



Faculty of Information and Communication Technology

**INVESTIGATING THE KEY FACTORS EFFECTING THE USE OF
TELEMEDICINE IN IRAQI HOSPITALS**

Mustafa Musa Jaber

Doctor of Philosophy

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MUSTAFA MUSA JABER

**A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy**

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016

DECLARATION

I declare that this thesis entitled “Investigating the Key Factors Effecting the Use of Telemedicine in Iraqi Hospitals” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name : Mustafa Musa Jaber .

Date :

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in term of scope and quality for the award of Doctor of Philosophy.

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Date :

ABSTRACT

The weakness of information sharing has appeared clearly with the events of 11th of Sep 2001 that caused cannot stop and prevent the attacks of terrorist. Recently, a prevalent relationship between information sharing and intelligence in the context of counter-terrorism. A few studies have been conducted in this domain by Western countries whilst, none studies done with countries which have effected directly with terrorist attacks especially the Middle East. Issues with information sharing in intelligence domain are still significant challenges to cover. Nevertheless, literature showed there is no single model combined with the technology, information sharing and human factors with an empirical gap in this field, to determine what the intelligence need to develop non-failure intelligence product. This study aims to analysis the technology gap that focuses on fully supporting the common requirements of information sharing in Iraqi intelligence through propose an electronic information sharing model adopted based on Layered Behavioral Model. The fourteen factors are employed in five layers included, Policies and Political Constraints as an Environmental Layer, Compatibility, Information Quality, and Common Data Repository as an Organisation Layer, Cost, Expected Benefits, and Expected Risk as an Information Fusion Center Layer, Technology Capability, Top Management Support, and Coordination as a Readiness Layer, and the last factor in Individual Layer are Trust, Information Stewardship, and Information Security. A quantitative method employed to achieve a broader background of the phenomenon under investigation and to address a broader range of attitude and behavioural issues. This method was a statistical approach in testing the proposed research hypotheses for the factors. From the empirical testing point, found that Policies, Compatibility, Common Data Repository, Cost, Expected Benefits, Expected Risk, Technology Capability, Top Management Support, Trust, Information Stewardship, and Information Security had a significant influence on the degree of electronic information sharing. Whereas, Political Constraints, Information Quality, and Coordination had no significant influence on the degree of electronic information sharing. Several contributions of this study are, create a new theoretical model for the electronic information sharing within intelligence domain. Enhances existing literature by expanding upon layers and factors that are affecting in two dimensions are, electronic information sharing and intelligence. Add new vision to develop information fusion center in the context of electronic information sharing. Reduce the gap of the empirical study in intelligence sectors. And provide a formal strategy and creation a series of the guidelines for Iraqi intelligence authorities to govern E-information sharing activities

ABSTRAK

Kelemahan perkongsian maklumat telah muncul dengan jelas dengan peristiwa 11 September 2001 di mana ianya tidak dapat dihentikan dan dicegah. Baru-baru ini, terdapat hubungan meluas di antara perkongsian maklumat dan perisikan dalam konteks memerangi keganasan. Beberapa kajian telah dijalankan dalam domain ini oleh negara-negara Barat dan, tidak ada kajian dilakukan dengan negara-negara yang menerima kesan secara langsung dengan serangan pengganas terutamanya Timur Tengah. Isu perkongsian maklumat dalam domain perisikan masih menjadi cabaran besar. Walau bagaimanapun, kajian literatur menunjukkan tidak ada satu model pun yang menggabungkan teknologi, perkongsian maklumat dan faktor manusia dengan jurang empirikal dalam bidang ini, untuk menentukan apa keperluan agensi perisikan untuk membangunkan sistem perisikan yang tidak gagal. Kajian ini bertujuan untuk menganalisa jurang teknologi yang memberi tumpuan kepada menyokong sepenuhnya keperluan perkongsian maklumat dalam perisikan Iraq melalui cadangan model perkongsian maklumat elektronik berdasarkan Layered Behavioural Model. Empat belas faktor yang Empat belas faktor yang digunakan dalam lima lapisan termasuk, Dasar dan Kekangan Politik sebagai lapisan Persekitaran, Kekerapan, Kualiti Maklumat, dan Penyimpanan Data Umum sebagai Lapisan organisasi, Kos, Manfaat Dijangka, dan Risiko Dijangka sebagai Lapisan Pusat Gabungan Maklumat, Keupayaan Teknologi, Sokongan Pengurusan Tertinggi, dan Penyelarasan sebagai lapisan Ketersediaan dan faktor lapisan terakhir adalah individu iaitu Amanah, Pemilik Maklumat dan Keselamatan Maklumat. Kaedah kuantitatif digunakan untuk mencapai latar belakang yang lebih luas daripada fenomena yang sedang disiasat dan menangani pelbagai isu sikap dan isu-isu tingkah laku. Kaedah ini adalah pendekatan statistik dalam menguji hipotesis faktor penyelidikan yang dicadangkan. Dari sudut ujian empirikal, hasil dapatan menunjukkan bahawa Dasar, Kekerapan, Repositori Data Awam, Kos, Faedah yang Dijangka, Risiko Dijangka, Teknologi Keupayaan, Sokongan Pengurusan Tertinggi, Kepercayaan, Maklumat Kepimpinan dan Keselamatan Maklumat mempunyai pengaruh yang besar ke atas tahap perkongsian maklumat elektronik. Manakala, Kekangan Politik, Kualiti Maklumat, dan Penyelarasan tidak mempunyai pengaruh yang besar ke atas tahap perkongsian maklumat elektronik. Beberapa sumbangan kajian ini adalah, mewujudkan satu model teori baru untuk perkongsian maklumat elektronik dalam domain perisikan. Meningkatkan literatur yang sedia ada dengan mengembangkan lapisan-lapisan dan faktor-faktor yang memberi kesan dalam dua dimensi, perkongsian maklumat elektronik dan maklumat perisikan. Menambah wawasan baru untuk membangunkan pusat gabungan maklumat dalam konteks perkongsian maklumat elektronik. Mengurangkan jurang kajian empirikal dalam sektor-sektor perisikan. Dan menyediakan strategi formal dan penciptaan satu siri garis panduan bagi pihak berkuasa perisikan Iraq untuk mentadbir aktiviti perkongsian maklumat elektronik

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INTRODUCTION

1.1 Introduction

Chapter one discusses the background of technologies, electronic information sharing, data warehouse techniques, and telemedicine in Iraq. This chapter starts with the background of the study, followed with the problem statement, and by research questions, research objectives, significance of the study, scope of the study, and finally the structure of the study.

1.2 Background

The Aim of this research is to examine the feasibility and acceptance level of telemedicine framework in Iraq to reach that objective the research needs to study and analyse the factors that affect the implementation of telemedicine toward building a framework that includes the influencing factors in adopting telemedicine in Iraq.

The electronic information sharing entails the sharing of data electronically by using ICT tools such as internet, email, phone, websites and others. Information sharing raises the amount of data that helps the decision makers to make better decisions (Sharon S. Dawes 1996; Landsbergen & Wolken 2001). Furthermore, the saving in time consumption is one of the most important factors of electronic information sharing, in addition to savings in effort and money during the course of getting information (Fisher et al. 2012).

Several benefits can be expected from the use of telemedicine. These benefits can affect not only the health providers and the patients, but also the entire healthcare organization. For example, a study on physicians and health managers in the Quebec health region in Canada by (Jennett et al. 2005) found that the benefits and usefulness of the telemedicine system were seen on three levels: (1) clinical/patient, (2) professional/educational, and (3) organizational.

The traditional information sharing entails the exchange of data in the form of one-to-one mode and between sender and receiver. Ensuing the September 11 attack incident in New York city, USA; the utilization of information technology has gained popularity and was the onset for the world to start the sharing of information on terrorists throughout the world.

Clinical data warehouse is a place where healthcare providers can get access to clinical data collected in the process of patient care. It is also assumed that such a data warehouse can give information to users in areas ranging from research to management (Sen & Sinha 2005; Fayyad et al. 1996). In this regard, the organization of the captured design data such as data modeling, normalization, and their aspects enable ease in measuring the effectiveness of treatment of the relationship between causality and treatment protocols for systemic diseases and conditions (Witten et al. 2011).

The Iraqi government has launched a plan which involves the utilization of Information Communication Technology (ICT) towards the improvement of services in Iraq (E-Iraq 2014). The plan involved and has impacted many significant sectors in Iraq. These sectors are the Ministry of Health, the Ministry of Municipalities, the Ministry of Interior and the Ministry of Higher Education and Scientific Research (E-Iraq 2012).

Overall, the Iraqi government has to increase the electronic information sharing between the government and its organizations, as well as the organizations themselves in order to give a higher value of Iraqi e-services (Mahmoud 2010; Husain 2013; Ali 2013) (Mahmoud, 2010; Husain, 2013; Ali, 2013). There is a real need for Iraqi hospitals and clinics to share information because there is lack of information sharing between medical organizations in Iraq (Al-Aqaby 2012).

The inadequacy in support of providing databases for electronic information sharing resulted in the emergence of the data warehouse to take its place (Cuiling et al. 2006). Data

warehouse also facilitate government organizations to decrease the cost, thus ensuring high quality service, enabling these organizations to be more effective (Ghani, et al. 2015; Zeng et al. 2003).

In Iraq, information flows from facilities and the District Health Office to the governorate Directorate of Health and then to the central Ministry of Health, largely through the use of paper forms. Although some computerization has occurred at the Central Health and Vital Statistics Department, this development has not led to improved capacity for analysis, dissemination, or use of information. To respond to disease outbreaks in a timely manner, on the one hand, governorates and health districts need the capacity and authority to make operational changes in services on the basis of data collected, however on the other hand the centralized structure of the present health system prevents this approach. The building of the analytical capacity to pose and answer epidemiological and demographic questions pertaining to-the health and the adequacy of services in Iraq is an important and easily reached goal.

(Hussain 2012) critically analyzed the issues involved in incorporating wireless technology in Tele-surgery applications. (Hussain 2012) examined and evaluated the quality of service issues in current and future wireless technologies, which are essential for the successful transmission of Tele-surgery data. Ensuing that, a solution to overcome the problem of Iraq National Health service was suggested, which involved the need to exchange the medical information between the sites that are difficult to reach, Besides proposing a scenario of implementing an Internet Data Network in Iraq to transfer Tele-medical application and Tele-surgical application. she moreover she proposed a wireless technology to support Tele-medical application within Health Care organizations.

1.3 Problem Statement

The research problems would be categorized into several factors as follow:

1.3.1 Inadequate of health information sharing

In prevalent times, the growth and development of countries is measured by the extent of their use of Information Technology (IT) and telecommunications systems to provide services to the public. The Developed countries have utilized ICT into healthcare services such as hospital information system (HIS), clinical information system (CIS), electronic health records (EHR), e-health and telemedicine effectively and gained benefits from it as a good tool for communication. These would be an efficient way to exchange healthcare knowledge and to provide high quality of healthcare services.

Telemedicine plays a central role in providing healthcare for distant sites, as it saves time and effort for patients and physicians.

The availability, accuracy and completeness of health records will be of great help to clinicians in treating patients (Román et al. 2006). The completeness of patients' Lifetime Health Records (LHRs) should not only be present chronologically in a single application system or health institution but also across different applications and in institutions (Abd Ghani et al. 2008).

The foundation for the planning of appropriate and precise adversarial engagements entails the conditions by which the integration of health records posited on a chronological continuum (autonomous in terms of sources) should be fulfilled and satisfied; and only then would the entire significant and essential patient data be made accessible, irrespective of the location when a patient requests for healthcare services.

According to (Whitten & Sypher 2006), the outlook which takes into account the continuous time span consideration; termed as seamless would propel clinicians to an improved planning; for the provision of a person's lifelong healthcare provision.

According to (Suleiman 2001), an essential future healthcare system entails the elastic and adjustable access to preceding LHRs, which would result in high-quality healthcare. Intermittent or gaps in healthcare must not be the way, but should include the provision of long term perspective on a patient's total health history.

However, the characteristics mentioned would not be achieved if health ICT applications (for example, telehealth, telemedicine and hospital information systems) developed for supporting the clinical process is rigid and inflexible. These scenarios become much worse when dealing with the inadequacy of telecommunication infrastructures and system interoperability limitations (such as disparate set-ups of hospital information systems)(Ghani, et al. 2015).

1.3.2 Inadequate implementation success story for benchmarking.

An Australian study identified a number of reasons that make telemedicine services vulnerable and not sustainable using a qualitative approach (Wade et al. 2010). The reasons for failure include: (1) lack of support from the parties involved; (2) lack of interest on the part of some personnel and relying on one person; (3) insufficient funding for sustainability; and (4) difficulties in approaching the intended goals. Furthermore, the study concluded with two supportive factors, which are important: (1) appropriate cooperation and coordination among the telemedicine staff; and (2) a good IT infrastructure that matches the needs of the organization.

The current health systems scenario in developed countries besides developing countries have beckoned the practice of innovative approaches which can provide solutions for

most of the existing issues. The developed countries face a number of challenges such as increased economic pressure, inequities in health status, quality of care, and a shortage of health professionals ,while in developing countries the issues are around accessibility, quality of care, provision of services for remote areas, shortage of medical specialties, inadequate continuous medical education, and lack of accurate and timely health information (Sadowsky & Kunzel 1996).

According to (Baroud 2008), despite the high hopes, in reality however, the use of ICT (e-health) in developing countries lacks clear readiness. This situation on the grounds potentially carries a number of risks, including huge losses in time, money, and effort. More generally, numerous studies have documented infrastructural barriers and other non-technological factors as barriers to e-health technology adoption, including organizational aspects(Aas 2001) , human elements or behavior (Croteau & Vieru 2002; Kifle & Asker 2006), policy (Varghese & Scott 2004), socio-economic factors such as cost and website (Jennett et al. 2003; Madon 2005) and cultural issues (Checchi et al. 2002; Bagchi et al. 2009; Leidner & Kayworth 2006).

On a more specific front, the Arab culture is characterized by strong relationships among families within Islamic society through the customs and norms that are shaped accordingly. Based on this outlook and way of life, illegitimate interactions between unrelated men and women are discouraged religiously, including conversation.

1.3.3 Culture and belief of Arab communities towards ICT

Some studies have revealed that culture and beliefs have an influence on the adoption of IT particularly in Arab countries (Straub et al. 2006). Despite the similarities of

most of the Arab cultures, there are observable differences. For example, in Saudi Arabia, one of the social norms is gender segregation, which is strictly implemented (Rouibah 2008), while gender inequality is common in Ethiopia, Africa (Kifle & Asker 2006). Moreover, an attribute that characterizes Arab culture is the propensity for-face-to-face interaction (Rouibah 2008). Therefore, introducing ICT in the Arab community must be studied carefully with regards to the culture and other related issues upon which the decision of the individual regarding ICT adoption would rely.

The current health care situation in Iraq had put a stress and had increased the burden on resources, as issues in impeding access to health care for patients since 2003 (Al Hasnawi 2008).

Other important measure is aggressive retention policies, such as improving the remuneration and working conditions of physicians, protection, safety and the use of telemedicine (Aziz et al. 2009; Salih Al Hasnawi 2013).

Many doctors left Iraq during the height of the conflict or were killed (Aziz et al. 2009). This outflow has now lessened, although of the 1500–1800 new medical graduates each year, about a quarter leave, mainly to go to the UK, USA, and Australia. Table 1.1 shows a review in some of Middle Eastern countries regarding the healthcare staff. The efforts to encourage migrant Iraqi doctors to return have been largely unsuccessful.

Table 1.1 the comparison on healthcare staff between some of Middle Eastern countries per 10, 000 person (Al Hilfi et al. 2013)

	Iraq	Jordan	Egypt	Syria
<i>Doctors</i>	7.8	25.5	28.3	15.7

<i>Nurses and midwives</i>	1.8	9.8	4.8	7.8
<i>Pharmacists</i>	2.0	12.66	16.3	8.2

According to (Al-Aqaby 2012), Director of National Center for Management Development and Information Technology (NCMDIT) in the Ministry of Planning in Iraq, the electronic information sharing among the Hospitals is limited. He has done a survey in different locations in Iraq, namely, Baghdad, Salah Al-Deen, Basra, and Al-Anbar, as samples with 35 staffs of hospitals. His finding has two aspects:

Firstly, the information sharing between medical organizations is 54%; and secondly is to demonstrate the authorization of the medical organization which is 32%, as shown in Figure1.1.

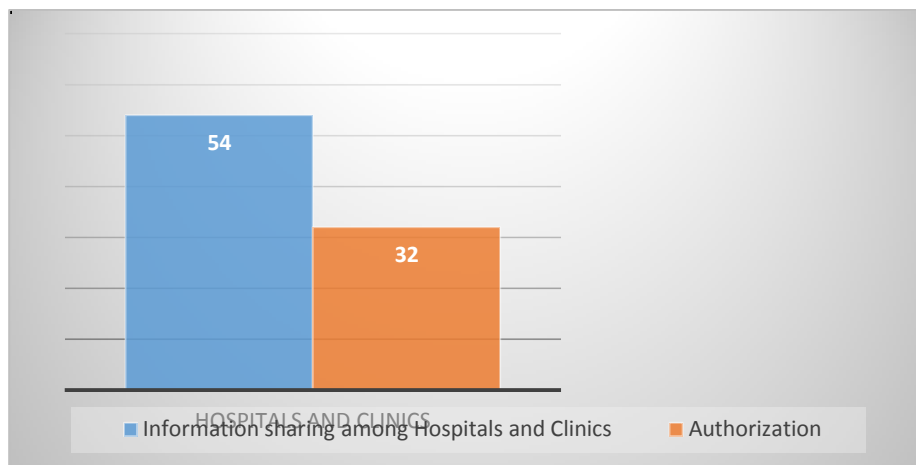


Figure 1.1: Information Sharing and Authorities in Hospitals and Clinics In Iraq (Al-Aqaby 2012).

This study conducted an interview that was performed to ascertain e-health adoption readiness of healthcare practitioners in Baghdad medical city which comprised of two