E-HEALTH STATE IN MIDDLE EAST COUNTRIES:  
AN OVERVIEW

Ali Fahem Neamah¹,²  
Mohd khanapi abd ghani²  
Asmala bin Ahmad²  
Esraa Saleh Alomari¹  
Riyadh Rahef Nuiaa¹

University of Wasit, collage of computer and information technology ¹  
UTeM, FTMK, Melaka, Malaysia ²

Abstract  
Diverse health systems within the Middle East continue to experience a high degree of variability with regards to accessibility, capacity, and the quality of care provided within each individual country. This paper summarizes the unique challenges and achievements within the healthcare systems of ten countries in the Middle East region. Additionally, the review aims to provide evidence for how healthcare systems in the Middle East are managed and sustained despite differences in wealth and infrastructure, as well as the presence of conflict in certain areas.

Keywords: E-health, Middle East, ICT, demographic state

1. Introduction  
Information can be a powerful tool for any business, and the healthcare sector is now beginning to realize its potential use to improve the quality of services they provide. A variety of acute to long-term care healthcare facilities are looking towards adopting information technology, such as an electronic health record (EHR). Healthcare professionals now have the opportunity to access and use the collected information quickly to their advantage, as a decision support tool and provide better patient care (W.-H. Hung et al., 2015). Physicians have a central role in the use of the EHRs, as they are who provide much of the information that the systems handle in their automated processes).

The electronic health record (EHR) is viewed as the backbone supporting the integration of various tools (e.g., emergency information, test ordering, electronic prescription, decision-support systems, digital imagery, and telemedicine) that could improve the uptake of evidence into clinical decisions. Using such evidence in daily clinical practices could enable a safer and more efficient healthcare system (MS Househ et al., 2017). Although many organizations are implementing EHRs, there is no one common strategy that is being followed, and the lack of change management during these implementations leads to failures (Paton & McCalman, 2008). Nearly 75 percent of all large health information technology (HIT) projects fail, as well as 30 percent of EHR implementations (Dennis, 2015). The employment of new technologies in healthcare practice provides numerous benefits and functionalities such as effective healthcare services, reduced costs, better sickness management, less medical errors and improved
managerial functionalities. The benefits of information technology (IT) has also been recognized by developing countries and they have also begun to incorporate electronic health records within their facilities (Joshi, 2013). Patients, professionals, organizations, and the public in general are thus expected to benefit from EHR implementation.

2. Electronic Health Records in Developing Countries

In developing countries, a patient’s medical records can be found scattered in various locations within the hospital. This situation makes it difficult for a physician to provide care to the patient and poses danger to the well-being of the patient. In developed countries, the Electronic Health Records and the web-based Electronic Medical Records system provide a robust system that integrates various patient medical records into a single system (Norris, 2016). Developing countries lack not only infrastructure but also human resources to manage patient data and provide quality healthcare (Luna et al., 2014). In Iraq, like in most other developing countries, finding reliable patient data is challenging. Even data created during a patient visit is not stable due to lack of attention given when the data is collected. Without stable data, physicians cannot provide useful diagnosis to patients. In addition, the lack of a robust information management system to deal with chronic diseases such as AIDS, TB, and malaria has led to public health crises in various developing countries.

3. Information Technology and Healthcare

The current information age means more rapid information is available more quickly which places a value on it like never before (Schwarz & Brock, 1998). One of the fundamental challenges for health care information has been the ability to manage patient information, which has not kept up with the rapid advances in technology and medical science (Fleurence et al., 2014). Although medical and diagnostic technology allows more rapid identification and many more treatment options, health care professionals’ inability to get the right information to the right person efficiently limits the quality of care that can be provided. According to the Institute of Medicine it is jeopardizing the safety of the patient.

The electronic age appears to be denoted by two distinct waves each influencing the shape and type of organizational change (Schwarz & Brock, 1998). The first wave (1950-1980) recognized technology as a back-end support or automation for manual processes. In the second wave which began in the 1990s technology began to shape an organization and create organizational change. Schwarz and Brock noted one of the significant features of this wave was a move toward integrated systems that brought key components of the organization into one view (e.g., customers, financial, operational).

Health care unlike other industries has been slow to embrace the fully integrated system and is still plagued with isolated stand-alone systems that do little to advance knowledge or information sharing (Meier, 2015). The advancement of e-health and the electronic health record may signal the beginning of the second wave for health care. This second wave clearly signals change therefore; its success will depend on understanding institutional level of readiness. The use of computers in health care practice is still relatively new. One study noted that information technology in health care is estimated to be 10 -15 years behind other information intense industries (Menachemi et al., 2004). One reason for the slow uptake may be provider resistance. A study exploring the barriers to adopting computerized order entry found physician resistance to be the largest barrier (Rogove et al., 2012). Resistance appeared due to the perception of inefficiency in using the new system and low levels of computer literacy among physicians. Aboumatar et al., (2013) also found, perception of work and computer literacy to be a barrier to the implementation of an electronic health system. These studies did not examine the relationship of computer self-efficacy, readiness for change and resistance. This raises the question of whether provider resistance is a result of low computer literacy levels or whether low computer literacy...
levels are a result of low computer self-efficacy. In turn low computer self-efficacy reduces the level of readiness which then manifests itself as resistance.

Although many proposals have been made to control healthcare costs, implementing electronic information systems within the healthcare system is considered to be a proposal with the greatest potential for success (Ackermann, 2014; DesRoches et al., 2008). Efforts to implement information technology within the healthcare industry are underway. As part of the Health Information Technology for Economic and Clinical Health Act, government leaders also offered financial incentives to providers who implemented digitized healthcare records starting in 2010. Corporate leaders are making an effort to control healthcare costs. Walmart officials began to digitize employee healthcare records in an attempt to reduce the organization's healthcare costs (V. N. Patel et al., 2012).

Healthcare practitioners have not shown the same affinity for information technology as other industry leaders. In a comprehensive electronic medical record system patient medical records were maintained, and all clinical units within the hospital had access to data entry and patient information. Jha et al., (2009) found that fewer than 8% utilized a basic electronic medical record system, in which patient medical records were maintained and at least one clinical unit within the hospital had data entry and information access. Electronic prescription order entry systems were used in less than 18% of hospitals (Jha et al., 2009). Urban and teaching hospitals were more likely to use an e-health system.

E-health involves these aspects related to healthcare activities using information systems (informatics).
- Electronic health records: mainly focusing on communication of patient data between healthcare professionals.
- E-Prescription: an electronic transmission of prescriptions between doctors and pharmacists, as well as patients.
- Telemedicine: remote physical treatments, including distance-monitoring of patients functions.
- Healthcare information systems are considering management of healthcare data, including demographic data, lab data, and biologic data (e.g. bio ontology).

4. Overview of Middle-East Country E-Health Implementation
4.1 Jordan
a- demographic state
Officially The Hashemite Kingdom of Jordan, is an Arab kingdom in Western Asia, on the East Bank of the Jordan River. Jordan is bordered by Saudi Arabia to the east and south, Iraq to the north-east, Syria to the north, Israel, Palestine and the Dead Sea to the west and the Red Sea in its extreme south-west. Jordan is strategically located at the crossroads of Asia, Africa and Europe. The capital, Amman, is Jordan's most populous city as well as the country's economic, political and cultural center (Convention, 2011).

b- ICT state
The rise of the electronic era in Jordan began when King Abdullah the Second of Jordan assumed his constitutional powers. For a country with limited natural resources, The King saw a great opportunity in ICT related initiatives to modernize Jordan, with the vision of Jordan becoming an IT hub for the region. In response the country launched a number of ICT based programmes (Strachan, 2008).

c- Healthcare state
The Jordanian healthcare sector consists of 45 public hospitals and 84 comprehensive medical centers. In order to implement Hakeem in all hospitals, three phases of implementation were required. The project started with the connection of one public hospital, the Princess Hamzah Hospital, with the Amman comprehensive health center. Then a second public hospital was
connected to the system, and this was followed by all of the other public hospitals and health centers in Jordan until they were all connected (Rosen, 2015). An e-Health initiative was launched in 2000. Its goal was the connection of Al-Basheer Hospital (the biggest public hospital in Jordan) using IT network with all other public hospitals in Jordan within three years. The e-Health initiative has also been unable to deliver any of its intended goals and the scheme seems to have been halted for the time being (Matar & Alnabhan, 2014).

4.2 Saudi Arabia

a- demographic state

Officially known as the Kingdom of Saudi Arabia (KSA), is an Arab state in Western Asia constituting the bulk of the Arabian Peninsula. With a land area of approximately 2,150,000 km2 (830,000 sq mi), Saudi Arabia is geographically the fifth-largest state in Asia and second-largest state in the Arab world after Algeria. Saudi Arabia is bordered by Jordan and Iraq to the north, Kuwait to the northeast, Qatar, Bahrain, and the United Arab Emirates to the east, Oman to the southeast, and Yemen to the south. It is separated from Israel and Egypt by the Gulf of Aqaba (Altuwaijri, 2008).

b- ICT state

In recognition of the transformational nature of information and Communications technology (ICT), Saudi Arabia has placed great importance on diffusing technologies throughout the nation–across the public and private sectors and civil society. Indeed, one of the Kingdom’s strategic objectives as per its Ninth Economic Development Plan (2010-2014) is to evolve into a ‘knowledge economy’ in which ICT forms a necessary component. The growing economy of the Kingdom requires well directed investments into ICT if such an objective is to be attained.

c- Healthcare state

Over the past 3 decades, the government of Saudi Arabia has spent billions of Riyals to develop and improve the quality of healthcare, and expands its coverage (Bah et al., 2011). This has resulted in an increase in the numbers of both government and private hospitals and medical centers. Major hospitals provide all sorts of sophisticated treatments including open-heart surgery, kidney transplants and cancer therapy. Approximately 11,350 doctors, nurses, and other medical personnel, including the Saudi Red Crescent Society, provide medical service to the millions of people who visit the Kingdom for the annual pilgrimage of Hajj. Immunization against tuberculosis, polio, hepatitis, and tetanus is freely available. Medical insurance schemes are available at reasonable cost. Due to this rapid expansion, healthcare providers in Saudi Arabia have varied. While the ministry of health provides around 60% of the healthcare services, the remaining portion is provided by other government bodies such as the National Guard, the Ministry of Defense and Aviation, the Ministry of Interior, the University hospitals, and rapidly growing private sector. This variation of health service providers has led to variations in the way the healthcare facilities are administered and managed with significant variation in the information systems used. As a result, patient information/record has become scattered in different healthcare facilities without a provider having the complete patient record except in very rare cases where the patient chooses to receive healthcare from one provider at all times (Almuayqil et al., 2015). One additional negative impact of varied healthcare systems is the great waste of efforts and money resulting from treating patients repeatedly for the same health problems in several medical centers. Patients may at times be asked to repeat x-rays and other laboratory tests, and may be given different medications which may compromise patient’ safety. Saudi Arabia has made noteworthy strides in adopting Health IT into their health system. The government has a Health IT plan in place and is developing a network to connect all government-supported health facilities and hospitals. Saudi Arabia has also created a favorable environment to promote entry of companies into the Health IT market and currently relies on imported technologies and healthcare workers. Short-term reductions in healthcare budgetary expenditures may slow down Health IT adoption, but long-term trends still look strong.
4.3 Turkey

a- demographic state

Turkey, officially the Republic of Turkey; pronounced, is a transcontinental country in Eurasia, mainly on the Anatolian peninsula in Western Asia, with a smaller portion on the Balkan peninsula in Southeast Europe. Turkey is bordered by eight countries: Greece to the west; Bulgaria to the northeast; Georgia to the north; Armenia, the Azerbaijani exclave of Nakhchivan and Iran to the east; and Iraq and Syria to the south. The Aegean Sea is to the west, the Black Sea to the north, and the Mediterranean Sea to the south. The Bosphorus, the Sea of Marmara, and the Dardanelles, which together form the Turkish Straits, divide Thrace and Anatolia; they also separate Europe and Asia. Turkey's location between Europe and Asia has retained its geopolitical and strategic importance throughout history.

b- ICT state

According to the report of TUBISAD (Informatics Industry Association), Turkey’s growth rate over the past 50 years is 4.5%, between the years 2001-2007 the growth rate is 6.5%. In order to achieve the goal of 2023 the growth should be 8.5%. For this growth rate ICT sector has the major share in the market. Productivity of ICT in Turkey is four times bigger than productivity of the private sector. Turkey’s information and communication technologies (ICT) market reached a size of $27.3 billion in 2010, an increase of 3.8% from 2009 (Altun, 2007). The fact is Turkey’s utilization of new information and communication technologies is rapidly growing, like its economy generally, albeit from a low base compared with other OECD countries. This growth creates opportunities to make use of new approaches, such as cloud computing and advanced mobile applications. The right conditions, however, will need to be met and there is much to do in Turkey, to prepare the ground for effective, rapid up-take. The first of these will be a well-functioning market for ICT goods and services, with congenial conditions on both the supply and the demand sides (Abbasi et al., 2008).

c- Healthcare state

Turkey is a moderate-sized Health IT market that has already set a solid foundation for their national Health IT system, particularly in the areas of Electronic Health Records (EHRs) and Hospital Information Systems (HIS). Turkey, however, has not done much to date in the areas of mobile health/telehealth, clinical decision support and data analytics, which offer significant potential to U.S. firms. A large public-private partnership project to build more than two dozen large hospital campuses will also be of interest to Health IT sector stakeholders. Turkey’s Ministry of Health (MOH) is the largest provider of healthcare services and serves as the lead government body to plan and implement healthcare and Health IT-related projects. Local software companies also play a significant role in providing specific Health IT solutions, including EHRs and HIS, which are widely used in Turkish hospitals (Yurt, 2008).

4.4 Israel

a- demographic state

Israel, officially known as the State of Israel, is a country in the Middle East, on the southeastern shore of the Mediterranean Sea and the northern shore of the Red Sea. It has land borders with Lebanon to the north, Syria to the northeast, Jordan on the east, the Palestinian territories of the West Bank and Gaza Strip to the east and west, respectively, and Egypt to the southwest. The country contains geographically diverse features within its relatively small area. Israel's financial capital and technology center is Tel Aviv and the proclaimed capital is Jerusalem, although the state's sovereignty over the city of Jerusalem is internationally unrecognized.

b- ICT state

Israeli hi-tech enjoys an international reputation for quality, talent, and know-how. Hi-tech products account for more than a quarter of all Israeli exports, and following the US and Canada, Israel has more hi-tech companies trading on the NASDAQ than any other country. Furthermore, many of the world’s largest hi-tech companies have set up R&D and production facilities in Israel, and invest in Israeli companies. Approximately 15% of all worldwide Internet technologies originated in Israel. Government policies in Israel support technical education, while national
priorities place an emphasis on infrastructure planning and development throughout the country, especially in telecommunications and electricity generation. The Office of the Chief Scientist of the Ministry of Economy (formerly the Ministry of Trade, Industry, and Labor) sponsors numerous programs that encourage applied research and development, and the establishment of technological start-up enterprises. Israeli universities, especially the Technion and the Weizmann Institute of Science, have been at the forefront of Israel’s technological drive. Most Israeli enterprises, regardless of size, have computerized their management infrastructure, and almost every major company and institution has a website. At the same time, it is important to note that Israeli hi-tech is vulnerable to world trends and economic forces, as well as domestic fluctuations. As a result, varying degrees of opportunities exist at any given time.

**c- Healthcare state**

Despite the fact that Israel has adopted a national information policy and a national ePolicy, it has not yet adopted a national eHealth policy, which is something the Ministry of Health (MOH) has been working towards in recent years. In Israel 100% of the physicians at healthcare providers have access to their patients’ EMR. For purposes of comparison in the United States in 2013, according to data from the Centers for Disease Control and Prevention, only 78% of office-based physicians used any type of EMR and 48% of office-based physicians reported having a system that met the basic criteria of an EMR (Arnold et al., 2007). In recent years, not only was an EMR implemented in Israel, but also, the health plans have been providing different services on-line and some via mobile phones. With these services the health plans have granted the patients access to their own healthcare information from a computer or smartphone, in a user-friendly way and with clear information, a key step towards more complete patient empowerment. This system is called Personal Health Record (PHR). Additionally, administrative services are offered via the PHR and other services such as electronic prescriptions or ePrescriptions began to be offered. At the onset of ICT implementation within the health plans the government exercised no defined role, neither as a regulator nor as a facilitator (Berman et al., 2014). More recently, however, the administration of the MOH started to acknowledge the benefits of eHealth and mHealth and it has been working on national projects such as the National EMR that finally led to the Health Information Exchange (HIE) project. This project is intended to facilitate the sharing of information at the point of care between different healthcare organizations (Catan et al., 2015).

**4.5 Qatar**

**a- demographic state**

Qatar local vernacular pronunciation: officially the State of Qatar, is a sovereign country located in Western Asia, occupying the small Qatar Peninsula on the northeastern coast of the Arabian Peninsula. Its sole land border is with Saudi Arabia to the south, with the rest of its territory surrounded by the Persian Gulf. A strait in the Persian Gulf separates Qatar from the nearby island country of Bahrain, as well as sharing maritime borders with the United Arab Emirates and Iran.

**b- ICT state**

Over the past several years, the Supreme Council of Information and Communication Technology (ictQATAR) has been monitoring the overall progress of information and communication technology (ICT) penetration and utilization among key sectors crucial to the growth of a knowledge-based economy. A first-ever country-wide, survey-based ICT study was conducted in 2008 and released in early 2009. Two years later, Qatar National Development Strategy from 2011 to 2016 commissioned International Data Corporation (IDC) to conduct an in-depth review of the same key sectors-households and individuals, the government, businesses, healthcare, education, and tourism and sports, as well as of the ICT job market (Kheir & Fahey, 2011). This report is a summary of IDC’s findings on the penetration and usage of IC. Qatar’s ICT Landscape 2011 outlines numerous areas of progress in ICT penetration and usage across various sectors in Qatar. Today, the country is better connected than ever, with ICT providing new means of delivering learning, enhancing business efficiencies, helping to improve healthcare and government services, and allowing households and travelers to socialize, access information, and seek entertainment.
Qatar has been making significant progress in terms of ICT access and use, with digital technology touching the lives of an increasing number of people within the country. With a national vision to transform itself into a knowledge-based economy by 2030, Qatar has continued to make significant investments in ramping up its national infrastructure as well as the capacity of its human capital. Overall, Qatar’s ICT penetration rates have shown strong growth since the previous assessment conducted in 2008. A growing number of the country’s households are embracing the Internet—in 2010, 84 percent had access to the Internet, compared with 63 percent in 2008. Furthermore, broadband connectivity in households increased from 41 percent in 2008 to 70 percent in 2010. The business sector also saw a strong increase in overall PC penetration, growing from 67 percent in 2008 to 76 percent in 2010. Beyond households and businesses, there is also high penetration of PCs, mobile phones, the Internet, and broadband connectivity among government organizations, schools, universities, and tourism facilities in the country. Qatar’s growing ICT penetration rates have contributed to the country’s favorable placement in various comparative international indices. Qatar ranks 17th out of 139 nations in the Global Competitiveness Index produced by the World Economic Forum (WEF), and 30th out of 133 national economies within the Networked Readiness Index, which is produced by the WEF in cooperation with the INSEAD, the international business school. Also, the country ranks in the upper third of the UN E-Government Development Index and the Ease of Doing Business Index, which not only evaluate the spread and use of ICT, but also explicitly consider the roles played by major stakeholders, such as individuals, businesses, and governments.

c- Healthcare state
Qatar has a well-developed healthcare infrastructure, comprising both the public and private sectors. Key aspects of the healthcare services in the country include:

1. A significant participation of the eight government hospitals in the delivery of healthcare services managed by Hamad Medical Corporation (HMC);
2. More than 30 government clinics managed by Primary Health Care Corporation (PHCC) that are being re-designed to be the cornerstone of a new Integrated Health Model for health care;
3. World renowned specialist centers and hospitals such as Aspetar and Sidra;
4. A recently established and evolving health insurance scheme that is transforming how services are funded in the country; and
5. The Supreme Council of Health (SCH), as regulator, leading an E-Health agenda to improve the health outcomes through the integration of the public and private providers and a greater participation of patients in their wellness management.

Many of these organizations are still providing healthcare supported by paper-based processes and lack the required systems to connect to one another. Without focused investment to transform its services through the introduction of information and communications technology, Qatar will be unable to meet the expectations and demands for excellent health care in the future. The impacts of an ageing population, chronic and complex conditions, and workforce constraints are all putting pressure on health services to deliver more effective healthcare with the current resources. Qatar’s strategy to deliver a world-class health care has been impacted by the following four key issues which have been identified as typically affecting clinical service delivery in paper-based environments:

1. Safety and Quality: Paper based records, poor integration of systems and lack of information exchanges put at risk the patient’s safety and hinder health service quality.
2. Effectiveness: Lack of digital data results delays or prevents access to the health data needed for clinical care and incurs significant overhead costs as a result of the time wasted looking for information.
3. Decision Support and Research: Questionable data quality and absence of data analytics capabilities at a national level result in limited evidenced based decision support and lack of health data for research.
4. Access and Capacity: The lack of integration between facilities and external services has a negative impact to service access and capacity.

4.6 Kuwait

a- demographic state
Kuwait, officially the State of Kuwait, is a country in Western Asia. Situated in the northern edge of Eastern Arabia at the tip of the Persian Gulf, it shares borders with Iraq and Saudi Arabia. As of 2016, Kuwait has a population of 4.2 million people; 1.3 million are Kuwaitis and 2.9 million are expatriates. Expatriates account for 70% of the population.

b- ICT state
Information Communication Technology (ICT) is in constant growth in quest with economic and demographic trends of Kuwait. This induces a great need for capacity building and maintenance. In the early eighties, Kuwait adopted telecommunication technology before its GCC peers by establishing MTC (Zain), the first telecommunication company in the region. Kuwait was one of the earliest internet adopters in the region as well. However, it lagged behind other countries in the recent years in terms of various key indicators. For e.g., in terms of network readiness index, it ranks 62 compared to 27 for Bahrain and 28 for Qatar. Similarly, it has lower mobile and internet penetration compared to other GCC countries. One of the key limitations of Kuwait ICT sector is the lack of an independent regulatory body which is slowing further development in this evolving sector. Kuwait is the third largest spender on ICT infrastructure in the GCC. ICT spending has grown at a CAGR of 12.6% between 2003-2011 and is expected to moderate to a 6.4% annualized growth over the next three years. We expect total ICT spending to reach USD 28 billion between 2011- 2015. The bulk of ICT spending, about 80%, is towards Communications, followed distantly by Computer Hardware and Software. Based on segment analysis, ICT spending is concentrated on consumer segment with 47% of total 2011 spending, followed by energy and utilities with 9.3% while the government segment contributed to 7.2% of total ICT spending. Consumers might be leading ICT adoption in Kuwait; however, this is not the case in the government sector. This issue was addressed by the Government of Kuwait, through the establishment of the Central Agency for Information technology. The CAI is in charge in digitizing the government, the task is long and challenging but fruitful as we can see with several unified communication tools including Ministry of Health digital medical record initiative and TASDEED portal. CAI projects once implemented will require increased spending on ICT infrastructure.

c- Health care state
The Ministry of Health in Kuwait (MOH) is the second largest ministry in the country. It is headed by a minister and an undersecretary, as well as twelve assistant undersecretaries. The Ministry of Health is responsible for the administrative and technical management of the planning, monitoring and evaluation of healthcare services. Every citizen and expatriate in Kuwait holds an identity card, with a unique number for the holder. This card is used by the Ministry of Health to access the patient’s medical record. These medical records are held in the main database center, which in turn are transferred to the master database within the Department of Information Systems. This system has been running successfully for the last ten years. The medical record contains details of all visits to a health center, the regional general hospital and referrals to specialty hospitals. In addition, the patient may have been overseas for a specific treatment. All this data and information is kept in the medical record of the patient.

4.7 United Arab Emirates

a- demographic state
The United Arab Emirates sometimes simply called the Emirates or the UAE, is a Middle Eastern federation country in Western Asia, at the southeast end of the Arabian Peninsula occupying the Persian Gulf bordering Oman to the east and Saudi Arabia to the south, and shares marine borders with Qatar and Iran. In 2013, the UAE’s population was 9.2 million, of which 1.4 million are Emirati citizens and 7.8 million are expatriates.

b- ICT state
The ICT sector in the UAE is one of the most advanced in the Arab world. The UAE ranked 30th worldwide and 3rd among all Arab states in the 2011-2012 in the Network Readiness Index. Market overview The UAE ranked first among the Arab states on:

- Broadband internet subscribers;
- Impact of ICT on new services and products;
- ICT patent applications per million populations;
- Secure Internet servers per million populations;
- Low Software piracy rates.

Also, 4G coverage is now available in certain locations. IT spending in the UAE was AED 21.6 billion (approximately GBP 3.6 billion) in 2011. The UAE’s mobile penetration rate was 199% in 2011. The UAE has a tech-savvy young population that aspires to own the latest products. There is an increasing adoption of broadband and the government plans to develop the country’s infrastructure. The implementation of Long Term Evolution (LTE) and Fibre-to-the-home (FTTH) by telephone companies led to spending in the transport, communications and utilities sectors. The Telecommunications Regulatory Authority (TRA) is the government authority responsible for the management of every aspect of telecommunications and information technology in the UAE. The UAE offers ICT companies an opportunity to set up in Free Zones such as Dubai Internet City (DIC) and Dubai Outsource Zone. A Free Zone Company does not need a local business partner and can be 100% owned by a foreign national or nationals.

c- Health care state

The UAE government is extensively expanding and upgrading its healthcare systems to match international standards. High birth rates, rise in life expectancy, growing incidence of NCDs, and medical tourism are driving the demand for healthcare in the UAE. Healthcare spending in the country grew at an 8.9 percent compound annual growth rate (CAGR) from $8.4 billion in 2008 to $12.9 billion in 2013. The per capita healthcare spending in the UAE was at $1,569 in 2013, the second highest in the GCC region.

The UAE Ministry of Health (MoH) has embraced the information technology (IT) revolution, an electronic patient record, generated by a state-of-the-art health information system, to improve the patient care experience. Wareed is the first of its scale healthcare improvement initiative in the UAE spearheaded by the MoH to revolutionize the quality, safety and efficiency of public healthcare delivery across all 15 public hospitals and more than 86 affiliate clinics across six emirates in the UAE. MoH partnered with iCapital, the prime contractor of Wareed, to implement Cerner Millennium as the core application for the project to link all clinical, operational and administrative data. Nurses can now access entire data to improve patient care across all MoH healthcare provider facilities.

4.8 Oman

a- demographic state

Officially the Sultanate of Oman, is an Arab country on the southeastern coast of the Arabian Peninsula. Holding a strategically important position at the mouth of the Persian Gulf, the nation is bordered by the United Arab Emirates to the northwest, Saudi Arabia to the west, and Yemen to the southwest, and shares marine borders with Iran and Pakistan. The coast is formed by the Arabian Sea on the southeast and the Gulf of Oman on the northeast. The Madha and Musandam exclaves are surrounded by the UAE on their land borders, with the Strait of Hormuz (which it shares with Iran) and Gulf of Oman forming Musandam's coastal boundaries.

b- ICT state

Upon the inception of the National Strategy for Oman - Oman Digital Society (e.Oman) in 2003 and its revision in 2010, Oman has taken concrete steps to fulfill her national and international obligations towards streamlining ICT, transforming communities and integrating societies. The Information Technology Authority of Oman (ITA), a dedicated body to oversee the implementation of national IT infrastructure projects and supervise all projects related to e.Oman, has been a catalyst of synergy and augmentation of all stakeholders in the e.Oman. In this context, WSIS Action Lines have served as an invaluable framework for e.Oman and provided pivotal milestones to its goals. Of particular note is the WSIS forum and its components, which
provide a remarkable opportunity to learn and exchange how common human needs are attended to in diverse human experiences. In this sense WSIS action lines dovetail the MDG framework. Enormous efforts have been exerted by several governments to achieve these MDGs. In Oman, conscientious efforts have been consistently rendered to utilize the benefit of the MDGs framework and the WSIS towards achieving tangible results and transforming lives. Oman has made significant strides along fruition of all MDGs most notable in Health and Education.

c- Health care state

MOH claims that it has a comprehensive healthcare services management system automating most processes of healthcare delivery in MOH hospitals and health centers to the extent of almost making them paperless. There are currently 200+ public healthcare institutes adopting this system across the Sultanate, benefiting around 85% of public healthcare seekers in Oman. This “great success” encouraged the decision-makers of the non-MOH governmental healthcare providers to also adopt the system. HIS is a client-server system. It is a fully integrated graphical user interface application system for hospital management that is built around Oracle 9i and 11g database and developed using Oracle Developer 6i that runs under the platform of Windows 2000/Linux. With regard to healthcare industry standards, the system uses several sets of internationally recognized standards. The team managing the system developed a set of high-value central application services built on top of the previously described core systems, the most important among them are Al-Shifa (name of health care system in Oman) e-Referral and Al-Shifa e-Notification engines. The system has been designed in compliance with the main elements of e-security: Confidentiality, Integrity and Availability.

4.9 Iran

a- demographic state

Iran also known as Persia, officially the Islamic Republic of Iran, is a sovereign state in Asia. It is bordered to the northwest by Armenia, the Nagorno-Karabakh Republic, and Azerbaijan; to the northeast by Turkmenistan; to the east by Afghanistan and Pakistan; to the south by the Persian Gulf and the Gulf of Oman; to the north by the Caspian Sea; and to the west by Turkey and Iraq. Comprising a land area of 1,648,195 km² (636,372 sq mi), it is the second-largest country in the Middle East and the 18th-largest in the world. With 78.4 million inhabitants, Iran is the world's 17th-most-populous country. It is the only country with both a Caspian Sea and an Indian Ocean coastline. The country's central location in Eurasia and Western Asia, and its proximity to the Strait of Hormuz, make it of great geostrategic importance. Tehran is the country's capital and largest city as well as its leading economic center.

b- ICT state

Iran was a key hub of IT in the Middle East and many foreign suppliers had their own branches in Iran. The Iranian industry was very well developed in the ’60s and ’70s; for example, early software systems supporting the Farsi language were developed in Iran. After the 1979 revolution, the situation changed significantly. Iran's entrance into the Internet was then spearheaded by IPM (Institute for studies in theoretical Physics and Mathematics). The link was at first through the BITNET network and Iran's membership in European Academic Research Network (EARN) (which developed later to the Trans-European Research and Educational Networking Association - TERENA). It consisted of a single 9600 baud leased line to the University of Vienna in Austria in January 1993. The first email from Iran was a simple greeting from IPM’s director to Vienna University administrators. Primary users of the connection at first were academics and research institutions, all being served through their own connections to IPM. Over the past few years, domestic Internet connections have grown very rapidly, at times placing Iran among the top countries in terms of rate of growth of Internet access. Iran is among the first five countries, which have had a growth rate of over 20 percent and the highest level of development in telecommunication, and is also proud to have been awarded the UNESCO special certificate for providing telecommunication services to rural areas was a simple greeting from IPM's director to Vienna University administrators. Primary users of the connection at first were academics and research institutions, all being served through their own connections to IPM. Over the past few years, domestic Internet connections have grown very rapidly, at times placing Iran...
among the top countries in terms of rate of growth of Internet access. Iran is among the first five countries, which have had a growth rate of over 20 percent and the highest level of development in telecommunication, and is also proud to have been awarded the UNESCO special certificate for providing telecommunication services to rural areas.

c- Healthcare state

The Ministry of Health and Medical Education is mandated to fulfill this goal through designing and implementing a national-level health policy. Yet, the Ministry of Health and Medical Education delegates its implementation to medical universities across the country. There is at least one medical university in every province. The president of a medical university is the highest health authority in the province who reports to the Minister of Health and Medical Education. The president of the medical university is in charge of public health, health care provision in public facilities, and medical education. Health care and public health services are provided through a nation-wide network. This network consists of a referral system, starting at primary care centers in the periphery going through secondary-level hospitals in the provincial capital and tertiary hospitals in major cities. The public sector provides primary, secondary, and tertiary health services. The emphasis of the government on primary health care over the last two decades has made the public sector the main provider of primary health care services across the country. Some primary health care services such as prenatal care and vaccination are provided free of charge in public facilities. The public sector also provides a considerable part of secondary and tertiary health services in the province. The private sector plays a significant role in health care provision in Iran. The private sector mainly focuses on secondary and tertiary health care in urban areas. There are many nongovernmental organizations (NGOs) active in health issues in Iran. NGOs are mainly active in special fields like children with cancer, breast cancer, diabetes, thalassemia, and so on.

4.10 Bahrain

a- demographic state

Officially the Kingdom of Bahrain is a small Arab monarchy in the Persian Gulf. Bahrain consists of a group of islands between the Qatar peninsula and the north eastern coast of Saudi Arabia. It is an island country situated near the western shores of the Persian Gulf in the Middle East. It is a small archipelago centered on Bahrain Island, its largest land mass. It is just 23 km (14 mi) east off Saudi Arabia, connected to it through the King Fahd Causeway. The peninsula of Qatar is also nearby, about 50 km (31 mi) to the southeast across the Gulf of Bahrain. Iran lies 200 km (124 mi) to the north across the Persian Gulf. The population in 2010 stood at 1,234,567, including 666,172 non-nationals. It is 780 km² in size, making it the third smallest nation in Asia after the Maldives and Singapore.

b- ICT state

Bahrain is among the region’s and the world’s most vibrant and advanced markets for ICT services, with high penetration of mobile cellular and broadband Internet, low prices, and a top performing regulator (TRA) that has been repeatedly recognized internationally for its forward looking approach to ICT development. At end 2013, 82% of households in Bahrain had Internet access while more than 90% had computers – making the country one of the world’s most connected nations, ICT services in Bahrain are very affordable: Bahrain ranked 34th in the ICT Price Basket (IPB) with a value of 1.2 in 2012. Prices for all three services included in the IPB are relatively affordable, with fixed-telephone prices being the cheapest at 0.4 % of GNI per capita, followed by mobile cellular prices at 1.1% of GNI per capita and fixed-broadband prices at 2% of GNI per capita.

c- Healthcare state

Ministry of Health in the Kingdom of Bahrain has built an Information and Communication Technology Strategy (ICT). The Health ICT Strategy which was launched in 2001 is defined to cover the Ministry of Health (MOH) as a corporate policymaker as well as administrative directorates and health service providers in hospitals, clinics, and health centers. It works in parallel with the Ministry of Health Strategic Direction and Framework for Action, in addition to focusing on innovative ideas to support the issues created from uncertainty in areas such as...

5. Iraq country profile

The Iraq means different things to different people. It is land of prophets; it is the ultimate Holy Land, land of first civilization. For a large number of investment and biggest companies from Asia, Europe, and the United States (US), it is a land of opportunities. On 6 Jan 1920 is foundation of Iraq. Large reserves of oil were discovered soon after, and within a span of 6 years, commercial production of oil began. The first step in the oil was by British Oil Company Today, Iraq is the biggest market and trade in the Middle East. In all these years, Iraq has displayed remarkable economic stability. The population of Iraq is about 33,765,000 and the area is 438,000 km square (WHO, 2016).

During the 1970s and 1980s, Iraqi health care and medical education were said to be the best in the region. The country boasted free health care in 172 hospitals and 1200 primary health-care clinics. Iraqi medical graduates would often receive specialty training and certification in the UK and Germany. From the late 1980s until 2004, most medical graduates were barred from leaving Iraq. In the duration of war, funds were diverted from the health sector. The 1980–88 Iran–Iraq War killed perhaps half a million people on both sides, and further diverted resources and medical staff from civilian facilities, in 1991, Iraq invaded Kuwait, triggering the first Gulf War. The sanctions that followed had a major off etc. on Iraq’s health system and the health status of Iraqis. The subsequent oil-for-food program mitigated some of the off etc. of sanctions, but serious damage had been done to the health system. At the time of the 2003 US-led invasion of Iraq, the health system was weak, with non-functioning equipment, inadequate drug supplies, and fragile infrastructure. The destruction and looting of health, after that the government has spent billions of dinars about health care but the corruption and bad management lead to spent all these billions without any benefit (Al Hilfi et al., 2013).

6. Health Status in Iraq

Health development is a pre-requisite for the sustainable development of Iraq and an essential component of the task of reconstruction. This document charts the disastrous decline in the health of the population and in the standards of health services over two decades. It describes the challenges now facing the country in improving health and rebuilding its health services and it identifies priorities for investment and development over the next few years.

The population of Iraq has more than doubled in the last 25 years. It now stands at 33.8 million and is growing at about 3% a year. The health of the population was steadily improving between 1960 and 1990. During this period, infant mortality fell by about two-thirds (from 117 to 40 deaths per 1000 births) and child mortality fell by 70% (from 171 to 50 deaths per 1000 births).

But since about 1990, there has been a disastrous decline in peoples' health. At a time when children's health was improving in the vast majority of countries, infant, child and maternal mortality rates in Iraq more than doubled. Adult mortality increased and life expectancy fell to under 60 years for men and women by 2000. Iraq is currently rated by WHO as a country with high adult and child mortality alongside much poorer countries like Afghanistan, Djibouti, Sudan and Yemen. The figures below show Iraq context, legal frameworks for e-health, and e-health system in Iraq (WHO, 2016).
Table 1: Iraq Context (WHO, 2016)

<table>
<thead>
<tr>
<th>Iraq Context</th>
<th>Population (000s)</th>
<th>Life expectancy at birth (years)</th>
<th>GNI per capital (PPP Int $)</th>
<th>Total health expenditure (% GDP)</th>
<th>Physician density (per 10000 population)</th>
<th>ICT Development Index rank</th>
<th>Nurse &amp; midwife density (per 10000 population)</th>
<th>Mobile-cellular subscriptions (% population)</th>
<th>Hospital bed density (per 10000 population)</th>
<th>Internet users (% population)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>33,765</td>
<td>70</td>
<td>15,220</td>
<td>5.2</td>
<td>0.60</td>
<td>-</td>
<td>-</td>
<td>81.63</td>
<td>13</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 2: Legal frameworks for e-health (WHO, 2016)

<table>
<thead>
<tr>
<th>Policy or legislation - purpose</th>
<th>Country response</th>
<th>Global &quot;yes&quot; response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defines medical jurisdiction, liability or reimbursement of eHealth services such as telehealth</td>
<td>Yes</td>
<td>31%</td>
</tr>
<tr>
<td>Addresses patient safety and quality of care based on data quality, data transmission standards or clinical competency criteria</td>
<td>Yes</td>
<td>49%</td>
</tr>
<tr>
<td>Protects the privacy of personally identifiable data of individuals irrespective of whether it is in paper or digital format</td>
<td>Yes</td>
<td>70%</td>
</tr>
<tr>
<td>Protects the privacy of individuals' health-related data held in electronic format in an EHR</td>
<td>—</td>
<td>54%</td>
</tr>
<tr>
<td>Governs the sharing of digital data between health professionals in other health services in the same country through the use of an EHR</td>
<td>No</td>
<td>34%</td>
</tr>
<tr>
<td>Governs the sharing of digital data between health professionals in health services in other countries through the use of an EHR</td>
<td>No</td>
<td>32%</td>
</tr>
<tr>
<td>Governs the sharing of personal and health data between research entities</td>
<td>No</td>
<td>39%</td>
</tr>
<tr>
<td>Allows individuals electronic access to their own health-related data when held in an EHR</td>
<td>Yes</td>
<td>29%</td>
</tr>
<tr>
<td>Allows individuals to demand their own health-related data be corrected when held in an EHR if it is known to be inaccurate</td>
<td>±</td>
<td>32%</td>
</tr>
<tr>
<td>Allows individuals to demand the deletion of health-related data from their EHR</td>
<td>No</td>
<td>18%</td>
</tr>
<tr>
<td>Allows individuals to specify which health-related data from their EHR can be shared with health professionals of their choice</td>
<td>No</td>
<td>28%</td>
</tr>
<tr>
<td>Governs civil registration and vital statistics</td>
<td>Yes</td>
<td>78%</td>
</tr>
<tr>
<td>Governs national identification management systems</td>
<td>Yes</td>
<td>69%</td>
</tr>
</tbody>
</table>

Table 2: Legal frameworks for e-health (WHO, 2016)
Table 3: E-health systems in Iraq (WHO, 2016)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Country response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country records births, deaths, and causes of death using an electronic information system</td>
<td>Yes – partial coverage</td>
</tr>
<tr>
<td>Country has at least one electronic information system in place to collect and report health data at district level</td>
<td>Yes</td>
</tr>
<tr>
<td>Country has a resource tracking system in place to report total health expenditure by financing source, per capital</td>
<td>No</td>
</tr>
<tr>
<td>Country has a resource tracking system in place to report total reproductive, maternal, newborn, and child health (RMNCH) expenditure by financing source, per capital</td>
<td>No</td>
</tr>
</tbody>
</table>

7. E-health in Iraq

At present, the healthcare system in Iraq is characterized by an increased burden on resources that impede patients’ access to healthcare since 2003 (Alhasnawi et al., 2009). Other significant measures include aggressive retention policies, including enhancing the remuneration and working conditions of physicians, as well as the protection, safety, and use of e-health. In Iraq, maternal death is considered by the local community as an avoidable disaster resulting from negligence. By contrast, deaths caused by medical or surgical illnesses are regarded as a decree of fate. As such, obstetricians aim to provide the best possible care to patients to avoid catastrophes. The availability, accuracy, and completeness of patients’ health records will be of considerable help to clinicians (Román et al., 2006). The completeness of patients’ lifetime health records (LHRs) must be presented chronologically in a single application system or health institution, as well as in different applications and institutions (M. K. Abd Ghani et al., 2010). Health records must be integrated along a timeline (and independently of sources), such that relevant and necessary patient information can be easily accessed and serve as the basis for formulating proper and accurate medical advice, diagnosis, and treatment for patients wherever they are. This longitudinal and seamless view of a patient’s health record will improve the clinicians’ plans for providing continuous care throughout a patient’s lifetime.

Before 2003, Iraq was completely isolated from the world. All public & private sectors were suffering due to deficiency in the communication and development systems & programs. Health information systems were completely paper-based and manually processed because of the lack of computers, network systems and personnel capacity. Since 2004, Ministry of Health (MOH) realized the importance of information technology (IT) in collecting & processing health information. So, the MOH initiated the use of modern technology in its health facilities at the central and provincial levels. In recent years, Iraq has struggled to provide quality services such as healthcare to its citizens. The impact of subsequent wars, economic sanctions and the ongoing security threats has left the Iraqi healthcare system underfunded and depleted of physicians who...
have fled the country. According to a report published by the United Nations Assistance Mission in Iraq (UNAMI) in 2008, access to quality healthcare for all Iraqi people is severely undermined (Foran, 2008). The main problems the healthcare sector in Iraq suffers from are those of the developing world.

In the Project of Strengthening Primary Health Care, many statistical & Information Technology (IT) staff working in MOH has been trained on how to use computers and design special programs that would contribute to strengthening the Health Information System (HIS). Also, numerous computers and servers were provided to Directorate of Health in Governorates (DOHs) in Baghdad and other governorates. The Information Technology Center (ITC) designed many computer programs for entering data from special health programs (Health Visitor, Family Medicine), linking electronically Primary Health Centers (PHCs) with DOHs. This system is currently used in about 300 PHCs in Iraq and notably reflected in Maysan DOH.

Certain public hospitals developed Patient Management Programs that follow patients from their entry to the hospital record system until receiving medicine from the pharmacy. Ibn AL-Rushed Mental Hospital in Baghdad, AL-Rusafa DOH, is one of the health facilities having such a system. There are fragmented software programs that deal with some health related data management including management and maintenance of medical devices in three hospitals in different governorates. Yet these programs need to be optimized and become part of the MOH.

The MOH planned to carry out assessment of the current situation of HIS in Iraq, identify priority areas for intervention within the HIS components and fill the gaps. This process is also intended to lead to development of a HIS strategic plan for Iraq to strengthen HIS that will eventually result into improved and evidence based decision making system. One of the goals of the Strategic plan is to link all health facilities in the country through a network in order to capture accurate and timely health information.

There is a shortage of healthcare personnel and medical specialists. In 2011, the density of physicians in Iraq was 7.5 per 10,000 populations, i.e. one physician per 13,333 citizens, and the projected density in 2018 is 8.7 per 10,000, i.e. one physician per 1,149 citizens. These figures are much lower than global (14/10,000) and regional (16/10,000) physician density (Al Hasnawi, 2013). The healthcare infrastructure is poor and it is difficult to access physicians, clinics and hospitals due to long distances, poor transportation, security concerns, or time constraints. Added to this is the high cost of private healthcare services and limited purchasing power of the patients. In times of humanitarian crises, these problems worsen because of the impact of disasters on healthcare system and usually inefficient responses of healthcare authorities. A few solutions have been proposed to overcome these problems, such as privatization of governmental healthcare services, medical tourism, etc.

In the aftermath of the 2003 war in Iraq, a few international medical and humanitarian agencies implemented short-term telemedicine projects in different parts of Iraq (Al-Moosawi & Nayyef, 2017). Apparently, all those projects were successfully implemented but their impact is not clear and it is unknown if and why they were discontinued. In recent years, the Iraqi Ministry of Health, with support from international organizations, has endeavored to employ telemedicine technologies to support the healthcare sector in Iraq (Jaber, et al., 2014). Unfortunately, little is known about Ministry of Health’s plan to incorporate telemedicine into healthcare system in Iraq.

**Conclusion**

E-health has made substantial progress in the Region. An inventory of projects and activities would not be practical here, but the indicators to this progress are evident from the examples and the specific national activities that have been covered. This progress can be better calibrated when legal frameworks are introduced, national e-health policies are developed, more human resources are trained, regular funding is committed and long term plans are made.
References
Joshi, A. (2013). A pre-post study of patient journey modeling as a change management tool to increase clinician acceptance of EHRs.
Submit Date: 05.07.2018, Acceptance Date: 22.08.2018, DOI NO: 10.7456/1080SSE/375
Research Article - This article was checked by Turnitin
Copyright © The Turkish Online Journal of Design, Art and Communication