



**FACTORS INFLUENCING MEDICAL PROFESSIONAL
ADOPTION OF ELECTRONIC HEALTH RECORD
IN JORDAN HOSPITAL**

MALIK BADER HASAN AL AZZAM

DOCTOR OF PHILOSOPHY

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Faculty of Information and Communication Technology

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

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2017

DECLARATION

I declare that this thesis entitled “Factors Influencing Medical Professional Adoption of Electronic Health Record in Jordan Hospital “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 the candidature of any other degree.

Signature :

Name : Malik Bader Hasan Al Azzam

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.

Signature :

Supervisor Name :

Date :

DEDICATION

I am always grateful to all members of my family, first being my parents, I am thanking them for every prayer and supplication they made for me and as well for their love and most importantly being my parents. Equal gratitude goes out to my siblings, brothers, Thamer, Mohammad, Dia, and my sisters, Om Mohammad, Om Hadi, Om Adem I am also grateful to my wife, Om Malak Awawdah for her invaluable encouragement, my sons, Omer, Abdulrahman, and my daughter Alma and Malak.

ABSTRACT

Electronic health records (EHRs) have proven to improve hospital quality, reduce health costs and medical errors. Currently, EHRs adoption is not completed in Jordan hospitals, and limited research has been done in Jordan government hospitals. The aim of this study is to explore the factors that influence medical professional adoption of EHRs in Jordan Hospital. The problem statement of this study is the low acceptance level of EHRs in Jordan hospitals. A conceptual model, adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT2) model, is built to relate the Individual Context and Trust Factor on the Behavioural Intention to adopt EHRs in Jordan hospitals. Self-administered questionnaires are used to gather the data from healthcare professionals in two major government hospitals that have used EHRs. The results indicated that the effects of Individual Context, Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Motivation, Habit, Trust Factors, Trust Information and Trust System on the Behavioural Intention, to use EHRs are significant and positive. The results also indicated that Individual Context is the most significant predictor of the Behavioural Intention to use EHRs. Trust Factors is found as the second most significant predictor. Finally, from the results of moderation analysis, it is found that Age positively moderates the effects of Social Influence, Trust Information and Trust System on Behavioural Intention to use EHRs. However, the effect of Effort Expectancy on the Behavioural Intention to use EHRs is negatively moderated by the Age. The finding of this work has contributed to the growth and enhancement of the theoretical knowledge of UTAUT2 in the medical informatics field. This study has extended the current model and extension of the UTAUT2 model by including Trust Information and Trust System. Therefore, the findings can aid decision makers in formulating EHRs adoption strategies in Jordan hospitals medical informatics.

ABSTRAK

Rekod kesihatan elektronik (EHRs) telah terbukti dapat meningkatkan kualiti hospital, mengurangkan kos kesihatan dan kesilapan perubatan. Pada masa ini, penggunaan EHRs masih tidak lengkap di hospital-hospital Jordan dan penyelidikan yang terhad telah dilaksanakan di hospital-hospital kerajaan Jordan. Tujuan kajian ini adalah untuk meneroka faktor-faktor yang mempengaruhi penggunaan EHRs oleh profesional perubatan di Jordan. Pernyataan masalah kajian ini adalah tahap penerimaan EHRs yang rendah di hospital Jordan. Model konsep, disesuaikan daripada Teori Bersatu Penerimaan dan Model Penggunaan Teknologi 2 (UTAUT2), dibina untuk mengaitkan Konteks Individu dan Faktor-Faktor Amanah pada Niat Tingkah Laku menggunakan EHRs untuk diterima pakai di hospital Jordan. Soal selidik yang ditadbir sendiri telah digunakan untuk mengumpul data dari profesional penjagaan kesihatan di dua hospital utama kerajaan yang telah menggunakan EHRs. Keputusan menunjukkan bahawa kesan Konteks Individu, Jangkaan Pencapaian, Jangkaan Usaha, Pengaruh Sosial, Motivasi Hedonik, Sikap, Faktor-Faktor Amanah, Maklumat Amanah dan Sistem Amanah pada Niat Tingkah Laku untuk menggunakan EHRs adalah penting dan positif. Keputusan juga menunjukkan bahawa Konteks Individu adalah peramal yang paling penting bagi Niat Tingkah Laku untuk menggunakan EHRs. Faktor Amanah didapati sebagai peramal kedua paling penting. Akhir sekali, hasil daripada analisis kesederhanaan didapati bahawa Umur secara positif telah memberi kesan sederhana kepada Pengaruh Sosial, Maklumat Amanah dan Sistem Amanah pada Niat Tingkah Laku untuk menggunakan EHRs. Walau bagaimanapun, kesan Jangkaan Usaha di Niat Tingkah Laku untuk menggunakan EHRs adalah negatif sederhana oleh Umur. Dapatan kajian ini telah membawa kepada pembangunan dan peningkatan pengetahuan teori UTAUT2 dalam bidang informatik perubatan. Kajian ini telah menambahbaik model semasa dan lanjutan daripada model UTAUT2 dengan memasukkan Maklumat Amanah dan Sistem Amanah. Oleh itu, dapatan hasil kajian boleh membantu pembuat keputusan dalam merangka strategi penggunaan EHRs dalam informatik perubatan hospital Jordan.

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LIST OF ABBREVIATIONS

| | |
|--------|--|
| AMR | Automated Medical Records |
| BI | Behavioural Intention to use |
| CMR | Computerized Medical Records |
| EE | Effort Expectancy |
| EHRs | Electronic Health Record |
| EMR | Electronic Medical Record |
| FC | Facilitating Conditions |
| HCPP | Healthcare Professionals' Providers |
| HIT | Health Information Technology |
| HM | Hedonic Motivation |
| HT | Habit |
| IBT | Institution Based Trust |
| ICT | Information and Communication Technology |
| INCO | Individual Context |
| MI | Medical Informatics |
| MIT | Medical Informatics Technology |
| MM | Motivational Model |
| PBH | Princess Badea Hospital |
| PE | Performance Expectancy |
| PHR | Personal Health Record |
| PRH | Princess Rahmah hospital |
| SCT | Social Cognitive Theory |
| SI | Social Influence |
| TAM | The Technology Acceptance Models |
| TI | Trust Information |
| TPB | Theory of Planned Behaviour |
| TRA | Theory of Reasoned Action |
| TRFA | Trust Factors |
| TS | Trust System |
| UTAUT | Unified Theory of Acceptance and Use of Technology 1 |
| UTAUT2 | Unified Theory of Acceptance and Use of Technology 2 |

LIST OF PUBLICATIONS

M.Alazzam, A.S.H, and A.S, (2016). "Trust In Stored Data in EHRS Acceptance of Medical Staff: Using UTAUT2", *International Journal of Applied Engineering Research* 11 (4), pp.2737–2748.

M.Alazzam, A.S.H, and A.S. Pilot Study Of EHRs Acceptance In Jordan Hospitals By UTAUT2", *Journal of Theoretical and Applied Information Technology*" 31st 85 (3).

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents the background study, motivation of research, problem statement, the study questions, research objectives, research scope, and contribution. Finally, this chapter ends with a discussion on research strategy and the organisation of this thesis.

1.2 Background

Nearly two decades, the medical industry began to evolve through the exchange of health information system where they were provided with comprehensive coverage of medical care in developed countries.

The hospitals and clinics keep document-based profiles of patients to keep track of history. Though this traditional system has long been accepted, it has had many problems. Human-induced disasters, for example the wars in Middle East, and natural disasters like Hurricane Katrina in New Orleans in the United States of America. The wars and disasters destroyed the hard copies of medical records of innumerable numbers of people, bringing a new the need for a health system. Lost medical records exposed patients to considerable risk of medical mistakes because physicians were unable to draw relations between the current health conditions of the patients and their medical history namely on diagnosis, effects and operation risks assessment (Alnassar, 2012). Electronic Health Record system

(EHRs) is one type of Healthcare Information Technology, Medical Informatics like Electronic Health IT. That would be able to provide a solution for the hospitals and a clinic profiling system to decrease the problems the information and related. Many hospitals and clinics around the world these days have accepted EHRs. The general use of EHR system by professional healthcare providers has not yet happened due many challenges faced during the adoption and use of EHRs.

1.3 Motivation of Research

Jordan is considered to be the Middle East healthcare centre, almost all of Arab countries come to Jordan for Medical Tourism purposes (Alnassar, 2012). This research proposed UTAUT as an underpinning theory as it has been widely adopted by many researchers in this field. The purpose of this work is to develop an extension to UTAUT which includes two constructs Trust Factors (TRFA) and Individual Context (INCO) factors as perceived by professional healthcare providers. These factors have not been studied comprehensively in previous research. The motivation of this study is to know clearly and determinate the factors affecting the acceptance of electronic health records in Jordanian hospitals. The number of patients visiting Jordan for medical proposes are continually increasing, until august of 2009, the number stood at 225,000 patients, according to Alnassar (2012), the increasing number is due to high quality and performance of the professional healthcare providers, and the services are cheaper than the western countries. In 2009, the Jordanian health ministry began to apply electronic health record in the health sector. In this research focus on the factors that effect of EHRs adoption in Jordan hospitals. However the increasing patients that have a negative effect on EHRs, and as known the patients high increasing because refugees entering continuously from Syria and Yemen and others countries to Jordan.

1.4 Problem Statement

Despite the quick access to information of patients made available in electronic health records system, there is a need to work on the development of the system's users (the doctors, nurses, pharmacists and others) skills. In addition, the system helps reduce repeated medical errors which will cause complications for the patient and may cause death. In spite of the positive features of the system such as, the of cost, quality, speed and accuracy of diagnosis, and the removal of the manifestations of paper documents, these papers showed as lost, damaged or lack of clarity, but the level of acceptance of EHR systems is low. The low acceptance level of EHRs that acting huge problem in E health sector.

According to USA e Health systems, it is essential to ensure successful EHR acceptance by healthcare providers. Recent reports indicate that only 55 % of physicians nationwide have accepted the EHR system. A study about barriers adopting (EHRs) by Physicians showed EHRs use requires the presence of certain user and system attributes. In addition, the difficulty of using EHRs and the non-use of specific function result from the presence of a barrier. It has been found that the proportion of the adoption of the EHR is low, less than 16% in Saudi Arabian hospitals.

The acceptance of system of both the EMR and the EHR, the physicians showed resistance to accepting of this new technology at work. These problems are made worse by the many challenges and issues that are still hindering the acceptance of the EHRs in Jordan.

There are numerous concepts that could perform as mediators, moderators, inhibitors and enablers of EHRs that were not involved in eHealth in Jordan research. It is

also suggested to explore the potential inhibitors before applying the EHR system and then be rejected by medical staff.

This research put attention on factors influencing healthcare technology acceptance. The study has accepted and tested a well-known Unified Theory of Acceptance and Use of Technology. However, the key technology acceptance factors pertaining to the UTAUT are not enough to measure acceptance of EHRs.

This research examined the UTAUT2 which evaluated the acceptance of new technology by healthcare professional by this model created by Morris et al. (2003).

In 2012, Venkatesh has extended and developed the model to make it more accurate and more solid in the extraction of examination results, producing the UTAUT2. This study examines the Trust Factors, by healthcare professionals' providers (doctors, nurses, pharmacists, and other staff who use the system) in the electronic health records system, which is part of the E-health, for which Jordan is seeking to be applied in E-government.

Trust was shown to be an important factor that motivates the acceptance of technology use, especially in government sectors, as indicated by Horst et al. (2007); Chopra and Wallace (2003); Gilbert et al. (2004); Kim et al. (2005); Hung (2006); E-health system and EHRs are actually part of the E-government system.

The effects of EHRs and investigation in general posed a need to determine the current elements that affect EHRs technology adoption. These are generally mechanisms of technology adoption models, therefore there is a need to study and realise more issues, which affects the acceptance of EHRs.

1.5 Research Questions

The research questions are:

- i. Are there significant factors that affect the adoption of EHRs as perceived by healthcare professionals' providers in Jordan?
- ii. What is the relationship between the Individual Context (INCO) and Trust Factors (TRFA) on a Behavioural Intention to use (BI)?
- iii. How Age of the effects of Individual Context (INCO) and Trust Factors (TRFA) on the Behavioural Intention to use EHRs?
- iv. How the based model that describes the factors affecting EHRs acceptance in hospitals in Jordan?

1.6 Research Objectives

The general goal of this study is to investigate the factors that affect the acceptance of EHR in Jordanian hospitals. The research objectives are:

- i. To determine the significant factors that affect the acceptance of EHRs as perceived by healthcare professionals' in Jordan hospitals.
- ii. To examine the relationship between the Individual Context (INCO) and Trust Factors (TRFA) with Behavioural Intention to use EHRs.
- iii. To examine the moderating effects of Age on the effects of Individual Context (INCO) and Trust Factors (TRFA) on the Behavioural Intention to use EHRs (BI).
- iv. To evaluate models based on UTAUT2 that includes factors affecting EHRs acceptance in Jordan hospitals.

1.7 Research Scope

The scopes of this research are the factors that affect the acceptance of EHRs in the Jordanian healthcare organisation focusing on healthcare professionals of EHRs. This includes Individual Context (INCO) factors comprising of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Habit (HT), and also Trust Factors (TRFA), that is comprised of Trust Information (TI) Trust System (TS). In addition, are the moderation effects of the Age of Individual Context (INCO) and Trust Factors (TRFA) on the Behavioural Intention to use EHRs. This research applied into two hospitals in Jordan which are Princess Badeah hospital (PBH) and Princess Rahmah hospital (PRH) (Government hospital). This study focused on adoption new technology that mention in the literature as well as adding trust construct that include, trust information and trust system these factors that have been found that influencing on acceptance of EHR system. Venkatesh (2012) recommended the Unified Theory of Acceptance and Use of Technology (UTAUT2). Present reviews of the literature, though, suggested that Venkatesh (2012) is not sufficient to properly assess the adoption of EHRs. These models have yet been tested in the health care system; however, attempts had been made but mostly driven by the technology acceptance and use by professional healthcare providers in Jordanian hospitals.

In this research, the focus is on two hospitals with full adoption of EHRs: Princess Badeah Hospital and Princess Rahmah Hospital. These hospitals were chosen by recommendation of the Ministry of Health of Jordan. It was suggested that the north cluster of Jordan because it has the highest population density, second only to the capital. The researcher chose two hospitals that have fully adopted EHRs.

1.8 Research Contribution