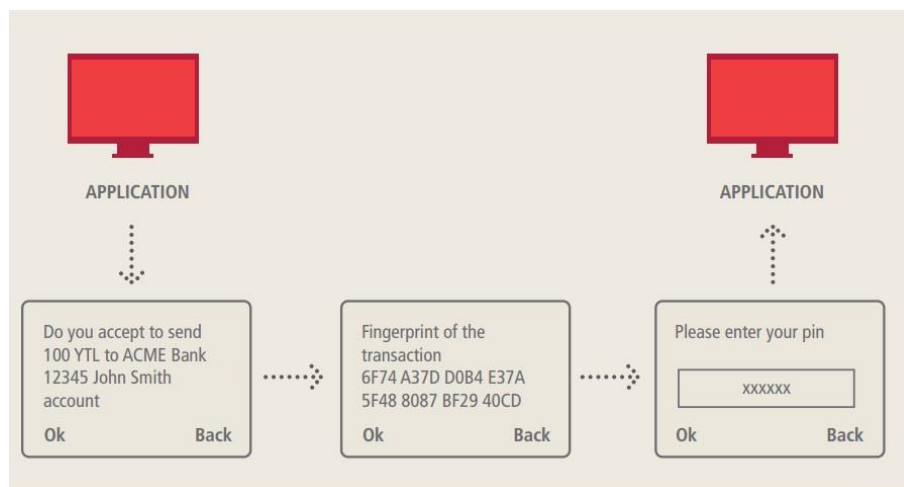
**Informational services as push services:** A service provides information, data or knowledge to the beneficiaries of e-governments from these services. For instance, the national weather service provides email alerts to the Atlantic and Gulf of Mexico regions by sending messages to the public regarding the weather and any potential disasters. Moreover, they provide emergency numbers. The beneficiaries of this service include private emergency management and the media who need to interact directly with any information regarding the weather and potential disasters resulting from bad weather. [25].

**Interactive Services:** These allow beneficiaries to deal with services electronically, for example, by using a mobile phone or computer to interact with the service. According to telecommunications regulatory reports in 2013, Abu Dhabi and the United Arab Emirates provided interactive services to students to allow them to look at admissions and national examination results and to make information inquiries, such as account information through the use of their mobile phones [26].

In another study [27], the Kingdom of Bahrain enabled any citizen with a mobile phone to access electronic government services and use them by sending text messages through the application of Bahrain's mobile portal project. The government provided more than 39 services, including flight information, complaints to government bodies, daily price indices, traffic contraventions and inquiries regarding electricity bills.

**Transactional services:** The mobile signature is used in Turkey for banking transactions and public services, as shown in Figure 13. However, the Turkcell and Avea mobile phone companies offer M-signature services. According to the study by GSMA Mobile Identity team & Turkcell [2012], the mobile signature being used in Turkey between different user segments included:

- banking and financial institutions;
- the public sector including government organizations, municipalities;
- merchants, dealers, sellers and resellers;
- Large companies.



**Figure 13** The mobile signature used by Turkcell [28]

### 2.2.7 Culture

In many developing countries, one of the challenges is overcoming certain cultural issues in society. This challenge of culture includes languages, religion, experiences, backgrounds, social characteristics and different probabilities of implementing e-government applications. A government facing such a problem has to first know the



strengths and weaknesses that exist between members of society. They need to build a plan that contains all the community and is able to deliver all services to all citizens so as to achieve the required readiness towards the successful implementation of e-government.

One of the methods adopted by the Saudi government to increase students' active participation in the use of ICT was a focus on developing the education system. They focused especially on the English language and ICT use. However, improving the level of English and using ICT in students enables them to visit global sites easily on the World Wide Web and to know the benefits of the available information technology, thus leading to encouraging students to develop their skills when using the new ICT [29].

On the other hand, religion and systems of tribal culture distinguish Saudi culture from most Middle Eastern countries. This culture affects Saudi society in many areas, including a delay in the use of the Internet in Saudi Arabia. The first time involved many arguments among stakeholders and leaders to consider many religious, social and cultural factors. One of the reasons was the government's fear of the Internet being used for unwanted sites. After the use of filters to filter and control sites was agreed upon, the Internet was used in Saudi Arabia. [30]

In Iraq, other social factors determine the spread and use of the Internet, such as not being able to keep Internet cafes open late into the night in many cities in Iraq. Moreover, many families did not want to be involved with the Internet service at home. All these factors lead to limited learning of the use the Internet in all age groups, thereby giving Iraq a lower proportion in the use of the Internet compared to other countries, which will affect the use of e-government services [31].

### **2.2.8 Intention to use e-government services**

The citizen is one of the obstacles to the success of the application of e-government. If there exists considerable reluctance, negative attitudes may prevail along with the preference to use traditional methods such as paper and long waiting times in queues [32]. Additionally; other factors include age and level of education of users, the

proportion of daily use of the Internet and the proportion of the use of e-services and e-government [31].

The problem becomes more complicated once we address how to convince the citizen to use electronic services [El Baradei, L., Shamma, H. M., & Saada, N. (2012)]. Many people prefer to use services traditionally by standing in queues and by using paper despite the existence of opportunities to use the same services via the Internet. However, the Egyptian government is promoting and supporting awareness campaigns to persuade people to use electronic services, particularly the over-20-years age group as those who are younger already have faith that the technology is useful to them.

In another study [Shafi, A. S., & Weerakkody, V. (2009)], the researchers found that the Qatari government has stepped up media campaigns of the benefits of electronic services at the beginning of the application of their e-government project. This is leading to an increased awareness and encourages citizens to use electronic services.

Another study [35] concludes that the resistance to change is one of the challenges facing the implementation of e-government. In Iraq for instance, in public institutions of old, employees resist change to the traditional work flow. The reason for this is the fear of loss of jobs after the implementation of e-government.

### **2.3 Discussion**

According to the previous studies in Section 2.2, it is shown that there are many obstacles that affect the performance of e-services and e-governments has been rated constraints on EGDI of UN survey. These obstacles can be found in TII, OSI or HCI. In this section, we will discuss previous studies that we visited.

The links between government institutions through the database and portal are used to share information between departments and sections, which is one of the points that should be the focus of governments. This facilitates the citizens' use of information and institutions' provision of, and meeting citizens' needs for services and information in the minimum time, without repetition and with timely

accessibility, as explained in Section 2.2.1. Moreover, governments should also develop the infrastructure to fulfill the requirements of the public as well as the basics of the success of e-services and e-government and increase the interoperability in the government's departments, as noted in Section 2.2.2. This reaches a point to increase the EGDI in OSI indicators of a country, as explained in Section 2.1.3.3.

However, the important point that has attracted our attention during the studies are that most services and projects depend on the Human Capital Index, as explained in Section 2.1.3.1, which was found in the examples cited in the chapter containing the literacy rate, awareness, training, culture and intention to use e-government.

There is a gap between the citizens and the use of e-services in spite of provision through government portals, responsible institutions or other channels in many countries. This gap appears due to the lack of awareness in the community about the e-services of the government as well as a shortage in training and knowledge to use ICT and through the culture experienced by citizens within the community. This may also show through the existing gap in the educational level of the community or the services used by users according to age and education groups.

Therefore, governments have to use educational workshops in schools and universities as well as the media and campaigns to teach citizens the role of the services and the benefits of e-services by focusing on radio and television campaigns as well as establishing workshops about the role of ICT in life. Alternatively, this may be done by sending SMS messages to citizens, as media campaigns for the services provided by the government through a mobile phone.

The following chapter presents some analyses we have conducted on Middle Eastern and Arabic countries in order to explain the effects of the Human Capital Index, which is an indicator that has been adopted in United Nations surveys for the performance of e-government for the component of the Human Capital Index.

## **CHAPTER 3**

### **HUMAN CAPITAL INDEX**

In this chapter, we will clarify part of the analysis that we have conducted on the role of Middle Eastern countries by relying on information from the United Nations surveys to assess the performance of e-government. We will also focus in this chapter on the role and impact of the Human Capital Index as we mention in 2.1.3.1 for the countries. Furthermore, we will explain the reasons for the adoption of the Human Capital Index in evaluating the performance of e-government and its impact on the sequence of countries in e-performance.

#### **3.1 Adoptions of HCI in UN surveys**

In this section, we will explain the reasons the United Nations has taken HCI as one of EGDI indicators for United Nations surveys of e-government readiness.

- The goal of the United Nations is development for all. Furthermore, the other commitment of the United Nations was to ‘Ensure the profits gained from new technologies are available to all, especially information and communication technologies.’ In addition, the promotion of human development provides economic and social benefits to the population through the use of e-services and e-government.
- The tools of development of e-government rely on three conditions: the minimum of technological infrastructure, human capital and electronic interaction for all. In addition to readiness for e-government, a program must include the whole population having a minimum education, literacy, access to and use of the Internet and a basic ability to use a computer.
- There is a positive relationship between HCI and use of e-services and applications of e-government. Likewise, a country has a high level of education, high levels of literacy and skill in the population, which provides potential for the use of ICT and e-services, thereby leading to an easier, faster

and broader spread of information, e-services and application of e-government than countries with a lower HCI.

- To quote what has been mentioned in the UN survey in 2003, there are 57 countries out of 191 member states of the UN which have a population among which one in five cannot read and write, implying that many countries have challenges with the HCI issue.

### 3.2 Analysis of data of Middle East countries

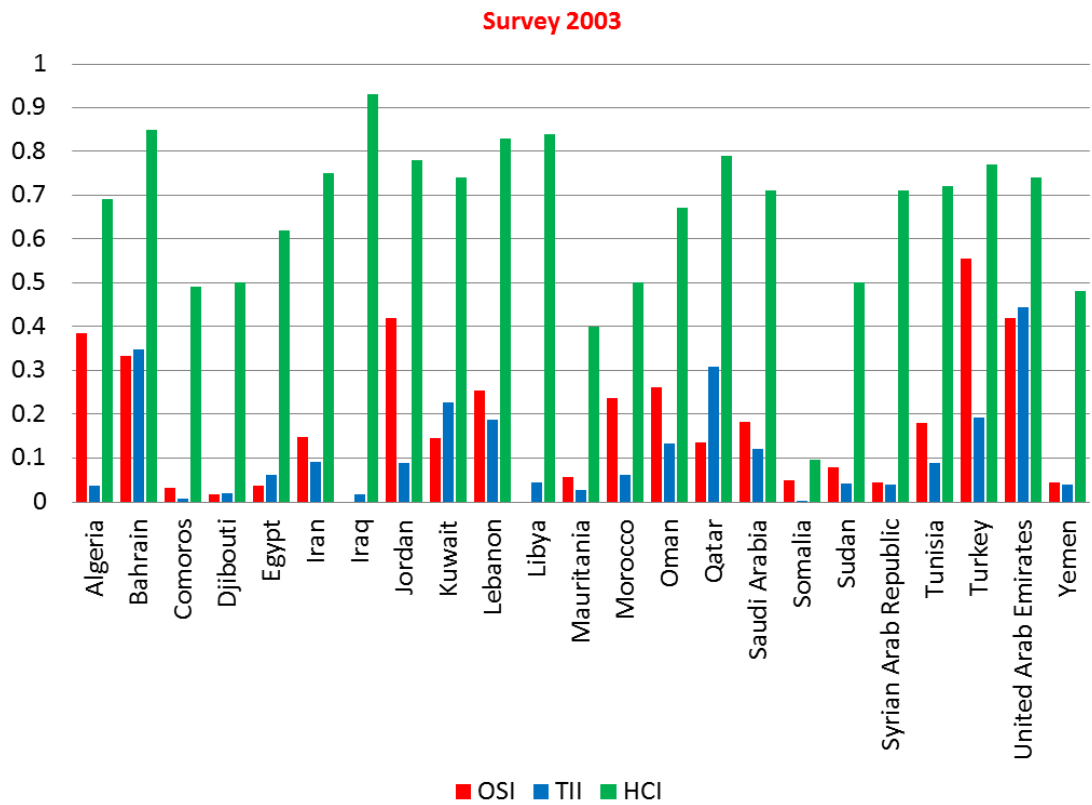
In this section, we take the Middle Eastern countries' statistics on the basis of information provided by the United Nations for the years 2003, 2004, 2005, 2008, 2010, 2012 and 2014. Moreover, we take the components of EGDI to explain the differences between the Human Capital Index and other components of EGDI, as mentioned in Section 2.1.3. We take the Middle Eastern countries as a study because:

- They are near to each other in distance;
- Many countries have similar cultures;
- There are some advanced Arab countries with good rankings, including Bahrain, United Arab Emirates and Saudi Arabia; and
- There is convergence in terms of political events and issues of the Middle East.

We did not take Israel from the Middle East countries as an example with which to work. Israel receives a higher ranking in the UN survey; therefore, we cannot make comparisons with Israel due to the large gap in the rankings, as seen in Table 7, which shows the ranking of Israel according to the UN survey.

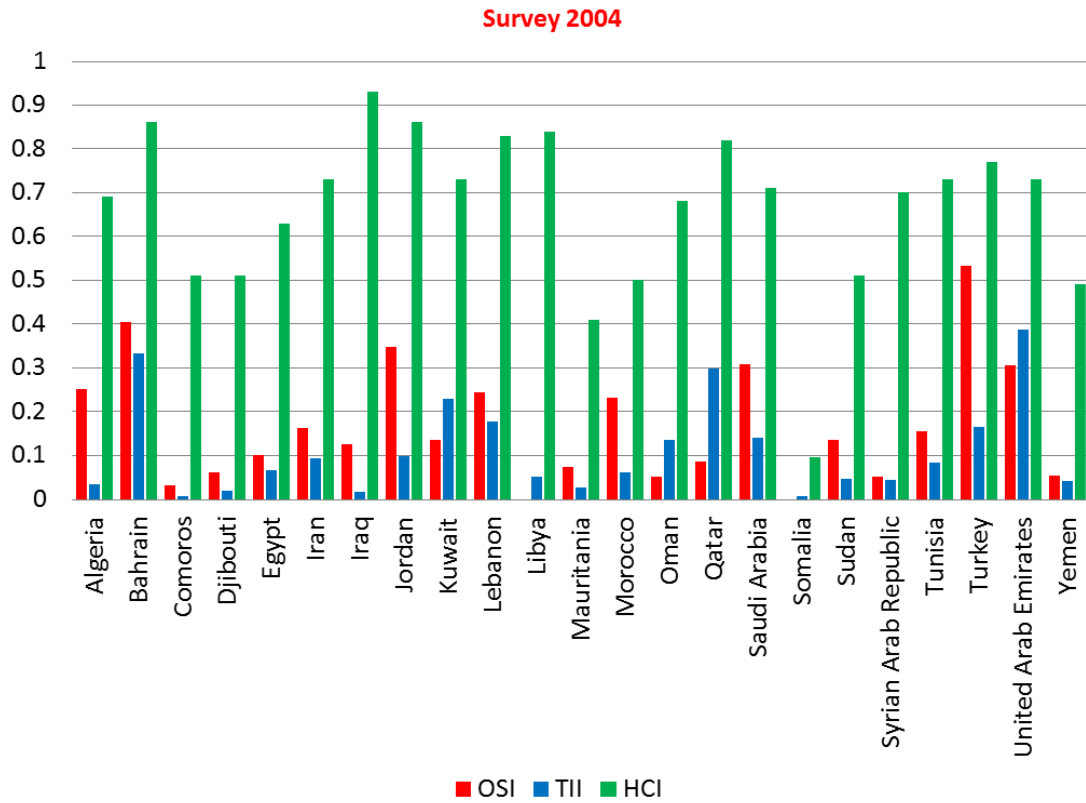
<b>Year</b>	<b>Ranking</b>
<b>2003</b>	24
<b>2004</b>	23
<b>2005</b>	24
<b>2008</b>	17
<b>2010</b>	26
<b>2012</b>	16
<b>2014</b>	17

**Table 7** Rank of Israel, [7]



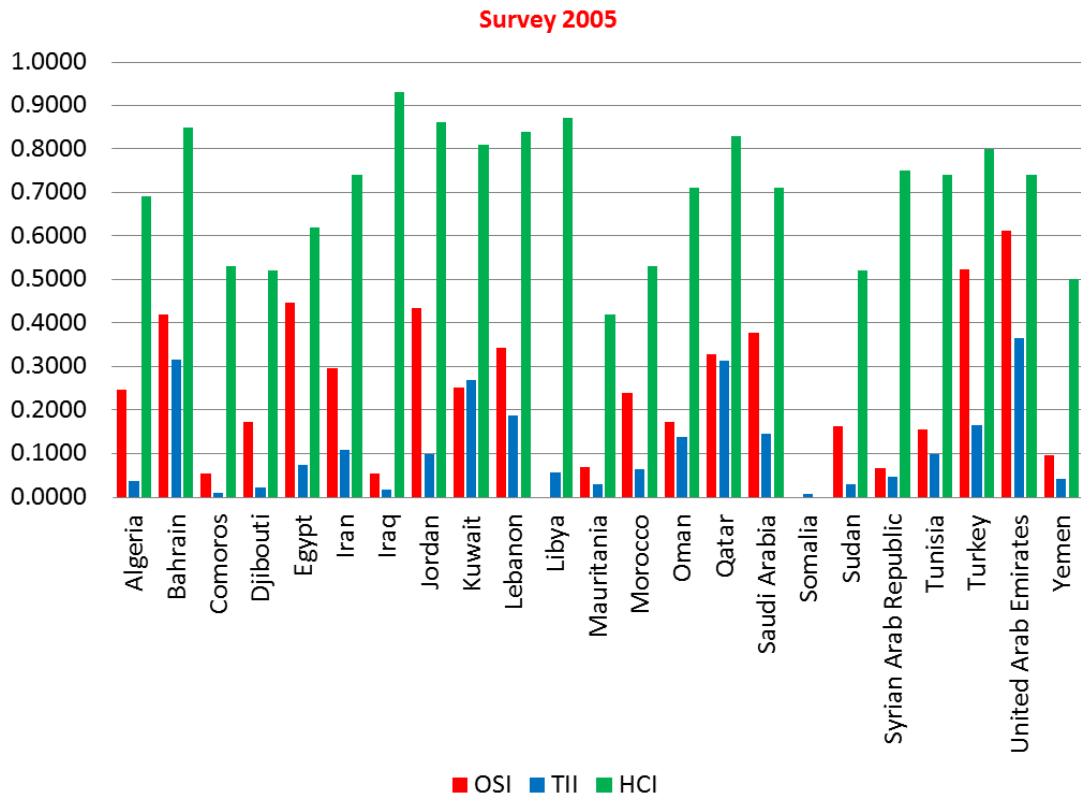
**Figure 14** EGD components for Middle East countries in 2003

In 2003 in our case statistical study of Iraq, has a higher HCI of 0.930 without an OSI of 0.000 and with the lowest TII of 0.016. Moreover, Iraq was not in the e-government readiness index of 2003. Turkey showed a higher OSI of 0.192, thereby ranking Turkey at 49. The United Arab Emirates had a higher TII of 0.419, ranking the United Arab Emirates at 38. Moreover, the HCI was higher than the rest of the indicators in all Middle Eastern countries.



**Figure 15** EGD components for Middle East countries in 2004.

In the statistical analysis of the research findings of 2004, we see that our case study, Iraq, has a higher HCI of 0.930, an Online Services Index of 0.124 and a TII of 0.016, implying that in 2004, there was no change in the HCI and TII indicators. On the other hand, Iraq's ranking in the UN survey in the E-Government Development Index table was 103. The OSI for Turkey was higher at 0.533, with a ranking in the E-Government Readiness Index of 57. The United Arab Emirates' TII was higher at 0.386 with an E-Government Readiness Index ranking of 60. We can note that Turkey still ranks higher than any other country in terms of OSI. The United Arab Emirates scored higher for TII. Finally, the HCI was higher than the remaining indicators in all Middle Eastern countries.

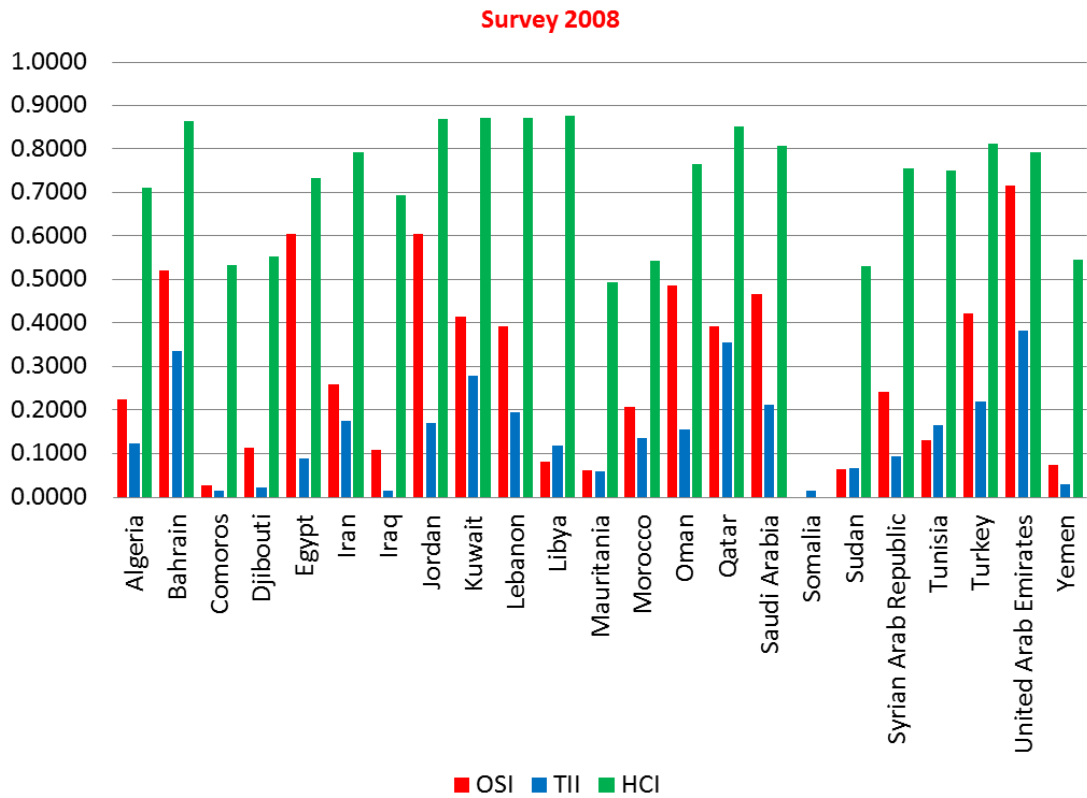


**Figure 16** EGDI components for Middle East countries in 2005.

In the statistical analysis of the 2005 research findings for our case study of Iraq, we find a higher HCI of 0.9300, an OSI of 0.0538 and a TII of 0.0164. The rank in the UN survey in the E-Government Development Index table was 118, indicating that in 2004; Iraq still has a higher HCI than other Middle Eastern countries in addition to an improvement in its OSI and stability of its TII.

On the other hand, we can see a change in the United Arab Emirates' OSI of 0.6115, which was higher index than other countries. In addition, there was a higher TII of 0.3639 and a ranking of 42 in the E-Government Readiness Index. Furthermore, the HCI was higher than the remaining indicators in every other Middle Eastern country.

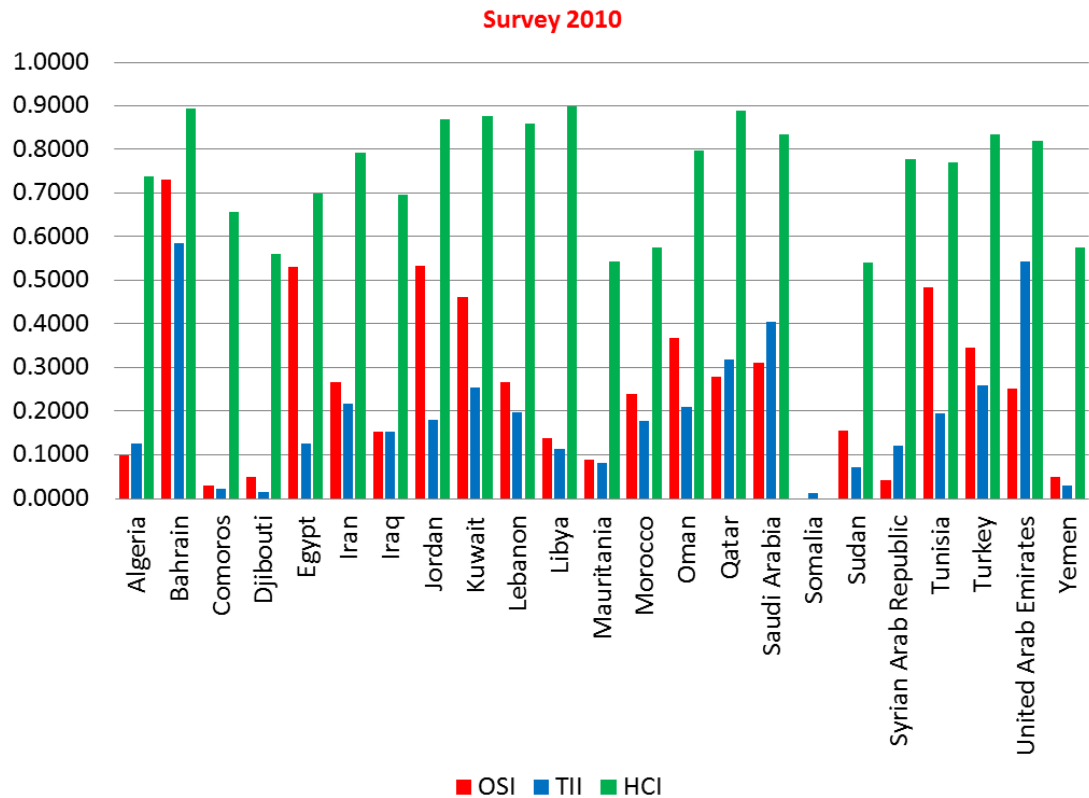




**Figure 17** EGDI components for Middle East countries in 2008.

The statistical analysis of the 2008 research findings for Iraq shows an HCI of 0.6922, an OSI of 0.1070 and a TII of 0.0127 and a ranking in the UN E-Government Development Index table of 151. The HCI for Iraq fell and the OSI rose.

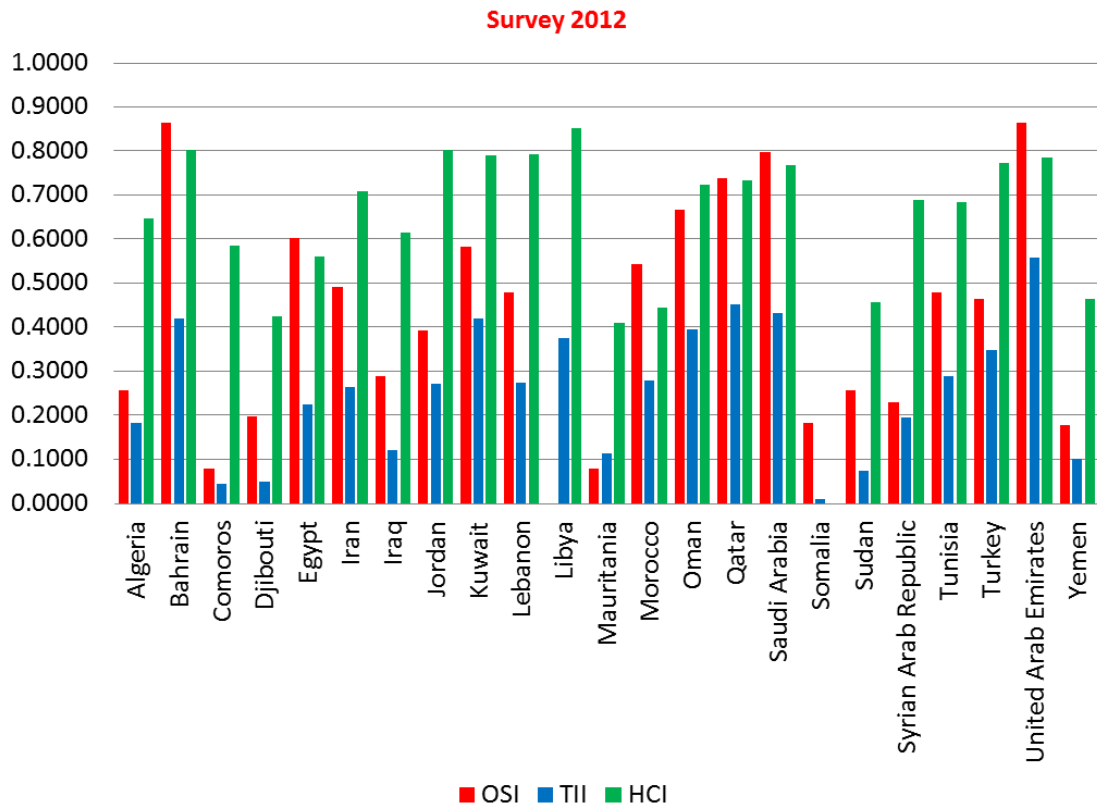
We can see that in 2008, the United Arab Emirates also had a higher OSI of 0.7175 and a higher TII of 0.3813 with a ranking of 32. The HCI was still higher than the remaining indicators in all Middle Eastern countries.



**Figure 18** EGDI components for Middle East countries in 2010.

An analysis of the research findings for the 2010 statistical case study for Iraq shows an HCI of 0.6956, an OSI of 0.1524 and a TII of 0.0552 with a ranking in the UN survey in the E-Government Development Index table of 136.

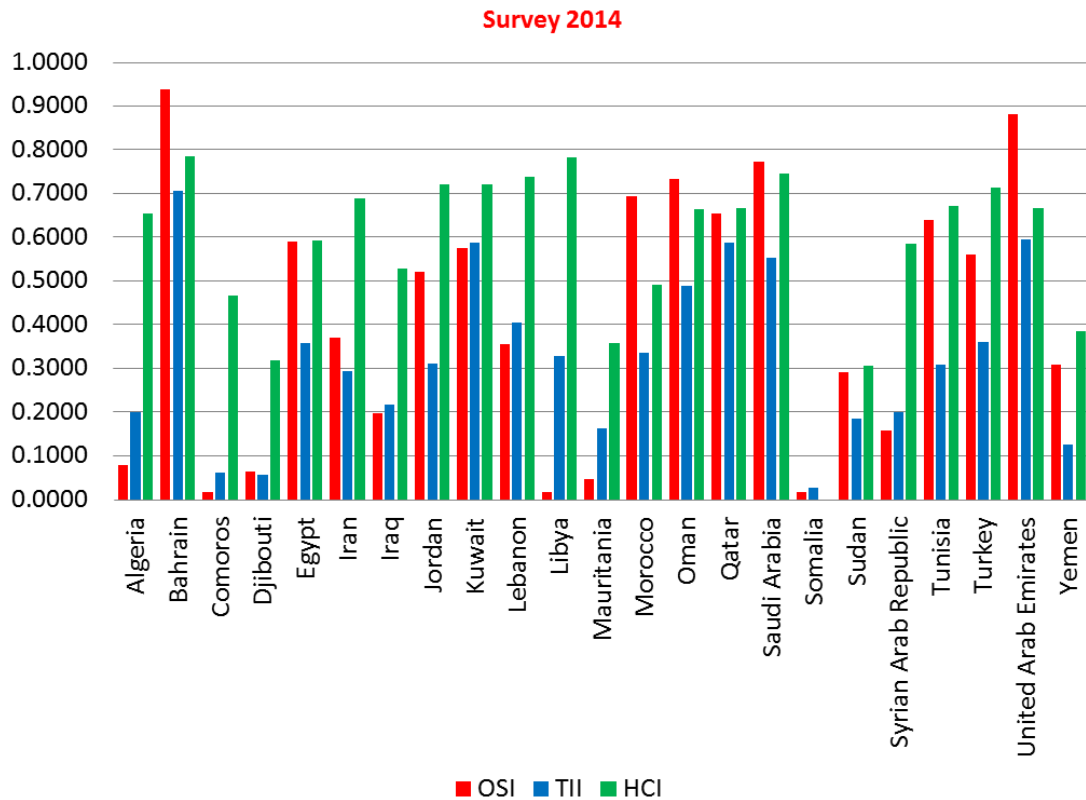
We observe here that Bahrain has a higher OSI of 0.7302 and scored higher for TII at 0.5855 with a ranking in the E-Government Development Index table of 13. On the other hand, the HCI for Libya was 0.8979 with a ranking of 114. The HCI was still high relative to other indicators.



**Figure 19** EGD components for Middle East countries in 2012.

An analysis of the research findings for the 2012 statistical case study for Iraq showed an HCI of 0.6151, an OSI of 0.2876 and a TII of 0.1201 with a ranking in the UN survey E-Government Development Index table of 137.

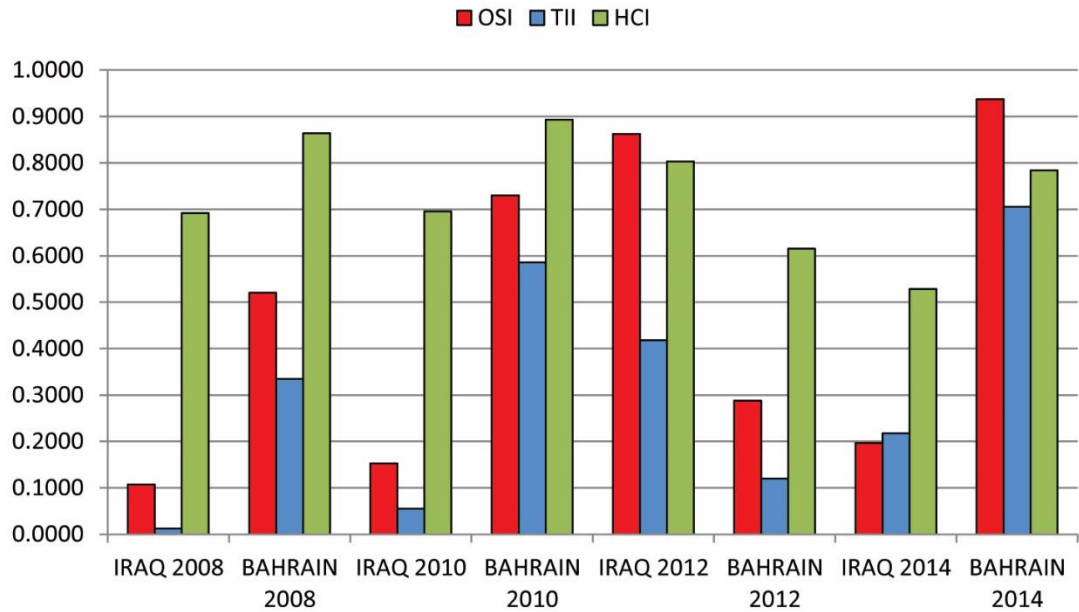
In 2012, Bahrain ranked at 36 and the United Arab Emirates ranked 28 both with a higher OSI of 0.8627. Furthermore, the TII for the United Arab Emirates was higher at 0.5568. On the other hand, it can be seen that in 2012 the OSI was higher than the HCI in countries such as Bahrain, Egypt, Morocco, Qatar, Saudi Arabia and United Arab Emirates.



**Figure 20** EGD components for Middle East countries in 2014.

An analysis of the 2014 research findings in our statistical case study for Iraq shows an HCI of 0.5283, an OSI of 0.1969 and a TII of 0.2173 with a ranking in the UN survey E-Government Development Index table of 134. However, for Bahrain, there was a higher OSI of 0.9370, a TII of 0.7055 and an HCI of 0.7840 with a ranking of 18. Moreover, the OSI begins to increase in many countries.

As an experiment, we took Iraq for our case study and the top ranking countries in the 2014 UN survey for Middle Eastern countries, including Bahrain (ranking at 18) and made comparisons between the respective Human Capital Indexes for Iraq and Bahrain, as shown in Figure 21. As mentioned in Section 3.3, the Human Capital Index was higher than other indicators for Iraq. However, when compared with other countries, such as Bahrain, we note that Iraq has a lower Human Capital Index than other countries and a gradual decline in the HCI. The situation can be seen in the following figures.



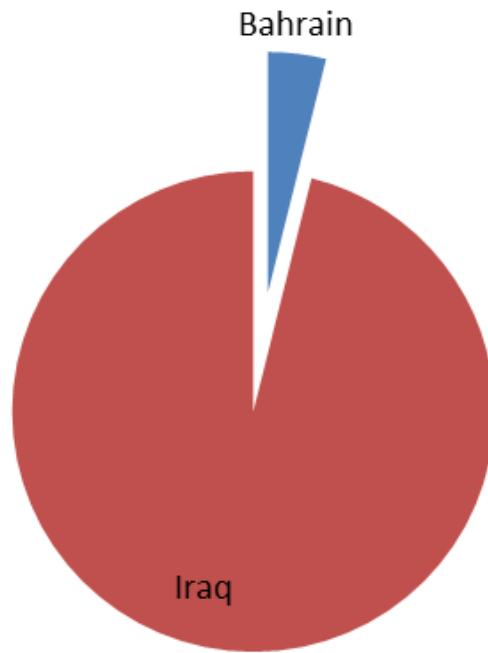
**Figure 21** Comparisons between Bahrain and Iraq in EGDI

We obtained information about Iraq and Bahrain from the Central Intelligence Agency (CIA), site such as population, area, languages, age structure and urbanization information (Table 8) in order to analyze this information and the effects of this information on e-government services.

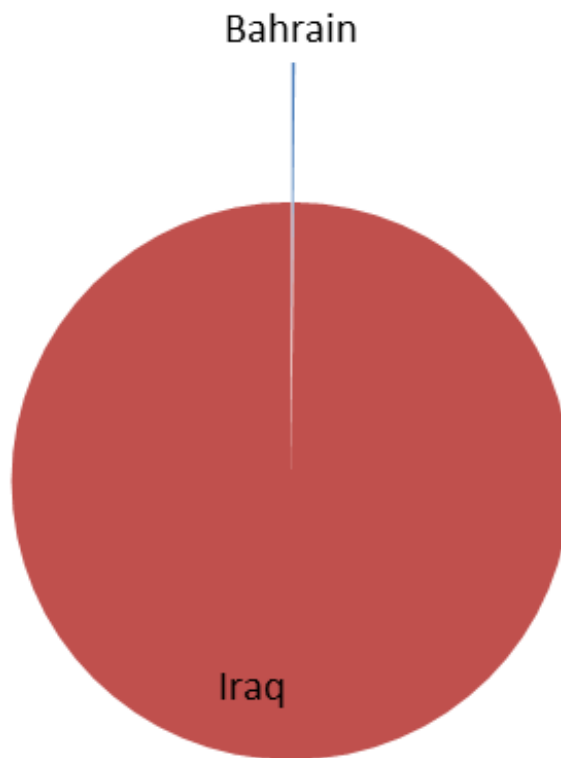
We found that the geographical area of Bahrain is almost equal to 1% of the total area of Iraq, as shown in Figure 22. Bahrain's population is 4% of Iraq's population, as shown in Figure 23.

This indicates that geographic area plays a great role in the provision of electronic services in order to facilitate the provision of infrastructure better than countries that have large geographic areas. On the other hand, we discover the impact and effects of high population on the spread and use of electronic services. Moreover, a small percentage of the population makes it easier for the government to develop community awareness of the use of services and development the community.

# Population



**Figure 23** Populations of Iraq and Bahrain



**Figure 22** Areas of Iraq and Bahrain

	<b>BAHRAIN</b>	<b>IRAQ</b>
<b>AREA</b>	total: 760 sq. km	total: 438,317 sq. km
	land: 760 sq. km	land: 437,367 sq. km
	water: 0 sq. km	water: 950 sq. km
<b>Languages</b>	Arabic (official)	Arabic (official)
	English	Kurdish (official)
	Farsi	Turkmen
	Urdu	Assyrian
<b>Population</b> (July 2014 est.)	<b>1,314,089</b>	<b>32,585,692</b>
<b>Age structure</b> (2014 est.)	<b>0-14 years: 19.7%</b> male 131,698 female 127,663	<b>0-14 years: 36.7%</b> male 6,093,069 female 5,878,590
	<b>15-24 years: 15.9%</b> male 117,156 female 91,477	<b>15-24 years: 19.6%</b> male 3,237,212 female 3,142,202
	<b>25-54 years :56.2%</b> male 483,449 female 254,627	<b>25-54 years: 36.3%</b> male 6,032,379 female 5,785,967
	<b>55-64 years: 5.5%</b> male 47,172 female 25,354	<b>55-64 years: 4.2%</b> male 652,973 female 713,662
	<b>65 years and over: 2.7%</b> male 17,106 female 18,387	<b>65 years and over: 3.2%</b> male 487,841 female 561,797

**Table 8** Information about Iraq and Bahrain

An analysis for the Iraq ranking in the HCI was carried out according to information from the UN surveys in Figure 24, which clearly shows that Iraq has fallen to lower Human Capital Index levels compared to the surveys of previous years. In the surveys of 2003, 2004 and 2005, Iraq had ranked first among the Middle Eastern

countries. Likewise, Figure 25 shows the Middle Eastern countries decreasing in the HCI among most countries.

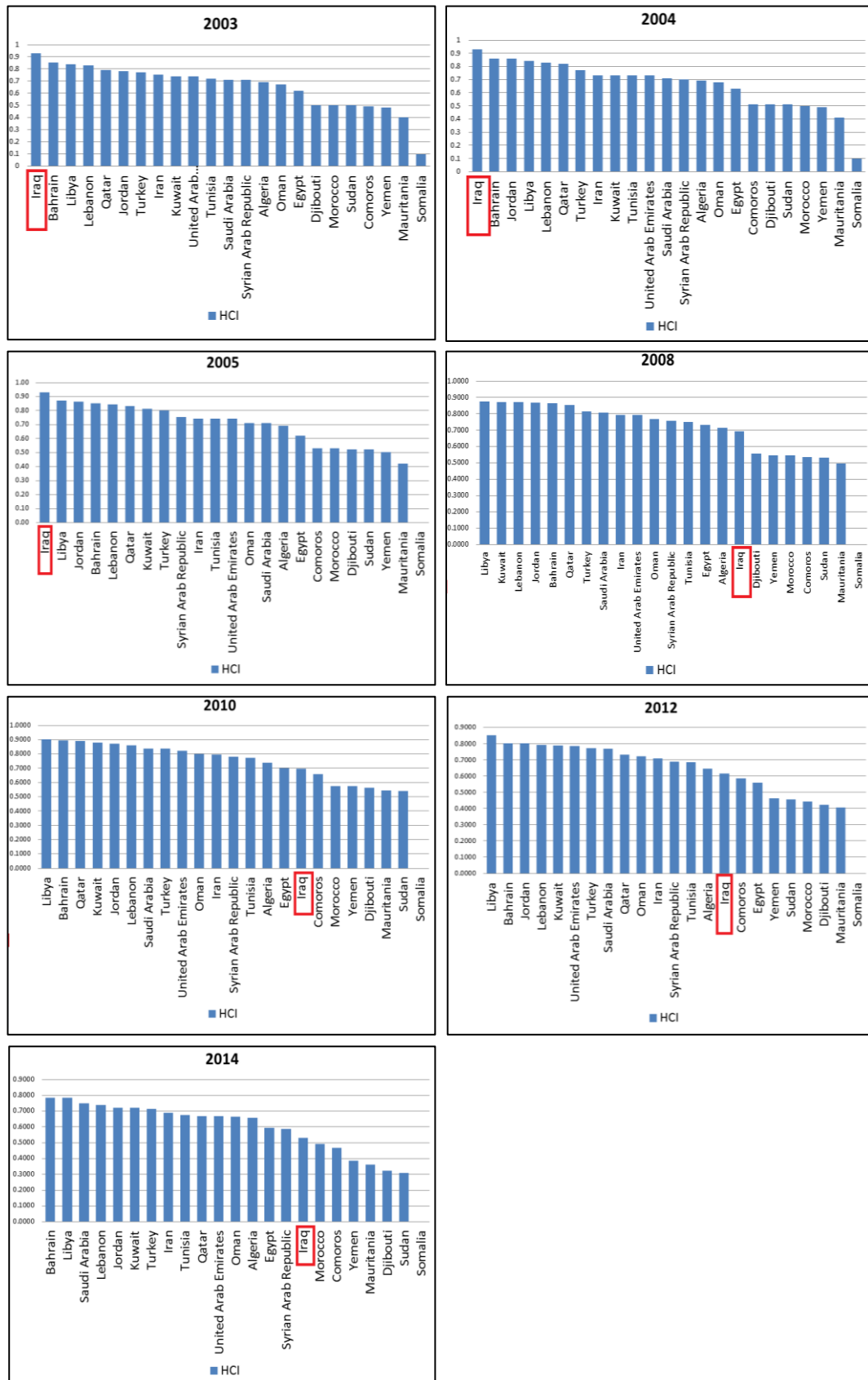
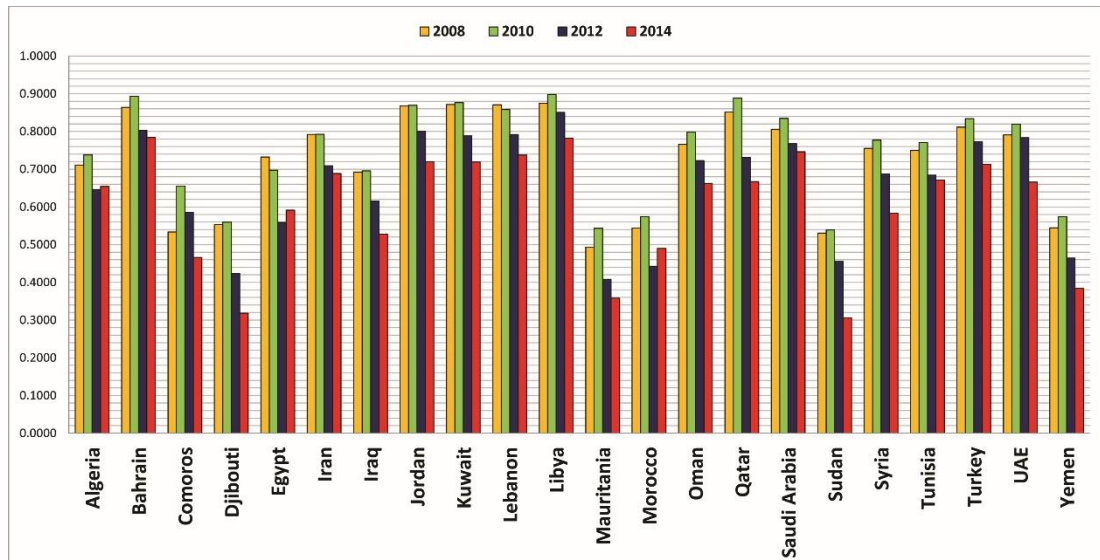


Figure 24 HCI ranking for Iraq





**Figure 25** HCI for Middle East countries

### 3.3 Discussion

The Human Capital Index is a primary component in the UN survey EGDI where have the value of 1/3 similarly to other indicators (OSI 1/3, TII 1/3). Moreover, we mentioned in our research one of the reasons for using the UN survey of the Human Capital Index (HCI). The aim for the United Nations is to “include all people in development and participate in the e-services and applications of e-government.”

According to our research and analysis in Chapter 3 in the EGDI indicators of Middle Eastern countries based on the UN surveys 2003, 2004, 2005, 2008, 2010, 2012 and 2014, we found the following points:

- Advantage relationship between Human Capital Index and dissemination of e-government services as explained in Section 3.2, a higher rate of literacy would lead to a higher volume of usage of e-government services.
- Clearly there is a gap in many countries between HCI, OSI and TII as seen in the Section 2.3 analysis data.
- Most Middle Eastern countries facing problems of a low Human Capital Index, as seen in Figure 25.
- The geographical area plays an important role in its impact on readiness for e-government, as seen in Bahrain in Section 3.2, where that smaller geographical area makes it easier for the government to provide the necessary

infrastructure to provide electronic services and e-government requirements such as phone lines, Internet networks and a number of Internet service providers.

- Population density is one ingredient that may affect the performance of e-government, as explained in Section 3.2, where a lower population leads to governments more easily overcoming the illiteracy rate, the school enrolment ratio and also increasing the proportion of skills in ICT usage.
- There is an indirect impact of the Human Capital Index on the Telecommunications Infrastructure Index the number of mobile phone users, the number of online users and the number of computer users as well as on the proportion of knowledge in the use of information and communication technology, as seen in Section 2.2.4. This, therefore, affects the increase of e-readiness of e-governments. On the other hand, the Human Capital Index may be high in some countries, but they lack the expertise to use ICT and lack knowledge about the available services of e-government, as clearly seen in Section 2.2.5.

As already explained, HCI plays an important role in influencing the provision of e-services and its spread to the community. For that, governments should be the focus on this important factor, especially while noting the low level of the Human Capital Index in Middle Eastern countries.

## CHAPTER 4

### CONCLUSION

We have presented in our review of the literature and analyses conducted on the Middle Eastern countries and the problems that face governments, especially regarding the Human Capital Index within the application of e-governments. Also presented was how it affects the low levels within the sequence of the UN survey, what are the possible solutions to obtain answers to the research questions.

This chapter presents the research findings which we have garnered throughout the preparation of this thesis as well as the limitations, hence further research methodologies for follow-up studies.

The chapter concludes with the benefits of this research study in the light of seeking answers to the research questions.

#### 4.1 Findings

- **Human capital index is a common factor in e-government performance evaluation**

In UN surveys, the number of children at school and the numbers of students that are required to attend schools are kept in calculations. Another evaluation method is performed by ITU, in which computer and IT literacy are measured. Moreover, WEF includes the ability of society to use information and communication technology.

- **ICT and computer literacy is relatively poor in Middle East countries**

As we visited the related literature in Section 2.2, we see that this is a common problem in Middle East countries. This problem is worsening with an absence of awareness of e-government initiatives in terms of both

existence and benefit. There are some examples (Section 2.2.7) in which cultural differences hinder the adoption of the Internet. When we look at the years (Section 3.2), we see the decline of the HCI in most ME and Arab countries.

- **Geographical distribution of the population has a remarkable influence in the e-government adoption**

Examples such as Bahrain show that a concentric population can be used to reduce the digital gap (Section 3.2).

- **HCI is open to discussion with its weight**

When we analyze the components of HCI in the UN surveys, we see that only the potential of ICT literacy is calculated. Introducing ICT usage would provide a more realistic figure about the countries. While OSI (Section 2.1.3.3) and TII (Section 2.1.3.2) have direct effects on the usage of e-government applications, HCI provides only the potential.

## **4.2 Limitations**

- **Websites and articles are the only information sources**

The information used in this thesis is mostly from the related works reported in the literature and in governments' websites. The researcher did not collect information from authorities or end-users. This limitation puts restrictions on findings 3 and 4.

- **Economical and legal issues are not researched**

These issues are considerably important when deploying e-government initiatives. Findings 2 and 3 are limited due to the fact that the economic and legal issues in these countries were not analyzed. Thus, the reason(s) for low HCIs is not clear in these countries.

- **Major measurement indexes are studied**

There are many measurement methods deployed by (non-)profit organizations. In this thesis, we have considered only UN, ITU and WEF methods (Section 2.1.2). Thus, finding 1 is limited to the reports of those three organizations.

### 4.3 Future studies

- **Information should be collected from the end-users**

As limitation 1, the information for this thesis was sourced from websites, articles and conference publications; therefore, a complementary study may be started by collecting information from a variety of citizens through (semi-) structured interviews.

- **Studies on economical, legal and social problems**

The second limitation may be solved by using this thesis as a basis to start complementary studies focusing on socio-economic problems. Concerning the legal studies, the researchers are reminded that law can be diverse in the ME countries although the nations are considerably close to each other. The problem becomes more complicated with the internal conflicts and wars in the region. With such studies, the main reasons for having poor HCI can be distinguished as economic and cultural focuses.

- **Other measurements**

Although UN, ITU and WEF are dominant in the world, more measurements including those used by EU member countries and OECD may be included to overcome limitation 3.

#### 4.4 Conclusion

In the light of our findings presented in Section 4.1 within the limitations of Section 4.2, we conclude that the potential impacts of HCI are on e-government performance in addition to the challenges that face Middle Eastern countries regarding the HCI. Therefore, the following research questions targeted in the thesis have been approached and encouraging positive answers have been found:

- How does the HCI fit into e-government performance measurement in Middle Eastern countries?

HCI is a common factor in the evaluation of e-government performance; hence it cannot be put off the consideration just for Middle Eastern countries. However, by its nature HCI gives a figure about potential to accept/adopt e-government applications. While concentric population is not uncommon in Arab states, OSI and TII components can be raised relatively easier in the urbanized places; however, the same remark can hardly be done for HCI as the use of ICT and computer literacy is relatively poor in Middle Eastern countries. It is still too early to give a straight and solid answer to the research question above when we consider the limitations in this thesis; however, keeping HCI component with its equal weight with OSI and TII should be open to discussion.

We keep in mind that most of the potential challenges of the HCI for Middle Eastern countries include the low ICT level in the community, culture, literacy rate, awareness, training, intention to use e-services and geographical distribution of the population.

We recommend that Middle Eastern countries focus on the problems expounded in our research. In addition, we recommend that there be a focus on awareness and training by using media campaigns, SMS, television, social media, advertising, establishment courses and workshops in order to provide communities with sufficient knowledge (to some extent) about the benefits of e-government services, thereby leading to increases in the ICT level.

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## APPENDICES A

### CURRICULUM VITAE

#### PERSONAL INFORMATION

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#### FOREIN LANGUAGES

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