The National Renal Patient Record System and Technology Acceptance

Ali Al-iady

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Summary

The prevalence and incidence of renal diseases worldwide is on increase. This is also evident in Ireland where it has become more difficult to manage the large number of patients presenting with renal failure. Keeping in view the reported benefits of these Electronic Patient Record Systems (EPRS) on the health-care system, two hospitals – Letterkenny Hospital and Sligo Hospital - have recently introduced into their haemodialysis units an EPRS, named eMED*Renal*. Mindful of the critical need of a renal patient record system in Ireland, the present study investigates and describes the degree to which the staff members of these two units have accepted the new system and are ready to use it, with the help of a technology acceptance model. The technology acceptance model has been designed after reviewing a number of important technology acceptance models used in previous studies.

The acceptance of the eMED*Renal* system was benchmarked using a number of factors that can affect the user acceptance of technology. The study noted that staff members from both hospitals considered the eMED*Renal* system to be useful for their professional career and claimed that it was easy to use. Staff members also regarded themselves as ready to use an EPRS and had a positive attitude towards the eMED*Renal* system. The study also found that there is little difference in the acceptance of the eMED*Renal* system among doctors and nurses. The study also proposed a technology acceptance model for future testing.

Because the study has found the eMED*Renal* system to be an acceptable EPRS for recording and sharing renal patients' data in the two hospitals of Ireland, it is suggested that the eMED*Renal* system ought to be introduced into other haemodialysis units as well. However, for improved perceived readiness and ease of use among users, it is important to provide training on the use the eMEDRenal system to staff members prior its introduction into haemodialysis units a cross Ireland.

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Abbreviations

AT	Attitude
BI	Behavioural Intention
BMA	British Medical Association
CDC	Centre for Disease Control and Prevention
CEN	European Committee for Standardization.
CKD	Chronic Kidney Disease
CNM	Clinical Nurse Manger
CPR	Computerized Patient Record.
DICOM:	Digital Imaging and Communications in Medicine.
DOHC	Department of Health and Children.
EHR	Electronic Health Record .
EMR	Electronic Medical Record.
EPR :	Electronic Patient Record.
EPRS	Electronic Patient Record System.
ERF	End stage Renal Failure
ESKD	End Stage Kidney Disease.
GEHR	Good European Health Record.
GFR	Glomerular Filtration Rate.
HD	Haemodialysis
HIS	Health Information System.
HL7:	Health Level Seven International.
HSE	Health Service Executive.
IDN	Irish Donor Network.

IHE:	Integrating the Healthcare Enterprise .
IKA	Irish Kidney Association.
INNA	Irish Nephrology Nurses Association.
INS	Irish Nephrology Society.
ISO	International Organization for Standardization.
KDCPMS:	Kidney Disease Clinical Patient Management System
NKF	National Kidney Foundation
NRD:	National Renal Dataset
NRO:	National Renal Office
PAS:	Patient Administration Systems
PCIS	Patient Care Information System,
PD -	Peritoneal dialysis
PEOU	Perceived Ease of Use.
PR	Perceived Resources
PU	Perceived Usefulness
RRT	Renal Replacement Therapy.
SN	Subjective Norm
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour.
TRA	Theory Of Reasoned Action.
UTAUT	Unified Theory of Acceptance and Use of Technology.

CHAPTER 1

INTRODUCTION

1.1 Study Background

We are living in the age of technology whereby every aspect of our life has been affected by rapid technological developments. In the field of health-care information systems have been developed over the past few years, which can be very helpful in the effective management of diseases. The Electronic Patients Record System (EPRS) is one such information system that assists health care professionals to record and share of patients' data (McNally, 2008).

The prevalence and incidence of renal diseases worldwide is on the increase. This is also evident in Ireland where it has become more difficult to manage the large number of patients presenting with renal failure (Plant & MacHale, n.d.; NRO, 2009a). In addition there is no renal registry system in the country and health-care providers often face difficulties in the retrieval of appropriate health information (HSE, 2010a). Keeping in view the reported benefits of these EPRSs with the health-care system (Department of Health, 2005; Delpierre, Cuzin, Fillaux, Alvarez, Massip & Lang, 2004) two hospitals – Letterkenny Genral Hospital and Sligo Genral hospital – have recently introduced into haemodialysis units an EPRS, named eMED*Renal* into their haemodialysis units. With the development of this application environment all arbitrary records are supposed to be centralized and synchronously available to multiple renal service provision locations.

However, the introduction of an information system does not guarantee the better management of health-care; they should be used willingly and effectively (Holden & Karsh, 2009; Halford, Obstefelder, & Lotherington, 2010). Therefore, the present study examines the end-users' acceptance of the eMED*Renal system*. Acceptance of technology systems is an important subject recently explored by a number of studies (Gadd, & Penrod, 2001; Gong, Xu, & Yu, 2004; Delpierre *et al.* 2004; Halford, Obstefelder & Lotherington, 2010). Scholars have designed a number of models for benchmarking technology acceptance (Taylor, & Todd, 1995; Venkatesh, 2000; Mathieson, Peacock, & Chin, 2001). The researcher analysed these technology acceptance models in order to develop a conceptual model for the study. This model was then tested using data obtained from a survey of eMED*Renal* system users from two haemodialysis units. The study is the first to determine the technology acceptance of the eMED*Renal system* among its users and serves as the basis for further research on this subject.

1.2 Research Questions

The present study seeks to answer the following research questions

- What is the level of acceptance of the eMED*Renal* system among staff members of the two selected hospitals?
- Is there any difference between doctors and nurses with regard to the acceptance of the eMED*Renal* system *?*
- Is the technology acceptance model suitable for benchmarking acceptance of the eMED*Renal* system among hospital staff?

1.3. Study Rationale

Recent developments in health informatics have heightened the importance of examining the implications of newly introduced information systems into the field of health-care. In the last

few years, researchers have shown an increased interest in investigating the use and implications of EPRS. The importance of examining the acceptance of EPRS among its end users has also been established. Keeping in view the importance of this subject, the study adds to the growing body of literature on the acceptance of EPRS by determining the acceptance of the eMED*Renal* system among the staff member of two haemodialysis units. The eMED*Renal* system is a recently-developed EPRS for renal patients' records and it is important to determine whether the staff members of the two haemodialysis have accepted and are ready to use it before its implementation in other hospitals of Ireland. The study is, therefore, a timely investigation into the acceptance of this system.

Besides the growing significance of the subject, another rationale for choosing this subject was the absence of a renal registry in Ireland. The study, by reporting the growing prevalence of renal diseases and the increasing difficulty in its management, establishes the importance of developing a national registry for recording and sharing data related to renal patients in Ireland. The eMED*Renal* system can be very helpful in this regard and findings from the study contribute to the evidence, which will determine if it is worth implementing this system at a national level.

1.4. Hypotheses

On the basis of the model developed for benchmarking acceptance of the eMED*Renal* system among the selected population, the study proposed the following hypotheses for testing:

H1: *Perceived Usefulness, Subjective Norm and Perceived Readiness have direct impact on the Behavioural Intention to use the eMEDRenal* system.

H2: *Perceived Ease of Use and Subjective Norms have direct impact on the Perceived usefulness of the eMEDRenal* system.

H3: *Perceived Usefulness and Perceived Ease of Use have direct impact on Attitude which in turn has direct impact on Behavioural Intention to use* the eMEDRenal system.

1.5. Outline of Dissertation

The dissertation has been divided into five chapters, which outline important aspects of study. Below is a brief description of the contents of each chapter :-

- Chapter 1: The first chapter of the study provides an overview of the present study. It contains a brief background of the research problem, which is based on the literature; a statement of the research problem and research questions, which the study seeks to answer and the rationale for selecting the particular research problem.

- Chapter 2: This chapter is a review of relevant and scholarly literature, which explores of the research problem. The chapter also contains a detailed analysis of important technology acceptance models from which a framework model for the study was developed. At the end of the chapter, hypotheses developed from the review of the literature are presented.

- Chapter 3: Chapter three contains details of the research design, approaches and study methods including rationales for selecting a particular research approach or method. The chapter also contains a detailed explanation of the strategy and instrument used for the collection of data.

- Chapter 4: This is a very lengthy chapter, which presents the research findings obtained from an analysis of the survey responses. In the first part of the chapter the researcher has adopted the descriptive style of writing and all the information gathered from the analysis of the data has been presented as it is. However, the second part of the chapter is a critical

discussion of the research findings, whereby the researcher explains the research findings within the context of the literature..

- Chapter 5: The last chapter presents the conclusions that can be drawn from the detailed discussion of the research findings. The purpose of this chapter is to provide answers to the study's research questions. On the basis of the findings recommendations are proposed. The chapter also outlines important limitations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature review is one of the essential parts of research as it provides the foundation to a research study (Garrard, 2010) and is critically important in justifying the topic one has selected to study (Shaughnessy, 2009). Several scholars have recommended analysing what is already known about the problem before embarking upon the primary data collection. The review assists the researcher in understanding the relevant theories, identifying the knowledge gap, finalising the research questions, designing the research methodology based on the methodology used in prior studies and predicting the outcome of the study thorough the analysis of findings from previous studies (Fraenkel & Wallen, 2001; Gratton, & Jones, 2003; Shaughnessy, 2009).

Keeping in mind the importance of the literature review, the researcher has spent a considerable amount of time collecting and analysing the relevant literature. The chapter begins with the description of renal diseases in Ireland as outlined in previous studies, including the prevalence and incidence of renal disease, the treatment facilities and the care and prevention services available in Ireland for such patients.

A review of the literature on EPRS is also provided in this chapter and includes the definition of EPRS, their importance and acceptance and the use of EPRS within the Irish Health Care system, where it a relatively new technology. A review of the literature on the eMEDRenal system is also

presented. At the end of chapter, the conceptual model for understanding and measuring user acceptance of the eMEDRenal system has been designed with the help of critical analyses of the previous technology acceptance model. The literature review at this point includes a number of renowned technology acceptance models.

The literature reviewed in this chapter has been collected with the help of digital databases of scholarly published literature that were accessed through *Athens*. Important databases used in the present study include *ScienceDirect, EbscoHost, Sage, Oxford* etc. The main key words used to search the data were *Renal Diseases, Chronic Kidney Diseases, Electronic Patient Record System, Electronic Medical,* and *Technology Acceptance Model.* While searching, the researcher limited the search output language to English and time line to 1990-2011. The researcher obtained a long list of articles from which the researcher selected the ones closely related to research subject. The researcher also reviewed the reference list of these articles to examine the work that has been repeatedly cited by the scholars. The researcher searched for that work using their titles and, though some of the works were not accessible in the databases, many of them were found and reviewed.

2.2 Renal Diseases in Ireland

Renal disease, often termed as chronic kidney disease (CKD), refers to the progressive dysfunctioning of kidneys for a period of at least three months, manifested by pathological abnormalities or markers of kidney damage (National Kidney Foundation (NKF), 2002). Glomerular filtration rate (GFR) is the main indicator of CKD (Smith, 1951; Glynn, Reddan, Newell, Hinde, Buckley, & Murphy, 2007); a patient with or without kidney damage will be considered as suffering from CKD if their GFR is less than 60 mL/min/1.73m2 for more than 3 months (NKF, 2002). If the symptoms of CKD persist for longer, it may develop into End Stage

Kidney Disease (ESKD), which cannot be treated without renal replacement therapy (RRT) (Collier, 2008). RRT includes three forms of treatment namely transplantation (TX), haemodialysis (HD) and peritoneal dialysis (PD) (Collier, 2008).

CKD, as measured with the help of GFR, is found to be associated with increased risk of mortality and morbidity (Go, Chertow, Fan, McCulloch, & Hsu, 2004). Studies have shown CKD as a risk factor for cardiovascular disease (Go *et al.* 2004; Weiner *et al.* 2004; Foley, 2010). Other diseases caused by renal failure include diabetes, anaemia, bone diseases and acute myocardial infarction (Collier, 2008).

Despite this high risk of morbidity and mortality, the public health importance of CKD has only come to be acknowledged in the recent past (Foley, 2010). Governments of different countries have started to give special consideration to this important disease and a number of non-governmental organizations are also working to address this issue (Levey, *et al*. 2003; Centre for Disease Control and Prevention (CDC), 2010; British Medical Association (BMA), 2008).

In Ireland, the Health Service Executive (HSE), the governmental organization for public health service established a National Renal Office (NRO) in 2009, which is responsible for developing a national framework for providing renal services throughout the country (HSE, 2011). According to the information provided in the official website of the HSE, the "immediate priorities for the National Renal Office' are:

- Expansion of renal capacity to accommodate growth in demand;
- Provision of services closer to patients homes;
- Improvement in patient centred care;

- Expansion of renal transplantation" (HSE, 2011, "Remit and Scope of National Renal Office")

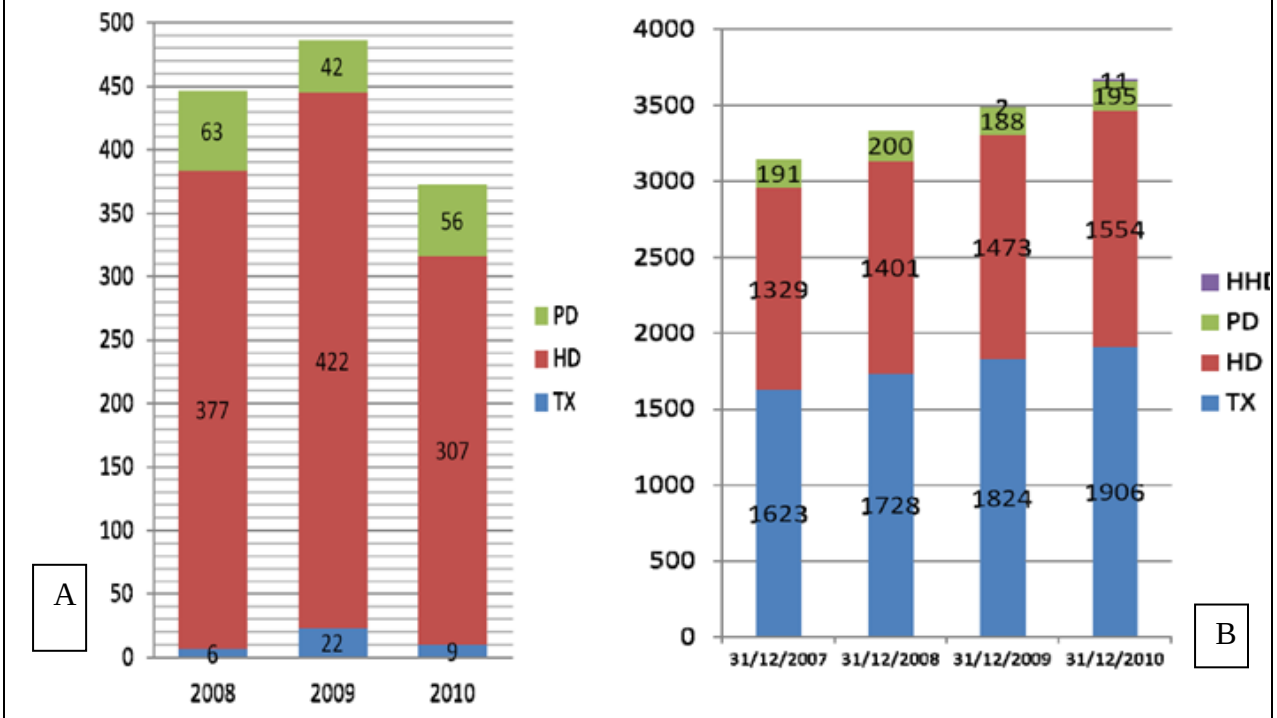
Other important organizations working in Ireland are the Irish Nephrology Nurses Association (INNA), Irish Nephrology Society (INS) and the Irish Kidney Association (IKA). These organizations are attempting to provide high quality care to the patients of CKD as well as contributing to the prevention of this disease by increasing public awareness.

2.2.1 Incidence and Prevalence

According to the HSE, about 280,000 adults in Ireland are currently suffering from CKD (HSE, 2010a). However, further data on the incidence and prevalence of the disease has not been found which shows the lack of attention to the national registry of renal patients. The NRO has recently published some facts and figures on the incidence and prevalence of ESKD, however there is a deficiency of data on the patients at earlier stages of the disease.

According to the data published by the NRO, the number of incident ESKD patients in 2010 was 372 while the number of prevalent ESKD patients in the same year was 3666 (See figure 2.1). Both incidence and prevalence of the disease have been found to increase with the passage of time (Plant & MacHale, n.d.; NRO, 2009a).

Figure 2.1: Incidence (A) and Prevalence (B) of ESKD Patients in Ireland from 2008-2010.



Source: NRO, 2010.
PD = peritoneal dialysis; HD= Haemodialysis; TX = transplantation

As shown in the figure 2.1, 83% of the incident ESKD patients and 42% of prevalent patients received haemodialysis. The percentage of patients receiving peritoneal dialysis is quite low for both incident ESKD patients (6%) and prevalent ESKD patients (15%) but there are a lot of prevalent ESKD patients whose kidneys were transplanted in the year 2010. Non living donors are the main source of transplantable kidneys in Ireland while the live kidney donor programme is still in its infancy. Each year there is a variation on the number of kidney transplanted which is dependent on the availability of transplantable organs.

2.2.2. Treatment Facilities:

As outlined above, both governmental and non-governmental organizations are working in Ireland to improve the quality of care for CKD and ESKD patients. Some 11 parent renal-units

are working in the country to provide treatment facilities for adult patients of renal diseases along with 8 satellite renal-units, as shown in table 2.1 (NRO, 2009b). These units have been established in each of the four HSE areas: Dublin North East, Dublin Mid Leinster, South and West.

In addition to the satellite units (shown in table 2.1) Cork University Hospital has recently opened a unit for cardiac and renal patients comprising of 141 beds, 35 haemodialysis stations, 2 isolation rooms, 3 acute bay station, an interview room, an examination room, 3 treatment rooms and many other facilities, which contribute to the better care of renal patients (IKA, 2010). The previous dialysis unit in Cork could carry out about 22,500 dialysis treatment in 2007 (IKA, 2010). With these new facilities, it is anticipated that the efficiency of the unit should rise between ten to fifteen percent per annum (IKA, 2010).

Table 2.1: Renal-Units in Ireland

HSE Area	Adult: Parent Renal Units	Satellite Renal Units	PD Programme
HSE Dublin North East	Cavan General		
	Beaumont Hospital Mater Hospital	 Northern Cross	X X
HSE Dublin Mid Leinster	Tullamore		
	St. Vincent's Hospital AMNCH/Tallaght	 Beacon	X X
HSE South	Waterford Regional	 Kilkenny	X
	Cork University Hospital	 Tralee	X
HSE West	Limerick Regional	Riverside Park	X
	Merlin Part Hospital	 Castlebar Parkmore	X
	Letterkenny General	 Sligo	

Source: NRO, 2009b, p. 40

Besides the services provided by the NRO, non-governmental organizations in Ireland are also playing their part. For instance, the IKA is providing financial aid to patients of CKD irrespective of the severity of their disease (IKA, n.d.). A counselling service with the help of trained and experienced counsellors for ESKD patients is also provided by the organization along with a rehabilitation training and back-to-work scheme.

2.2.3. Control and Prevention Services:

Besides the importance of providing good care to patients with CKD/ESKD, it is also important to control and prevent the spread of this disease. For this one important task; it should improve the awareness among the public about the disease and to provide the public with important information on the prevention of the disease.

For this purpose, the Irish Donor Network (IDN) is working to promote organ donation awareness among the public. The IKA, being a member of this network, is launching an intensive media awareness campaign, which is divided into four periods: "Awareness Week (April), Transplant Sports (summer), European Day for Organ Donation and Transplantation (October) and Christmas" (IKA, n.d., p. 4). The IKA also publishes a magazine titled "Support" that contains some useful information on renal diseases in Ireland for both patients and the general public (See Figure 2.2).

Figure 2.2: ‘Support’ magazines published by IKA

Source: IKA, n.d., p. 7

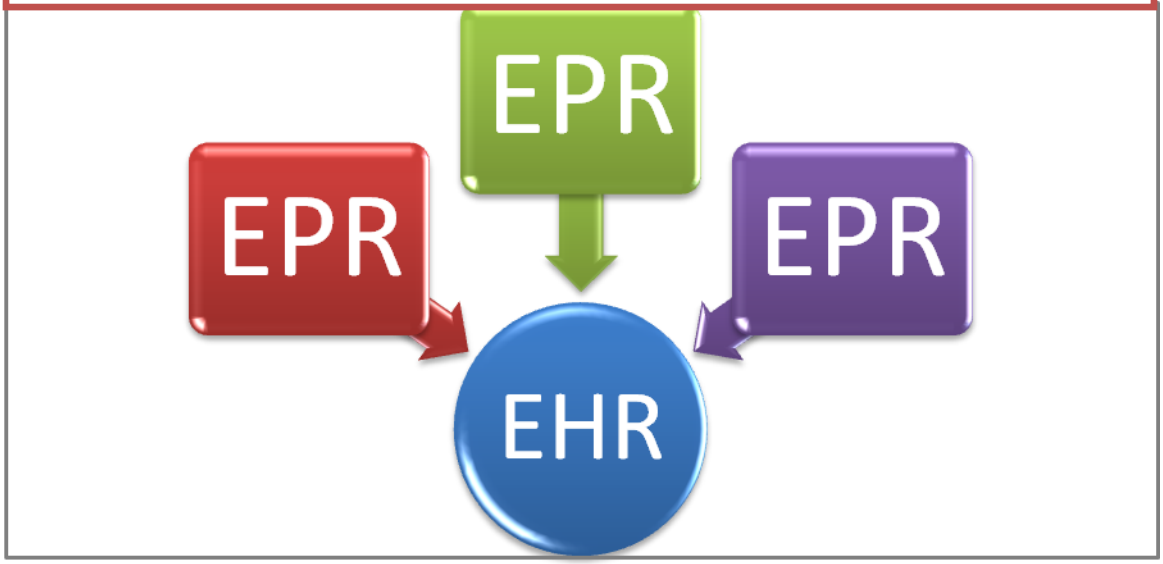
INNA is working to improve nursing standards for renal patients by providing assistance and education to nurses of Ireland (INNA, 2008a). The organization holds conferences and workshops for nurses and offers an Amgen Education Research Bursary to INNA members (INNA. 2008b). The mission of INS is to educate and train medical practitioners associated with nephrology and to advise the government as well as public on health care issues regarding kidney diseases (INS, 2010).

2.3 Electronic Patient Record System

The Electronic Patient Record System (EPRS) is a system designed to facilitate the recording and sharing of patient’s health information (McNally, 2008). However, it is quite difficult to define EPRS as the term has been used in a number of different contexts in previous studies (Greenhalgh, Potts, Wong, Bark & Swinglehurst, 2009). In addition, many other terms have been

used as synonymous to Electronic Patient Record (EPR) including Computerized Patient Record (CPR), Electronic Health Record (EHR), Patient Care Information System (PCIS), Electronic Medical Record (EMR), and Health Information System (HIS) (Jensen & Aanestad, 2007). EPR and EHR are often used interchangeably despite the important difference between the two terms. EPR is a *periodic record of patient's care provided by an acute hospital during a specific period of time* (Razzaque & Jalal-Karim, 2010). In contrast, EHR is the longitudinal record of the patient's care from birth till death, composing the summaries of all EPRs of that patient. The association between the two terms is provided in the figure 2.3.

Figure 2.3: Relationship between EPR and EHR



McNally (2008) held that EPR and EPRS are not similar but two different terms; EPR refers to the medical records of patients that can be assessed electronically but cannot be shared with other medical centres. In contrast EPRS is similar concept of EHR, which it is as a complete package responsible for the collection of longitudinal data on the health status of a patient as well as the health-care provided to the patient. This system is also responsible for the electronic

access of the collected data to authorized users; for insuring the security of collected data; for enhancing the quality, safety and efficiency of patient care by providing relevant knowledge and for assisting the medical professionals in efficient delivery of health care (Institute of Medicine, 2003).

McNally (2008) provided some prerequisite for an EPRS to fulfil all of the above mentioned responsibilities. The prerequisites include governance to ensure sustainability of the system; a pre-defined strategy; collaboration of public, health care providers, industry and government; an EPR model; financial assistance and funding; change management; technical and data interoperability through the use of consistent standards; unique identifier and certification from any third party. Though all these prerequisites are for a nationally implemented EPRS – the concern of this study is that many of these elements are equally important for an EPRS implemented in a single hospital or in a group of hospitals or medical organizations.

EPRS have been introduced with the aim of improving health care services and were reported to produce a number of positive impacts on health-care systems (Department of Health, 2005; Delpierre, Cuzin, Fillaux, Alvarez, Massip & Lang, 2004). They were found to be valid, complete, and accurate for prescription, consultation, laboratory tests, hospital episodes and childhood immunization (Hassay, Gerrett & Wilson, 2001). However some scholars have pointed out a number of concerns regarding the damage such system can cause on the human side of medicine and the negative outcome of flawed systems (Greenhalgh, Potts, Wong, & Swinglehurst, 2009). It is, therefore, important to understand the pros and cons of such systems with the help of a critical analysis of previous studies.

Delpierre and colleagues (2004) reviewed the research studies on the impact of EPRS on medical practice, quality of care and user and patient satisfaction, which were published from 2000 to 2003. They found that the implementation of such systems results in increasing the length of consultation per patient and changing the context of the consultation with more focus on the mental and behavioural health of the patient in the presence of EPRS as compared to in the presence of paper records. EPRS were also reported to bring significant improvements in preventive care, the use of guidelines and appropriateness of prescription.

Greenhalgh *et al.* (2009), nevertheless, criticized reviews on EPRS for incorporating only quantitative studies on the subject. They reviewed twenty four systematic reviews on the subject analysing the key concepts, theories and methodologies used in the previous studies and compared specific research traditions relevant to the understanding of EPRS. After such a comprehensive review, they reported that several questions were raised about the efficiency of EPRS in improving health care and they asserted that these questions are important ones and cannot be neglected. They noted that commercially developed EPRS are more vulnerable than the EPRS launched by public health authorities (Greenhalgh *et al.*, 2009). Keeping in view the definition of EPRS used in this study, it became quite clear why commercially developed EPRS have negative outcomes; such systems cannot fulfil all the responsibilities of an effective EPRS.

Halfrod, Obsterfelder and Lotherington (2010) held that these negative outcomes do not deny the advantages of using EPRS. The only purpose of highlighting these negative points of the EPRS, according to them, is to be cautious while implementing them and to improve their functionality. Johnson, Benbow and Baldwin (1999) provided the solutions to a number of problems attached with these systems, which highlighted that the majority of the disadvantages of the EPRS are the outcome of the flawed management of the system. EPRS are and will be, an important part of the

health care system and their importance cannot be neglected. It can be very useful if implemented with care and caution.

2.3.1 Electronic Patient Record System Acceptance

Changing patient records from paper to an electronic system is not such a simple task. It not only involves important technological changes but also involves changes in work practices and behaviour of people associated with health care. Halford, Obstefelder and Lotherington (2010) pointed out that record keeping produces tactic knowledge and produces significant changes in the workplace interaction and identities. They suggested examining the perceptions and evaluations of end-users' acceptance of the system before implementing EPRS or any health-care information system.

Holden and Karsh (2009) noted that the majority of studies on EPRS examine the adoption of the system by looking into its purchase and installation. Little attention has been paid to the degree to which the systems are in actual use or the extent to which healthcare professionals are willing to use these systems. Purchasing and installation of EPRS in hospitals does not ensure that the system is in use. Such an evaluation is necessary because previous studies have reported the underuse and disuse of health information technology despite its effectiveness (Lapointe & Rivard, 2006; Holden & Karsh, 2007; Koppel, Wetterneck, Telles, & Karsh, 2008). However, despite the significance of user acceptance, this area has not yet been well researched. Only few studies have been conducted on the actual use of EPRS by the physicians (Simon *et al.*, 2007). However, the trend is changing now and Holden and Karsh (2008) pointed out a number of exceptions to implementation focused studies.

The users of EPRS comprise patients and health care professionals including physicians and nurses (Delpierre *et al.*, 2004). Several studies have looked into the behaviour and perceptions of these users toward EPRS, the findings of which can be used to analyse the level of acceptance of these systems (Gadd, & Penrod, 2001; Delpierre *et al.* 2004; Halford, Obstefelder & Lotherington, 2010).

Physicians are core-decision makers in the health care system and their acceptance of EPRS is critically important. After reviewing thirteen studies on the physician's behaviour toward EPRS, Delpierre and colleagues (2004) reported that the majority of studies showed that physicians are satisfied and pleased with EPRS. Halford, Obsterfelder and Lotheringtong (2010) also reported the acceptance of EPRS among physicians. The benefits of EPRS reported by physicians were "improved knowledge of patients' medical history, better medical examination, and improvement in quality of care" (Delpierre *et al.*, 2004, p.413).

However four studies reviewed by Delpierre *et al.* (2004) reported some negative perceptions of physicians about EPRS, these included possible negative impact on patient-physician relationship; it cannot provide confidentiality and personal and professional privacy; it is difficult to carry out bug management and due to this system the physician had to do some additional work. Furthermore, it is difficult to interpret the clinical data collected from diverse sources and EPRS without standardization often poses serious challenges for the health-care professionals in exchanging and sharing medical data (Ginneken, 2002).

In another study on the subject, Jensen and Aanestad (2007) looked into the health care professionals' sense-making – which they defined as "the way people construct meaning and try to make it stand out as rational both to themselves" (p. 32) – of EPR. They found that physicians

do not consider EPRS as an important tool for improving overall patient treatment. The physicians believe that they have not been trained and educated about computer technology and EPRS has put an additional responsibility on them. They consider these systems to be a hurdle in their autonomy in practice. Therefore, on the whole, physicians' acceptance of the system is quite low and they have a number of complaints and concerns with regard to the implementation and adoption of EPRS.

As compared to physicians' attitude toward EPRS, nurses have been reported to be more welcoming toward EPRS, although they too have some complaints and concerns about these systems. In a study conducted on nurses' attitudes toward EPRS, Dillon, Blankenship and Crews (2005) found that the acceptance of EPRS is increasing among nurses and there is growing support for using technology in health-care. However, the image profile of the EPRS, in the same study, indicated a negative perception of EPRS suggesting nurses' concerns for quality healthcare delivery.

Delpierre and colleagues (2004) clarified the reasons for this negative perception of systems among nurses. They noted that the lack of flexibility in EPRs, the loss of nurse judgement and additional work were some of the negative aspects of the system. However, the authors also found that the acceptance of EPRS by nurses was quite high. Nurses were also found to regard EPRS as a way of enhancing their role in medical practice and reflecting their work practices (Jensen & Aanestad, 2007).

In almost all studies examining the attitude of patients toward EPRS, patients' acceptance of the system has been shown to be quite high (Gadd, & Penrod, 2001; Heard, Grivel, Schloeffel, & Doust, 2000; Lake Research Partners & American Viewpoint, 2006). The only hurdle in the

patients' acceptance of the system related to concerns on data confidentiality (Delpierre *et al.* 2004; Lake Research Partners & American Viewpoint, 2006).

2.3.2 Electronic Patient Record System in Ireland

In Ireland, the main organisation responsible for delivering health service throughout the country is the HSE. It has recently launched a transformation programme for 2007-2010 which includes a programme to develop "a unified national ICT (Information Communication Technology) infrastructure and support services and the development of clinical and administrative systems" (HSE, 2006, p. 16). However, no consideration was paid to the development of electronic health records, which is key to the national integration of the health services. This shows the lack of utilization of technology in the field of healthcare in Ireland.

Nevertheless, with regard to medical records, a code of practice has already been introduced and the HSE has also placed an emphasis on the standardization of medical records (McNally, 2008). This code of practice can serve as a framework for the development of a national EPRS in Ireland.

The EPRS is important for Ireland as the government acknowledges the hurdles in the retrieval of appropriate health information (Department of Health and Children (DOHC), 2004). In Ireland patient's information is collected through a number of systems, mostly manual, in different formats and by different agencies (McNally, 2008). It is, therefore, important to develop an EPRS for the integration of all diverse and distributed data in a way to integrate all health care professionals and to improve sharing of patient's data among them.

2.4. The eMED*Renal* System

With regard to renal diseases, the HSE has acknowledged the need to implement a clinical management system and has introduced a Kidney Disease Clinical Patient Management System (KDCPMS), which is at the final stage of development ("Health Informatics Subsidiary Awarded Contract in Ireland", 2010; HSE, 2010b). As a sub-project of KDCPMS, the HSE has proposed to establish an EPRS that can register data items on a national basis (HSE, 2010b). The outcome of all these efforts is the eMED*Renal* system.

The eMED*Renal* system is an EPRS developed with an intention to combine and integrate clinical and non-clinical patient data from both external and internal sources in order to maintain a dynamic and easily available current patient record for different renal service providers (HSE, 2010b; Mediqal HI, 2009a). With the development of this application environment, all the arbitrary records are supposed to be centralized and synchronously available to multiple renal service provision locations.

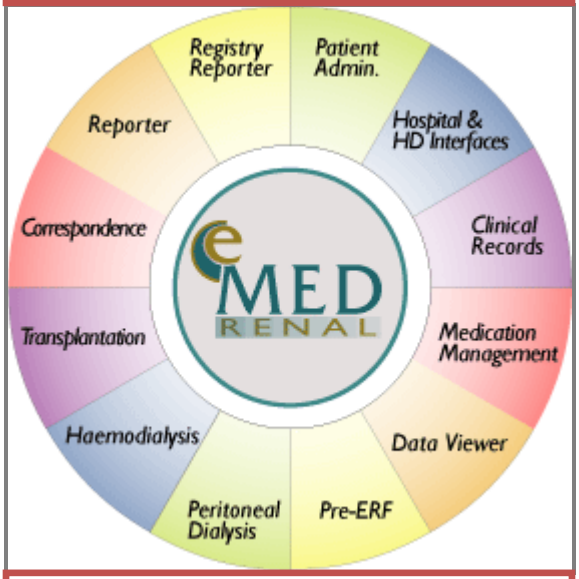
In the eMED*Renal* system, patient data/information is entered through maintaining a combination of current patient states and previous reflections, in order to draw multiple health status figures and facts (Mediqal HI, 2009a). Clinical Terms version 3 is used for data encoding so that the clinical information can be coded easily using the computer. With the help of this data encoding, the read codes can be generated from the glossary of clinical terms. In this manner, one important intention of the eMED*Renal* application is to keep dynamically updated data of all renal patients in a synchronized and electronic manner. The eMEDRenal software architecture covers following significant dimensions associated with the renal patients and their record management procedures:

1. Haemodialysis

2. Transplantations
3. Patient correspondence recording
4. Synchronized reporting
5. Registry reporting
6. Patient administration
7. Hospital & HD interfacing
8. Clinical record management
9. Medication management
10. Data viewer
11. Pre-ERF
12. Peritoneal dialysis (See Figure 2.4).

It is through the coverage of these important aspects, that the eMED*Renal* system seeks to provide an effective renal patient management environment.

Figure 2.4: eMED*Renal*.



Source: Mediqal H.I., 2009a

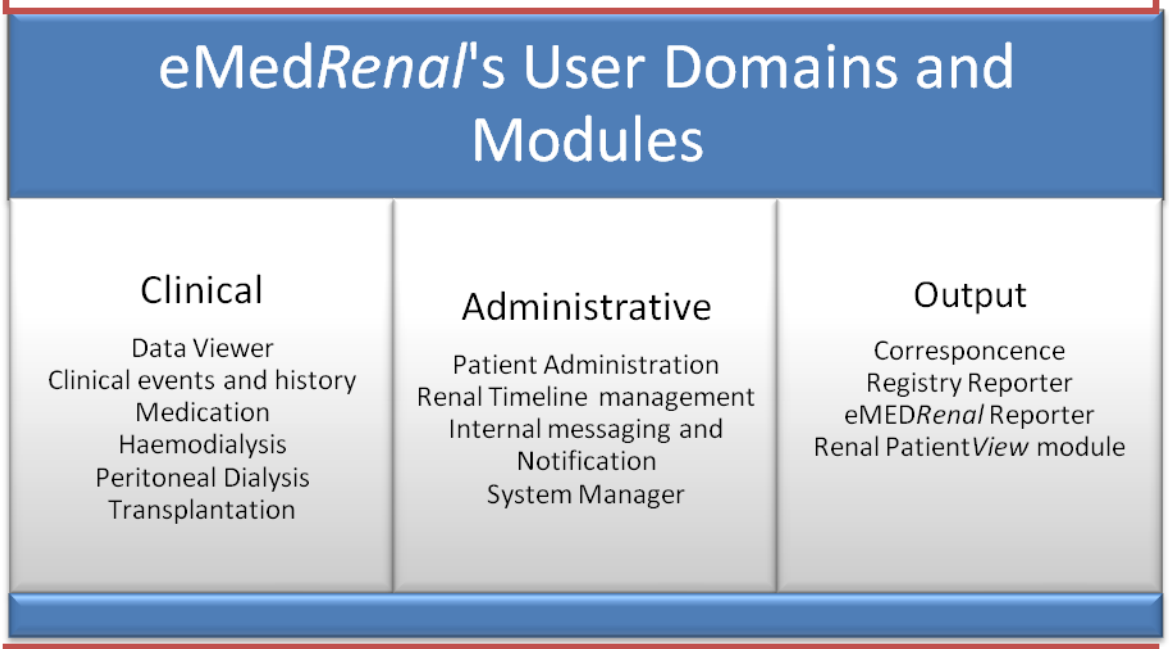
Moreover, its integrated architecture also includes support interfaces to the hospital laboratory/pathology system, the centralized hospital-based patient administration systems (PAS), and haemodialysis machine software system (Mediqal HI, 2009a). To further facilitate the healthcare professionals in the management of disease, the system has the ability to schedule clinic and referral appointments (Siemens, 2010).

2.4.1 The eMEDRenal Foundation

The foundation of the eMED*Renal* system is its user friendliness; the software has been developed to be managed and used by people from all sectors of life including healthcare professionals, patients, researchers etc. , therefore, it should provide some sort of user accessibility or ease-of-use features (Mediqal HI, 2009a). The eMEDRenal patient management application provides its users with effective functionally focused modules known as 'user domains', which are developed to meet the various aspects of patient management required by the latest and multi-disciplinary renal care team (Mediqal HI, 2009b).

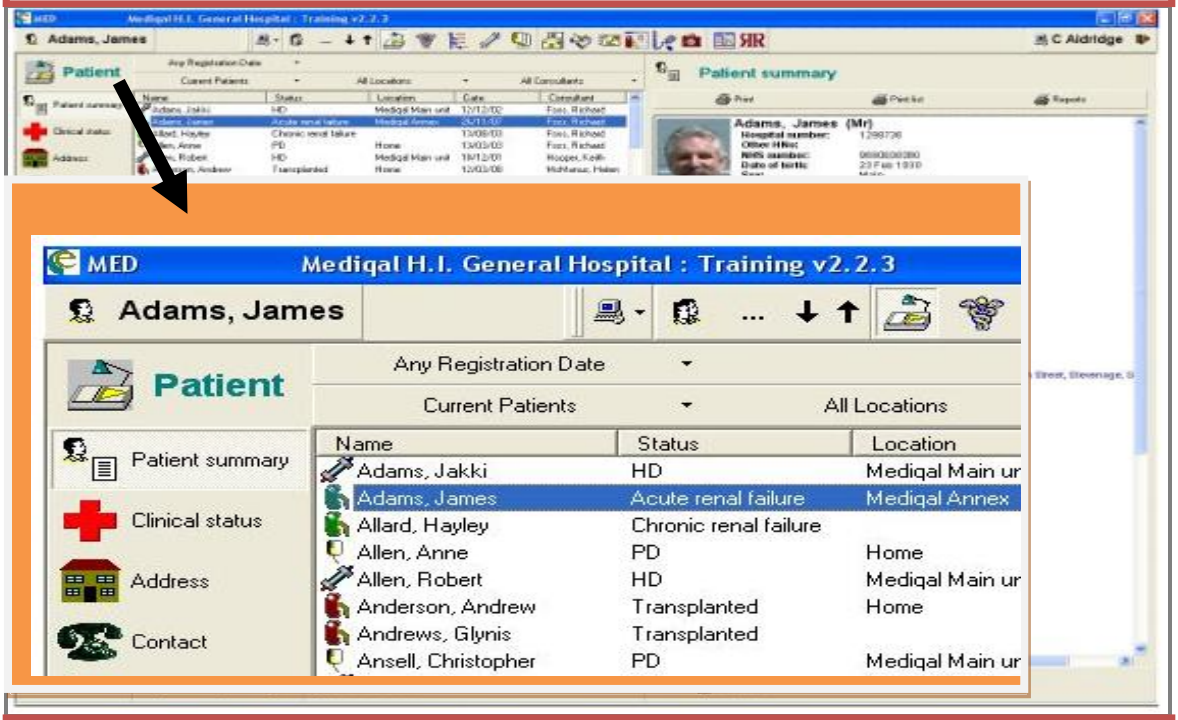
The easy-to-use and interactive features of 'user domain' provides the system with leverage of acceptance between masses (Mediqal HI, 2009b). The system is based on domain and module approach. Figure 2.5 shows the names of the eMED*Renal*'s user domains and modules. Each domain has been designed with the computer knowledge of its user in mind. The 'Patient Administration domain', for instance, is designed for non-clinical staff and it includes all the data needed for administrative purposes including the picture, name, hospital number, date of birth, sex, current medical status, address, contact number of all renal patients (See Figure 2.6). All the information can be accessed with a single click on the relevant tab.

Figure 2.5: User Domain and Modules of eMed*Renal*.



Source: Mediqal HI, 2009a

Figure 2.6: Screen shot of Patient Administration Domain

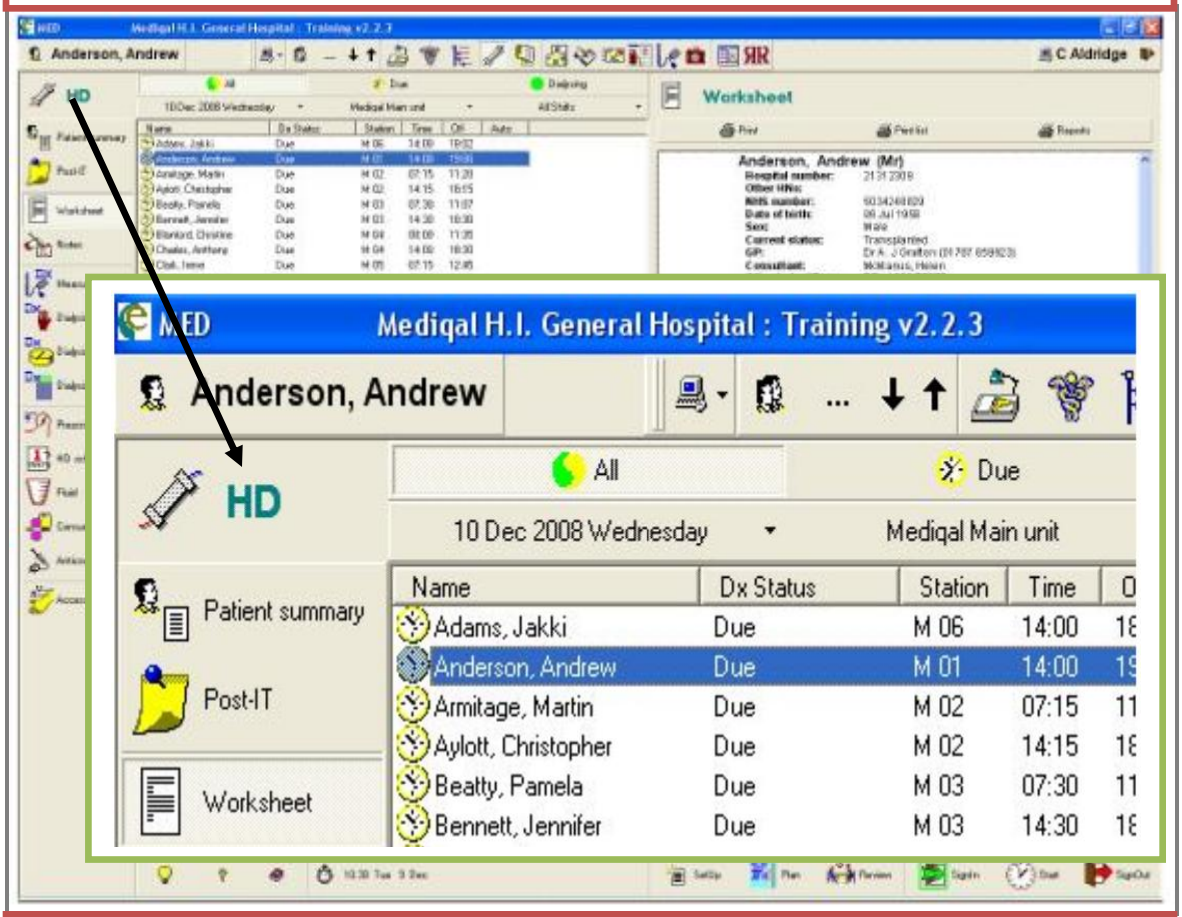


Source: Mediqal HI, 2009d

By contrast, the HD domain is for nurses working in the HD unit and, therefore, it includes the required information in clinical terms. The screen shot of this domain is shown in the figure 2.7. As shown, it displays a list of all the patients due for dialysis and includes relevant clinical data of all patients on this list along with the schedule time for the dialysis and the station number.

In this way, each domain includes the dataset specifically needed by its user. Furthermore the data is available in an easy to understand language and the screen is easy understandable and manageable.

Figure 2.7: Screen Shot of Hemodialysis domain



Source: Mediqal HI, 2009d

2.4.2 The Current Use of eMEDRenal:

The eMED*Renal* system was initially installed into the renal units in Sligo, Letterkenny and Cavan (HSE, 2010b). After its success in these units, the system was installed into Merlin Park Hospital and Mayo General Hospital renal units (HSE, 2010c). The users of the system in Sligo, Letterkenny and Cavan will test its functionality in the Merlin Park Hospital and Mayo General Hospital (HSE, 2010c). The process will continue till the installation of system is in all renal units cross Ireland.

The eMED*Renal* system has also been used by hospitals in England. For instance, Russels Hall Hospital, a private hospital in Dudley run by The Dudley Group of Hospitals NHS Foundation Trust has also installed the system (Siemens, 2010). According to a physician at the hospital, the system has improved the quality of patient care as it assists the physicians in changing therapy or dialysis and enables them to communicate with other people working in different departments of the hospital (Siemens, 2010).

2.4.3 The Compliance of eMEDRenal with EHR and Renal Registry Standards

Standardization of EHR structure, content and the exchange mechanism facilitates sharing of medical records and development of software that includes multiple health care professionals and institutions. These EHR standards differ from country to country and from time to time with the development in the EHR structure and content (Beale, 2002). Some important EHR standards for formatting, exchange and storage include ISO, GEHR, CEN, HL7, DICOM, and IHE (ARTEMIS, 2006).

The eMED*Renal* system has been said to be fully compliant with the EHR standards and renal reporting standards (National Dataset Service (NDS), 2008; Siemens, 2010). The Information

Centre for Health and Social Care of NDS has analysed compliance of the system with National Renal Dataset (NRD) a UK based dataset to ease the availability of properly standardized clinical data (NDS, 2008). The eMED*Renal* system was found to follow all renal reporting standards. It ensures the confidentiality of patient and security of collected data. The data reported by the system is valid and accurate. It helps the hospital in administration and drugs management. Though some minute issues have also been found, they can be resolved with the passage of time through education and training (NDS, 2008).

2.5 Development of Conceptual Model

The purpose of this study is to examine the acceptance of the eMED*Renal* system among physicians, nurses and patients. User acceptance of information technology is one of the most popular topics of information technology research (Gong, Xu, & Yu, 2004). Previous studies have found that there are a lot of factors that can predict the acceptance of the information systems (Mathieson, Peacock, & Chin, 2001). Based on these factors, a number of conceptual models have also been designed. These models can serve as a foundation for the development of a conceptual model for the present study.

The Technology acceptance model (TAM) has been used in the present study as the main conceptual model to predict the acceptance of eMEDRenal. However, acknowledging the limitations of this model, as outlined in the literature, some other models for understanding the acceptance of health care technology have also been examined and, with the help of these models, some amendments have been made to the TAM.

2.5.1 Technology Acceptance Model

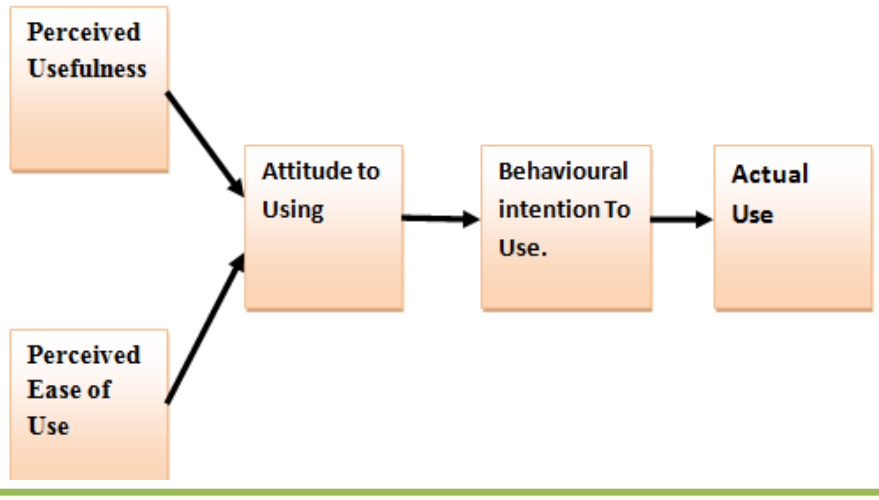
TAM was developed in 1980's by Fred Davis and Richard Bagozzi and was outlined within their respective studies (as cited in Mathieson, Peacock, & Chin, 2001). The model is based on the

theory of reasoned action (TRA) which says that Behavioural Intention is the main determinant of actual behaviour and it is determined by one's attitude and social norms (Shimp & Kavas, 1984). TRA was a good choice for the model as it had been proven helpful in explaining different human-behaviours (Manstead, Proffitt, & Smart, 1983; Shimp & Kavas, 1984)

The original version of TAM is shown in the figure 2.8 . As shown, according to TAM, the two main factors operating behind the decision of human elements regarding the acceptance of particular technology are 'Perceived Usefulness' and 'Perceived Ease of Use'. Perceived Usefulness refers to the level to which an individual realizes that the application of a particular technology/system would help towards increasing their overall professional performance, and Perceived Ease Of Use represents the level to which an individual believes that the employed technology/system would be maximally easy to use (i.e. free of complex operating efforts) (Mathieson, Peacock, & Chin, 2001; Gong, Xu, & Yu, 2004;).

These two factors combine together to show the attitude of the individual to use a particular technology/system, which led to the Behavioural Intention to use a particular technology/system. Behavioural Intention determines the interest of an individual in using the technology/system and the model is based on the assumption that if a person shows the Behavioural Intention to use a system, the person *will* use the system (Gong, Xu, & Yu, 2004).

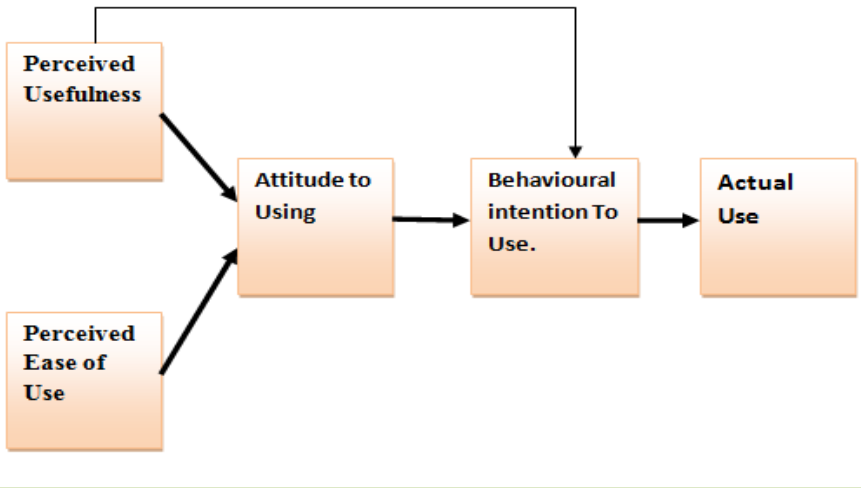
Figure 2.8: The original technology acceptance model



Source: Wu *et al.*, 2008, p. 124

Later on Davis (1989, as cited in Gong, Xu, & Yu, 2004) found that Perceived Usefulness and Perceived Ease of Use are not equal in predicting the Behavioural Intention. It was found that Perceived Usefulness has a stronger link with the Behavioural Intention to use and, as a result a line was added in the original version of TAM to show a direct link between Perceived Usefulness and Behavioural Intention to use (See figure 2.9).

Figure 2.9: The revised TAM



Source: Holden and Karsh, 2009, p. 3

Though the model has been quite popular, scholars have identified some limitations and weaknesses in it. Dishaw and Strong (1999) called for further research on the TAM' validation and Teo, Lee, Chai and Wong (2009) recommended that the model ought to be checked for cultural validity and recommended that studies be conducted on the validation of the model in different cultural contexts. Based on these recommendations, Teo and Ursavas (2011) evaluated the validation of the model for teachers in Turkey and concluded that TAM is a viable and efficient model in predicting the acceptance of information technology for the selected sample. They further recommended that studies involving different samples need to validate TAM in order to enhance its generalizibility.

Besides validation, the model has also been criticized for its limited view of user's acceptance. For instance, Mathieson, Peacock and Chin (2001) asserted that the model fails to incorporate the barriers preventing a person from using an information system even after he/she realizes the usability of the system and found no difficulty in using it. Important barriers, identified by Mahtieson, Peacock and Chin (2001), include the lack of time, money, expertise and resources for using the system.

To address these limitations and weaknesses, scholars have designed the extension models of TAM in which, in addition to Perceived Usefulness and Perceived Ease of Use, some other factors have been added to predict the Behavioural Intention of an individual to use the technology or system under study (e.g. Taylor, & Todd, 1995; Venkatesh, 2000; Mathieson, Peacock, & Chin, 2001; Riemenschneider *et al.*, 2003; Gong, Yu and Xu, 2004).

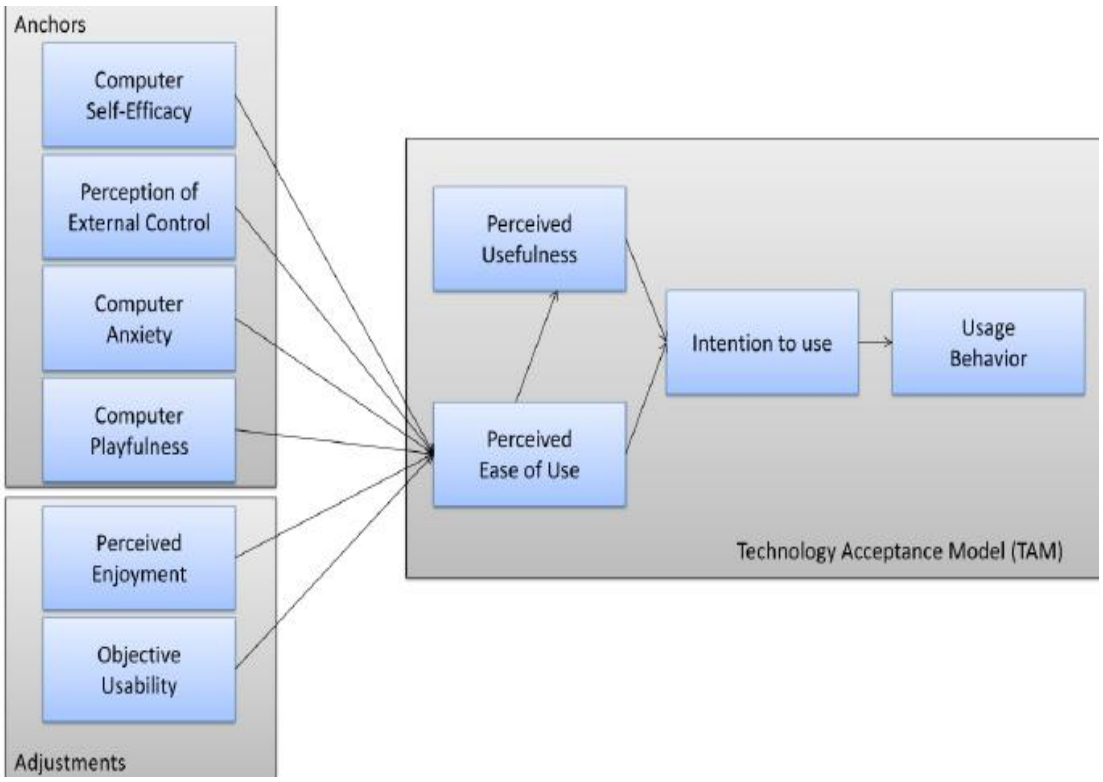
Taylor and Todd (1995) noted that while the model is the best for predicting behaviour, it lies behind other models in predicting behaviour intention due to missing important factors like

subjective norm and perceived behavioural control. Important factors that have significant indirect influence on Behavioural Intention are self-efficacy and resource constraints (Taylor & Todd, 1995). Thus, these factors ought to be added to the TAM for better understanding of Behavioural Intention (Mathieson, Peacock, & Chin, 2001).

Inspired from the findings of Taylor and Todd (1995), Mathieson, Peacock and Chin (2001) developed a model incorporating one construct of Theory of Planned Behaviour (TPB) into TAM. The new construct named perceived resources (PR) was defined by them as the extent to which the user perceived that he/she has all the available resources needed to use the technology/system. PR was found to have a significant relationship with Perceived Ease of Use and Behavioural Intention and the extended model was shown to be reliable and valid for predicting user acceptance of technology.

Venkatesh (2000) observed that the parsimony of TAM, which is often taken as it strength, is one of its limitation, as it provided insufficient understanding of the factors that should be taken into consideration by system designers to improve user acceptance of the system designed by them. To remove this weakness from the model, Venkatesh (2000) suggested taking into account the determiners of Perceived Ease of Use. He designed a model for the determinants for Perceived Ease of Use and tested it for validity in three longitudinal studies (See figure 2.10). The results revealed that the model of determinants explained up to 60% variance in Perceived Ease of Use. The expanded model of TAM after adding the model of determinants in it provides a better explanation of the factors directly or indirectly influencing the acceptance of a particular technology.

Figure 2.10: Determinants of Perceived Ease of Use Model



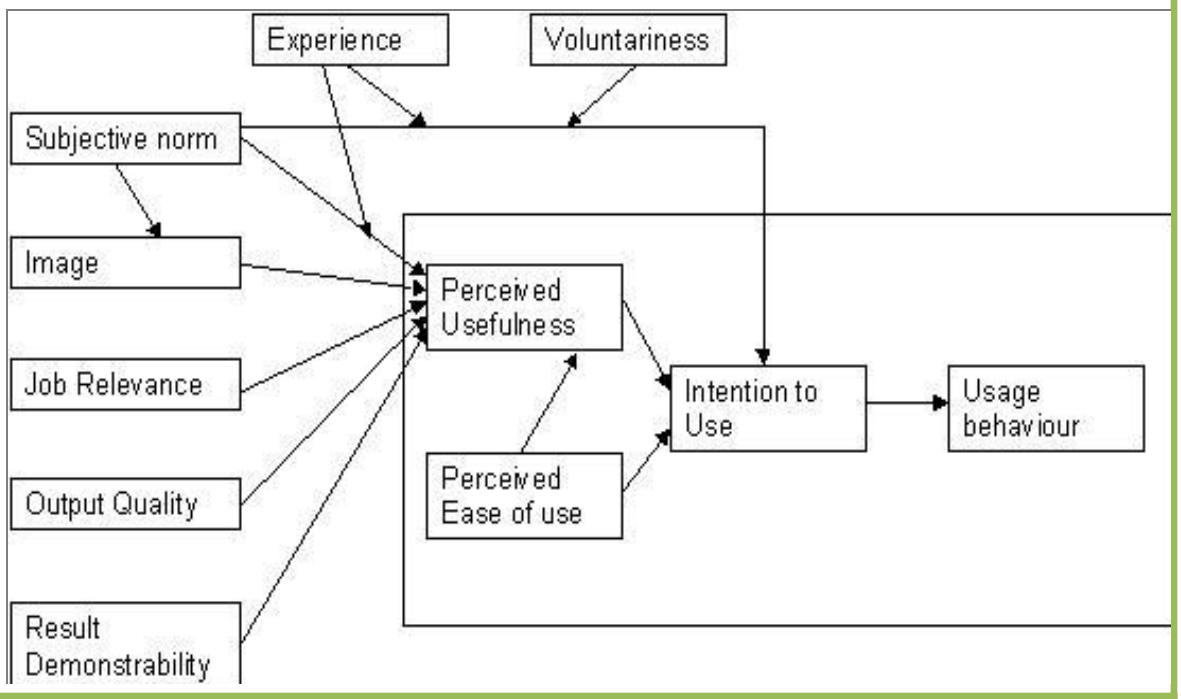
Source: Venkatesh, 2000, p. 346

The model is based on the role of anchors (general beliefs about computers) and adjustments (beliefs shaped after direct exposure to the targeted system) in determining the perceived ease of use. Important anchors used in this model are computer self-efficacy, computer anxiety and computer playfulness. Perception of external control (facilitating conditions) is a different anchor that adjusts with users increasing experience of the target system. These anchors have been found to be interrelated. With regard to adjustments. two important beliefs are perceived enjoyment and objective usability. Objective usability defines the degree of effort required to do a particular task on the targeted system while perceived enjoyment is the extent to which the use of targeted systems is perceived as enjoyable by the user.

Venkatesh and Davis (2000) designed another extension of TAM and named it TAM2. The extended model looks into the factors effecting Perceived Usefulness, mainly divided into two

categories namely social influence process (including subjective norm, image, experience and voluntariness) and cognitive instrument process (including (job relevance, output quality, result demonstrability, and Perceived Ease Of Use), as shown in figure 2.11. The resulting model was reported to explain 60% of variance in Perceived Usefulness, after testing in four longitudinal studies.

Figure 2.11: TAM2



Source: Eija, 2005

2.5.2. Technology Acceptance Model in Healthcare

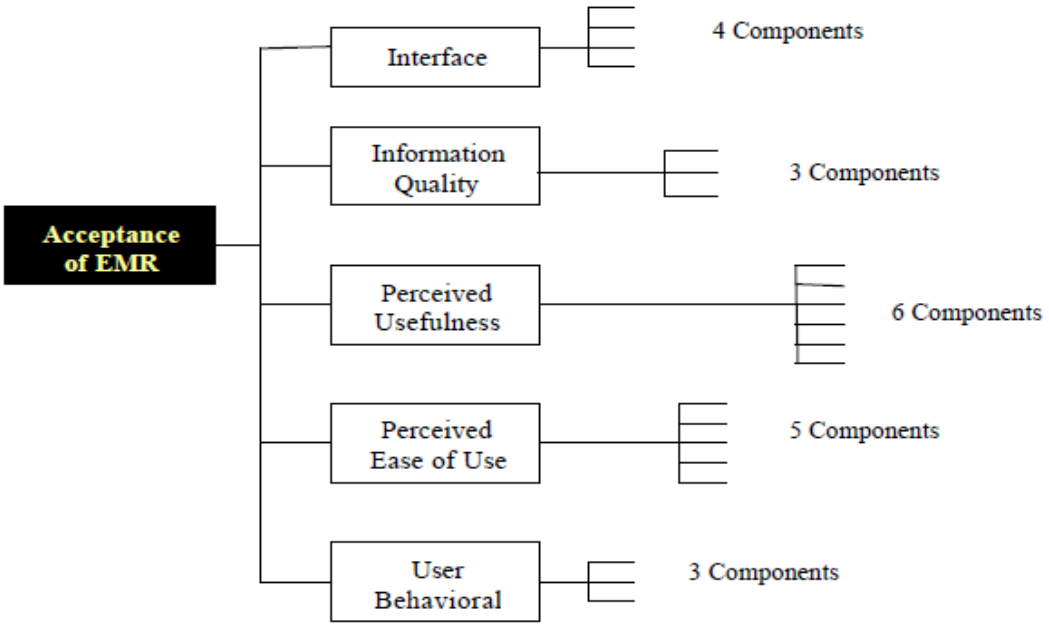
TAM is the most widely used conceptual model in studies on health information technology (Holden & Karsh, 2009) and a number of studies have used it successfully to predict the user's acceptance of health information technology (Chau & Hu, 2002; Gong, Xu, & Yu, 2004; Teo & Ursavas, 2011). The popularity of TAM is mainly due to its success in the prediction and

explanation of users' reaction to information technology together with its relative simplicity (Lee, Kozar, & Larson, 2003; Holden & Karsh, 2009).

However, one important limitation of TAM with regard to its application in health information technology is identified by Holden and Karsh (2009). They asserted that the model was not designed specifically for a health care context and, as a result, it missed a number of important factors like "how well the system performs and how relevant it is to one job, personal characteristics of users, characteristics of the organisation such as readiness for IT or technical support, and psychological variables such as ownership and trust" needed to be evaluated for predicting the acceptance of EPRS. As a result, the majority of studies on health information technology had added or removed some predictor variables from TAM before using it as conceptual framework (Holden & Karsh, 2009).

Mohd and Muhammad (2005) seem to agree with Holden and Karsh (2009). They reviewed the literature on the acceptance of EPR and found TAM to be the *closest framework model* for EPR acceptance which should be used in studies on EPR acceptance but only after adding some other predictors of EPR acceptance. The factors for EPR acceptance proposed by them include system interface, information quality and user behavioural along with Perceived Usefulness and Perceived Ease of Use (See figure 2.12).

Figure 2.12: Factors of EPR's acceptance



Source: Mohd & Muhammad, 2005, p. 89

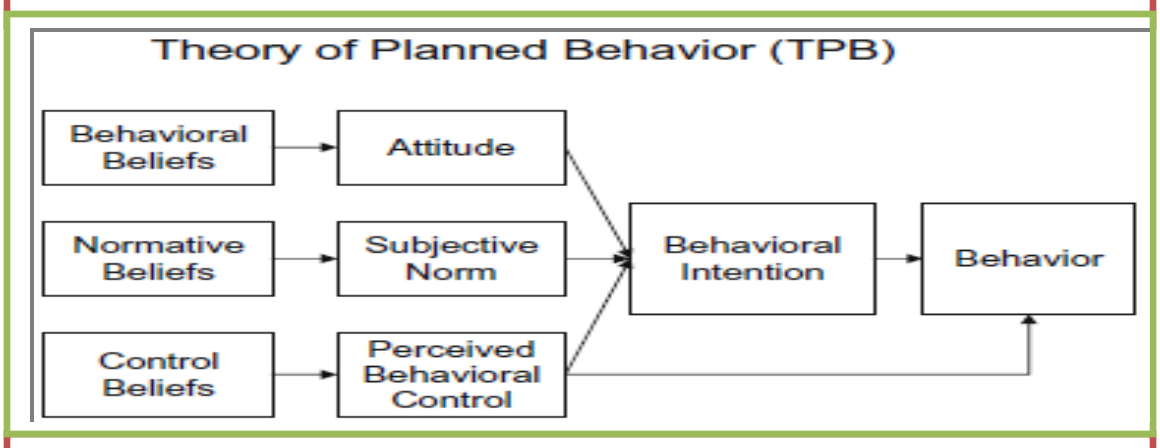
System interface determines the strengths and weaknesses of the EPR and includes four components namely screen, terminology and system information, learning and EPR system capability (Shneiderman, 2004, as cited in Mohd, & Muhammad, 2005). Information quality factors evaluate the functionality of EPR which includes the functionality of health information and data; the management of lab test and radiology report and order entry and result management. The user behavioural includes user's satisfaction with the system, the user's attitude toward the system and the user's intention to use the system (Mohd & Muhammad, 2005).

A close view of the items used by Mohd and Muhammad (2005) for system interface and information quality revealed that they have used pure technological and scientific terms and are not suitable for users unaware of informatics language (Mohd & Muhammad, 2005 (Table 1), pp. 84-88). A nurse who has never studied information technology cannot tell whether the use of

blinking and bolding on the screen is useful or not. Furthermore, there are some items which can only be answered by professionals working in relative fields like the accuracy and standardization of health information. Nonetheless, the language used in the items for benchmarking user behavioural was simple and for all users.

Rawstorne, Jayasuria and Caputi (2000) used TAM and TPB to predict usage behaviour when the use is mandatory. They found that TPB is better than TAM in predicting the usage behaviour of nurses using computerized nursing care plans. However, Holden and Karsh (2009) noted that the study was limited in many senses. The study examined the Behavioural Intention when the usage was obligatory and may not be applicable to studies examining a technology/system which is not mandatory to use. Then, it provides no definition of the construct and the details of their measurement. However, the study successfully showed the significant impact of subjective norm on Behavioural Intention, which is important to be added into TAM. The TPB model is shown in the figure 2.13.

Figure 2.13: TPB model

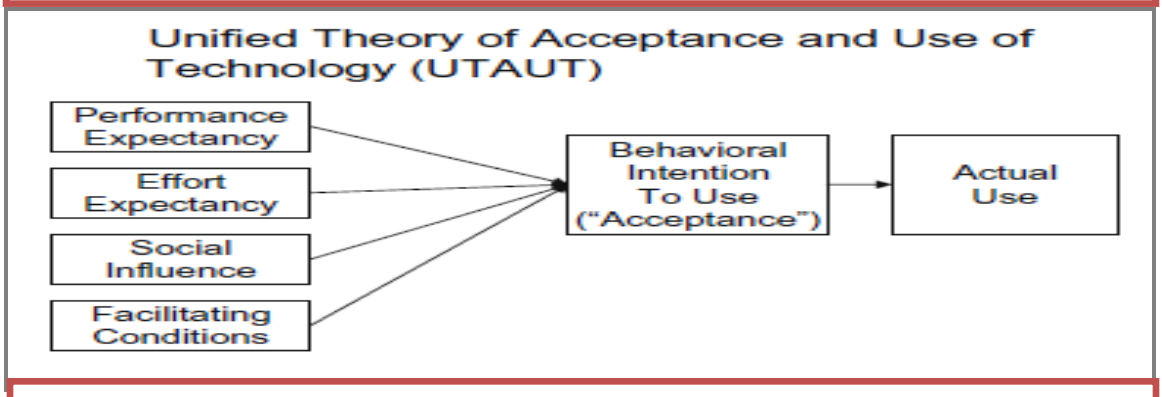


Source: Holden and Karsh, 2009, p. 3

2.5.3. Other Models of Technology Acceptance in Healthcare

Besides TAM, some other models have also been designed for predicting the acceptance of health information technology amongst its user. Holden and Karsh (2009) reviewed the studies on health information technology that used quantitative methods to analyse the acceptance of health information technology amongst its user. They found that apart from TAM, two important models that are quite popular in health information research are Unified Theory of Acceptance and Use of Technology (UTAUT) and TPB. The UTAUT model is shown in the figure 2.14.

Figure 2.14: UTAUT model

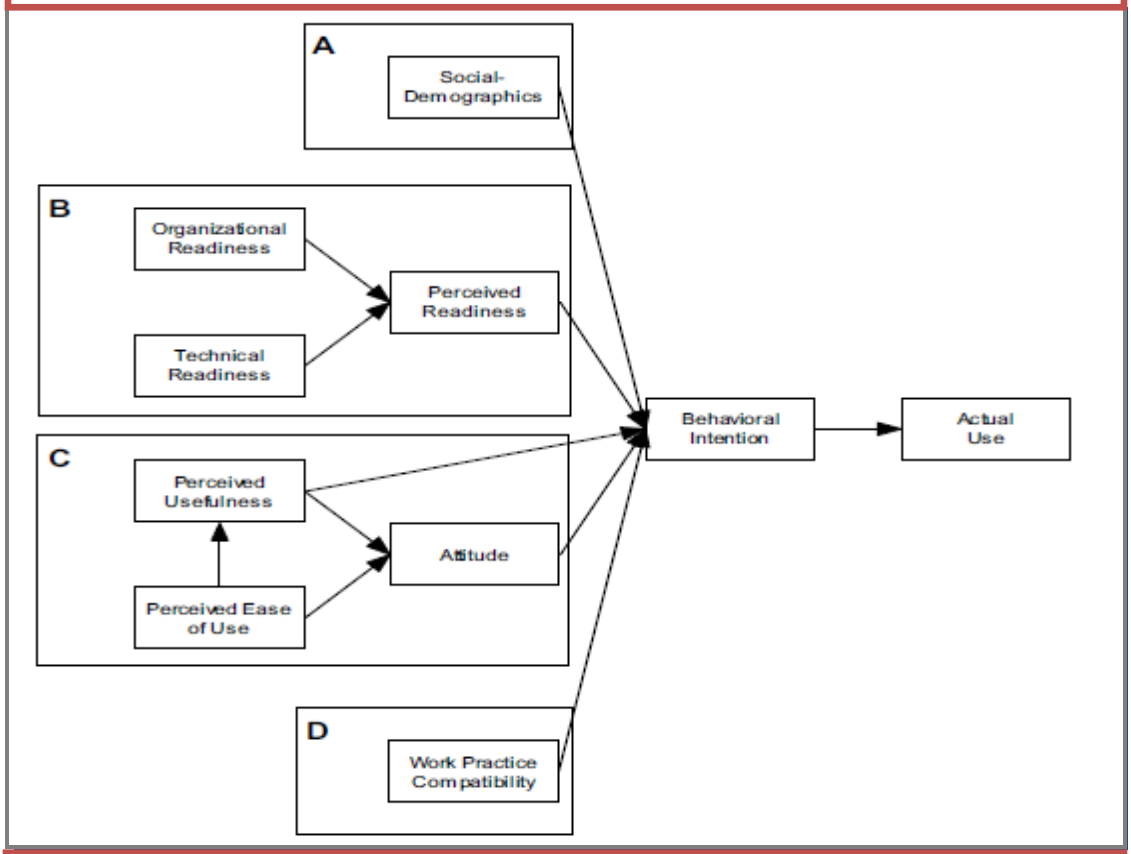


Source: Holden and Karsh, 2009, p. 3

However some scholars preferred to design new models for their studies instead of using already designed models. For instance, Horan, Tulu, Hilton and Burton (2004) designed a model for predicting physicians' acceptance of an online disability evaluation system. In this model, as shown in the figure 2.15, four factors have been selected to influence the Behavioural Intention: Social demographics, Perceived Readiness, Attitude and Work Practice Compatibility. They found that perceived readiness and attitude of physicians were more significant in predicting the Behavioural Intention to use the system as compared to social demographics and work practice compatibility. However work practice compatibility was found to be a significant predictor of Behavioural Intention when measured in terms of interaction. Based on these findings, they

criticized TAM for ignoring perceived readiness which is an important predictor of Behavioural Intention.

Figure 2.15: Another model for user acceptance of healthcare technology



Source: Horan *et al.*, 2004, p. 5

2.5.4. Conceptual Model for eMEDRenal Acceptance

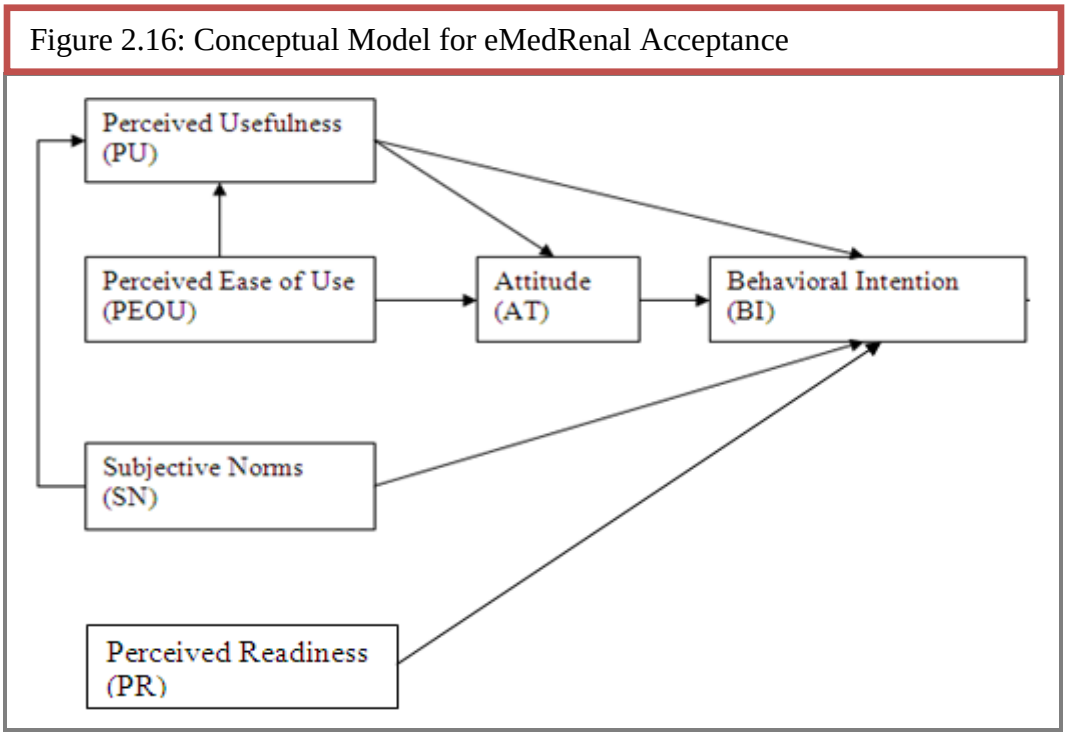
After analysing different acceptance models for predicting technology usage behaviour in both healthcare and non-health care industry, it has been found that TAM is one of the best models to predict user Behavioural Intention in the health care industry. The scholars accepted its significance and used it along with other models to predict the acceptability of healthcare information technology. However, they pointed out that the model is not designed specifically

for the health care industry and, consequently, does not include a number of factors, which need to be taken into account.

Important determinants of Behavioural Intention, as reported in previous studies on healthcare information technology, are Perceived Readiness and Subjective Norm. The two determinants have been selected out of many because of their relative significant association with Behavioural Intention. In the present study, Perceived Readiness is defined as the extent to which an individual perceives that the resources and skills needed to operate the system/technology are ready. Subjective Norm is defined in accordance with TPB, as the degree to which an individual perceives the importance or relevance of other's belief about the system.

The final conceptual models designed for the present study after adding these two constructs in original model of TAM is shown in the figure 2.16:

Figure 2.16: Conceptual Model for eMedRenal Acceptance



Behavioural Intention has been taken as a measure of user acceptance of the eMEDRenal system and assumes that if Behavioural Intention of the users is high, the users are ready to use and will use the eMEDRenal system, if not stopped by some other organizational and technical constraints. Since the purpose of this study is not to look into the actual use of the system but just to analyse the acceptance of the eMEDRenal system among physicians and nurses, these constraints have not been added to the model. One reason for not evaluating actual use is that the eMEDRenal system has only recently been implemented and such an evaluation requires long term implementation of the system. However, it is highly recommended to study the actual use of the system after its implantation in all renal units of Ireland for more than a year. For such studies this model will not be sufficient, and other constructs of Behavioural Intention will need to be added.

2.6 Hypotheses Development

Based on this final model (shown in above figure) the following hypotheses are proposed for the study:-

H1: *Perceived Usefulness, Subjective Norm and Perceived Readiness have a direct impact on the Behavioural Intention to use the eMEDRenal system;*

H2: *Perceived Ease of Use and Subjective Norms have a direct impact on the Perceived usefulness of the eMEDRenal system;*

H3: *Perceived Usefulness and Perceived Ease of Use have a direct impact on Attitude which in turn has a direct impact on Behavioural Intention to use the eMEDRenal system;*

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Introduction

The present study investigates the user acceptance of the eMED*Renal* System among physicians, nurses and other hospital staff with the help of a technology acceptance model. The model has been designed in the preceding chapter after reviewing a number of technology acceptance models. In the present chapter, the focus is on the application of that model in order to benchmark user acceptance of the eMED*Renal* System. The chapter describes the research methodology that the researcher employed. According to Jankowicz (2005) the research methodology is "the analysis of, and rational for the particular method or methods used in a given study, and in that type of study in general" (p. 224). Therefore the researcher will not only describe the methods used in this study but will also explain the rationale for choosing those particular methods.

Being mindful of the fact that the methodological decision ought to be within a particular philosophical paradigm, the chapter opens with a description of the research philosophy used in the study in which the debate between phenomenology and positivism is briefly described. An explanation for selecting the positivist paradigm is also provided. It is followed by a discussion on the qualitative and quantitative approaches to research and a description of the chosen approach is outlined. The method selected for collecting data from participants, which is a survey is described and explained in detail in the section on research methods. A complete description of the research design underpinning the present study is also provided. In addition to this, the

chapter addresses ethical and legal considerations as well as the limitations of the selected research methodology.

This detailed description of the research methodology will serve as the guideline for future researchers conducting research on the same subject and will help them in identifying the limitations and problems as well as the strength of the selected research methods and approaches.

3.2. Research Philosophy

Although a number of research philosophies can be utilised in a research study, phenomenology and positivism are two of the most followed philosophies (Saunders, Lewis & Thornhill, 2007). Phenomenological philosophy assumes the world to be socially-constructed, and knowledge about the world to be subjective and based on human experiences (Collis & Hussey 2003). On the other hand, the basic assumption of the positivist philosophy is the objectivity of knowledge which exists beyond the human mind and is independent of the individual who observes it (Shepard, Jensen, Schmoll, Hack & Gwyer, 1993). Therefore, in phenomenological studies, the researcher is believed to be connected to knowledge and there is a lack of attention towards the objectivity and generalizability of the knowledge (Amaratunga, Baldray, Sarshar & Newton, 2002). In the positivist research, by contrast, the role of the researcher is to remain separate and independent from the observed reality (Amaratunga, *et al.*, 2002).

Scholars have been debating on the efficiency of these research philosophies in solving research problems (Shepard, *et al.*, 1993). However, some scholars have argued against this never-ending debate and held that the two philosophies have their own strengths and limitations and each philosophy is more suitable to achieving some particular research aim (Weber, 2004; Lee, 1991). Thus, the selection of a research philosophy is fully dependent on the aim and objectives of a research study (Lee, 1991).

The aim of the present study, as described above, is to investigate user acceptance of the eMED*Renal* System among hospital staff. The objectivity of the generated knowledge is of immense importance. The focus of this study is to measure and record user acceptance and to statistically and mathematically capture the patterns, which appeared in the data. Farthermore, the findings of the study are intended to be useful for other hospitals in Ireland where the hospital administration is planning to implement the eMED*Renal* System. Therefore, the positivist philosophy has been selected as the most appropriate research philosophy to underpin the study. Besides the compatibility of this research philosophy with the study aims, it is also important to note that the discipline of health informatics in itself is inclined towards a positivist perspective and this is reflected in its dominate use within information systems research (Georgiou, 2006).

3.3. Research Approach

After deciding the research philosophy, the next important question with regard to the research was to decide, which research approach qualitative or quantitative, was the most suitable for the present study. Although positivist research favours a quantitative and deductive approach the researcher wanted to check that this was a suitability approach to address the purpose of the study as scholars recommends the selection of a research approach on the basis that it fits the purpose and requirements of a study (Hara, 1995).

A quantitative approach to research supports the collection of factual and numerical data while a qualitative approach is concerned with the collection of subjective data about observation and experience (Amaratunga *et al.*, 2002). The data generated by quantitative studies is properly structured and statistically verifiable (Collis & Hussey, 2003). In contrast, richness and validity are the strengths of qualitative data (Amaratunga *et al.*, 2002). A qualitative approach is said to

be suitable for exploring and explaining the hidden aspects of a phenomenon while a quantitative approach is aimed at testing the hypotheses by analysing the collected data.

Since the present study is based on the measurement of user acceptance with the help of a model, a quantitative approach is well-suited for a study that aims to test the applicability of the model and to find user acceptance of the eMED*Renal* system among physicians and nurses. The structured nature of quantitative data has enabled the researcher to establish whether staff at the research sites are ready to use the eMED*Renal* system. Despite the richness of the qualitative data, a qualitative approach was not suitable for the study because of its subjective nature and lack of generalisability. Therefore, the purpose of the study is to investigate and describe user acceptance of the eMED*Renal* system in hospitals of Ireland.

3.4. Research Method

Research methods define the instrument and procedures used for the collection of data in the study. The selection of research methods is primarily based on the research approach and, underpinning the study and only those methods, that particularly suit the research aim are selected. Considering the quantitative research, approach which clearly depicts empirical research (Saunders *et al.*, 2007) and the aim of the study which involves the description of the user acceptance of the eMED*Renal* system among the hospital staff in Ireland, the researcher has adopted the survey method in order to base the findings of the study on the self-report of hospital staff.

As indicated in the literature review, the studies on technology acceptance of EHRs are usually based on a model which is tested after surveying the target population (Gadd, & Penrod, 2001; Jensen & Aanestad, 2007). Therefore, evidence from the literature makes it possible to say that a survey method is the most popular research method in studies on technology acceptance of

EHRs. Besides the popularity of this method, it is also suitable for collecting data from a large sample of the targeted population and incorporates the views and opinions of as many doctors and nurses as possible. The survey method, because it is less time consuming and easier to use, facilitates the collection of opinion based data from a large sample in the least possible time so that the findings derived from the data are applicable to the entire population (Saunders *et al.*, 2007). Bryman (2001) has pointed out another advantage of this research method as he argued that surveys identify the present situation and point to the present requirements. This feature of a survey is of particular importance to the study as it is based on the description of the present scenario in the renal wards of the hospitals in Ireland with respect to the opinion of the physicians, nurses and other hospital staffs regarding a new renal record systems in the country.

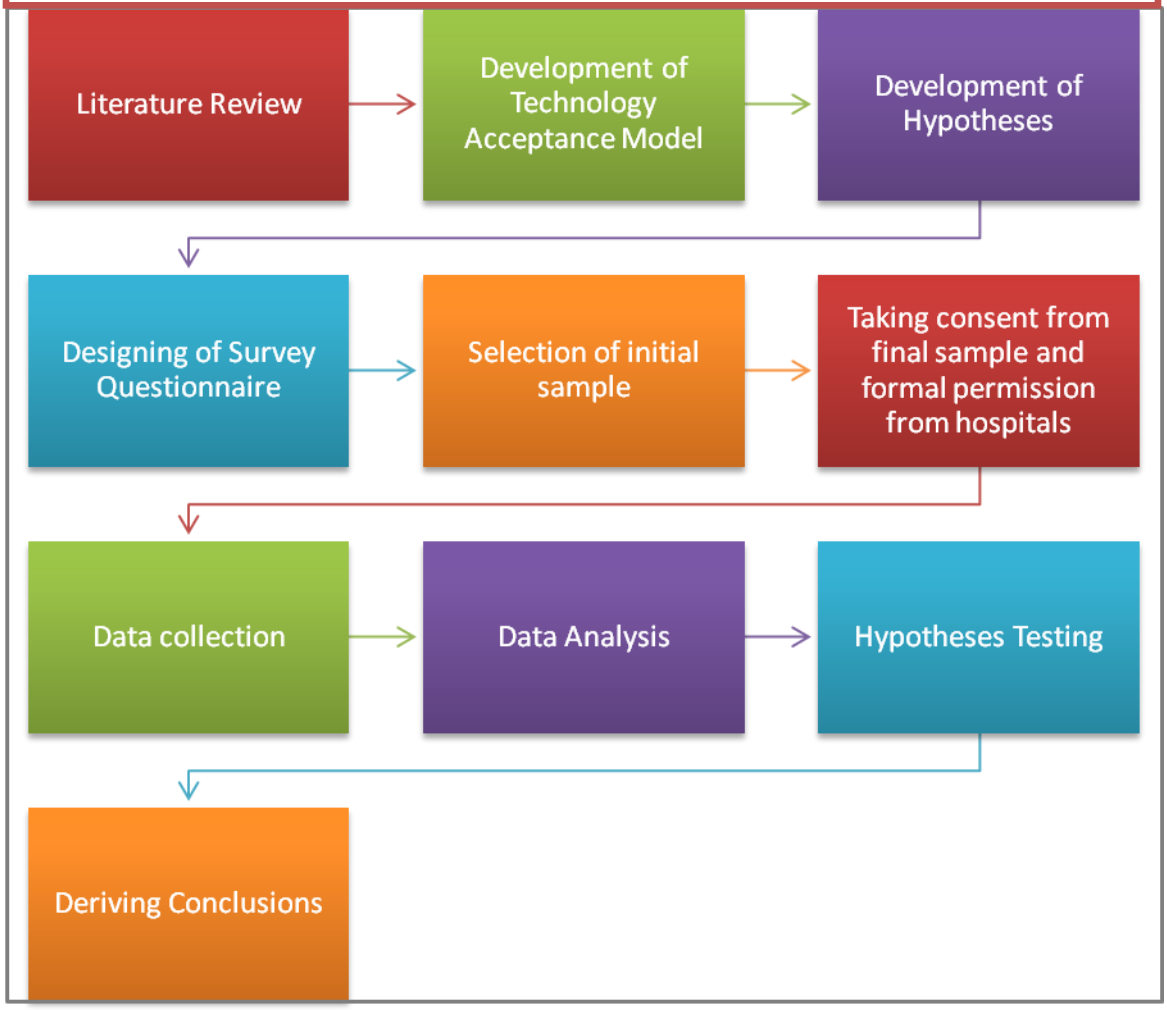
The doctors and nurses were surveyed to collect data about their use and perceptions regarding the use of the eMED*Renal* system with the help of a questionnaire containing close-ended questions. The data obtained from the questionnaire was numerical in nature and was ready for statistical analysis. This data is used to show user acceptance of the eMED*Renal* system among the study participants and to test whether the selected model is suitable for benchmarking user acceptance in future studies.

3.5. Research Design

The research design is the blue print of a study, which shows the steps taken by a researcher in collecting, presenting and analysing data (Burns, & Burns, 2006; Cooper, & Schindler, 2006). It can be said to be an overview of the research, which helps the researcher in pre-planning the scope and boundaries of the research in accordance to the aim of the study before embarking upon the research process (Cooper, & Schindler, 2006). This planning of research is important for making the research more organized and less time consuming as it makes the researcher fully

aware of the problems one might face during the research process (Cooper, & Schindler, 2006; Burns & Burns, 2006). The plan of the present study is provided in the figure 3.1.

Figure 3.1: The Research Design of the Present Study



As evident from the figure 3.1, the research design of the present study is process based with illustration of all the steps starting from the literature review to the conclusion. The first three steps shown in the first line are related to the hypothesis building stage of data collection. It starts from the review of secondary data on the subject to developing a conceptual model and finally to the development of hypothesis from that model. The second line of the above figure shows the

preparative stage of research during which the two important requirement of the study, the questionnaire and sample were finalised. The third line indicates the main research process where data was actually collected, analysed and used for testing the hypothesis. The final stage of the research design is to derive a conclusion from the tested hypothesis. Each step of the research design has been elaborated in the following sub-sections.

3.5.1. Literature Review

Scholars have pointed out the importance of secondary research without which a research study cannot be completed (Collis & Hussey, 2003; Saunders *et al.*, 2007). In the present study, the secondary research was conducted by reviewing the previous literature on the subject. One important purpose of the secondary research in the current study was to review a number of technology acceptance models and its use in studies on the technology acceptance of EHRs. These models are based on the view that there are number of factors that can influence the user acceptance of information systems and each model is seen as an attempt to incorporate all the important factors effecting user acceptance of technology. The review of these models has been provided in the last sections of the second chapter of this dissertation.

This step served as the base for the second step of the research process as the models reviewed in this step served as the foundation of the technology acceptance models used in the present study. Furthermore, the literature review also enabled the researcher in identifying the need for benchmarking user acceptance and understanding of the eMED*Renal* system and its use for recording of renal patients' data in Ireland.

3.5.2. Development of Technology Acceptance Model

After reviewing various technology acceptance models and identifying the important factors associated with user acceptance of information systems, the next step was to develop an acceptance model as a conceptual model of the present study. The base of this model is TAM which was found to be the most significant and popular model. However, because TAM is a general model, some important factors were added in it, which were particularly related to health care industry. The model has been shown in the figure 2.15 in the preceding chapter.

3.5.3. Development of Hypotheses

The purpose of the conceptual model developed in the last step was to predict the behavioural intention of the user to use the eMED*Renal* system. These predictions were made in the form of hypotheses. Three hypotheses were developed based on the conceptual model shown in figure 2.15. These were:

H1: *Perceived Usefulness, Subjective Norm and Perceived Readiness have a direct impact on the Behavioural Intention to use* the eMED*Renal* system.

H2: *Perceived Ease of Use and Subjective Norms have a direct impact on the Perceived usefulness of* the eMED*Renal* system.

H3: *Perceived Usefulness and Perceived Ease of Use have a direct impact on Attitude which in turn has direct impact on Behavioural Intention to use* the eMED*Renal* system.

3.5.4. Designing of Survey Questionnaire

While reviewing the literature on the acceptance model, the researcher noted that these models were tested in previous studies using a survey questionnaire. In these studies, different items have been used to measure the factors incorporated in the models and almost all scholars have

measured the reliability of the items used in their scales. The researcher reviewed the reliability of the different items reported in the previous studies to measure Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Subjective Norm (SN), Perceived Readiness (PR), Attitude (AT) and Behavioural Intention (BI). After a thorough examination of the reliability of each item, those items were selected that were reported to have good reliability.

PU was measured with the help of six items adopted from Mohd and Mohamad (2005). The factor loading of these items was reported to be around 0.69-0.84 which shows excellent overlapping variance (Mohd & Mohamad, 2005). The five items for measuring EOU, which were also taken from the same study where the factor loading of the item was reported to be quite good, ranging between 0.40 and 0.75 (Mohd & Mohamad, 2005). The items for SN were taken from Duyck *et al*. (2008, as cited in Holden and Karsh, 2008) where they were reported to have good reliability scores. For measuring PR, three items were taken from the study of Horan, Tulu, and Burton (2004). However, these are the only items used in the questionnaire that had no reported reliability. The researcher failed to find the reliability of this factor in any study and decided to use these items mainly because of their high correlation with the physician's behavioural intention to use an information system. The items for AT and BI were taken from Mohd & Muhammad (2005) where they were shown to have good overlapping variance as shown by their high factor loading scores. All the items were rephrased to add eMED*Renal* in place of computer and information systems. Survey questionnaire used in the present study is provided in the appendix A.

3.5.5. Selection of Initial Sample

Once the survey questionnaire was finalised, the next important step was to select the sample for data collection. The researcher found that the eMED*Renal* system had been functional in the hemodialysis units of only two hospitals of Ireland: Sligo and Letterkenny. The staff working in these hospitals and who were using the eMED*Renal* system were the target population of the present study. In each hospital around 35 staff members including physicians, nurses, and administrative staff were using the eMED*Renal* system.

Since the population size was not very large, it was possible to survey all staff members. The initial sample contained all the physicians, nurses and administrative staffs using the eMED*Renal* system at the two research site. The initial sample size was 70 – 35 from each hospital.

3.5.6. Taking Consent from Final Sample and Formal Permission from Hospitals

After deciding the sample from which the data would be collected, it was the researcher's responsibility to ensure that all ethical requirements have been fulfilled before starting the process of data collection. The first important ethical requirement was to obtain signed consent from study participants after providing them all with details of the study and their role in that study. The researcher prepared an information letter, which contained detailed information about the study and included a consent form. This letter was sent to all participants of the initial sample. Of the 70 participants of the initial sample, 53 participants sent back the signed consent form and agreed to take part in the study – 28 from Letterkenny hospital and 25 were from Sligo hospital. Thus, the final sample of the present study contained 75% of the population and can produce generalisable and reliable findings.

In addition, it was also important to seek from the two hospitals formal written permission from the two hospitals for using their staff members in the study. The administration of both hospitals agreed to allow their staff members to take part in the study after understanding the importance the present study has for their management of the new installed system. For Sligo hospital the researcher had to apply for ethical approval from their Ethics committee (see Appendix E). Though they told the researcher that there is no need to ask participants for signed consent, after getting approval from the hospital ethics committee, the researcher asked permission, through email, from the Director of Nursing, who asked the researcher to contact the Clinical Nurse Manger 3 (CNM3) for renal services. The CNM 3 referred the researcher to the head of haemodialysis department who granted final approval to conduct the study. For Letterkenny hospital the researcher also applied to their ethics committee and also spoke with the haemodialysis units CNM 2's line manger as well as asking permission from the nephrology consultant.

3.5.7. Data Collection

After the end of the preparative stage of data collection, the process of actual data collection was started. In Sligo Hospital, the researcher handed over the questionnaires to the CNM 2 and for Letterkenny Hospital, because the CNM2 was not present that day, the researcher himself handed over the questionnaires to the nurses. He also handed the rest of questionnaires to a nurse in charge who was to give them to other study participants. The estimated time needed for filling the questionnaire was 5-10 minutes but because of the busy schedule of the participants, they were asked to fill the questionnaire within one week. For the collection of filled questionnaire the researcher left a collection box at each hospital. After a week, the researcher visited both

hospitals and collected the questionnaires from the boxes. The entire process of data collection took a little more than a week.

3.5.8. Data Analysis

The data contained in the filled questionnaire was stored in the excel sheets using MS-office. This excel sheets were then used for the statistical analysis of the collected data to test the applicability of the model through hypotheses and to examine the acceptance of the eMED*Renal* system among the study participants. SPSS was the software that was used for conducting statistical analysis. First of all, the reliability of the model was calculated with the help of *Cronbach's alpha* which is used to determine the internal consistency of the scale and is a good estimation of the reliability of the scale. The descriptive statistics of the study participants was calculated to show the location and variability of the socio-demographic variables as well as variables determining the acceptance of the eMED*Renal* system. The results of these tests provide the details of user acceptance of the eMED*Renal* system among the study participants of both hospitals. Finally, a T-test was performed to compare user acceptance among the physicians and nurses.

3.5.9. Hypotheses Testing

To test the hypotheses, bivariate correlation analysis was conducted. The correlation between the different variables was examined to determine the extent to which the model used in the study was applicable to the study participants and can be used in future studies on technology acceptance of the eMED*Renal* system. The data obtained from the two hospitals was analysed separately as well as combined to provide a comprehensive analysis of the applicability of the model.

3.5.10. Deriving Conclusion

After testing the hypothesis and analysing the data for examining the acceptance of the eMED*Renal* system among the study participants, the researcher wrote a detailed discussion on the findings. The purpose of the discussion was to relate the findings of the present study with those of previous studies, to explain the contradiction and surprising outcomes, and to provide the implications and importance of the research findings. This discussion was important to finally derive conclusions from the findings of the study. The conclusions were explicitly narrated in the last chapter of the dissertation. This was the last step of the research and the research was formally ended once the conclusions were derived and explained. However, research itself is an unending process and the researcher considers this study to be the base for future studies on this subject. Therefore, while providing the conclusion derived from the research, the researcher also made a number of suggestions to the future researcher as well as to the policy makers to make use of this research in improving the management of the eMED*Renal* system and other EPRs in Ireland.

3.6. Ethical and Legal Considerations

Ethical and Legal considerations are important for research, particularly for primary research, to reduce the chances of researcher bias and to produce an original and authentic research (Collis & Hussey, 2003). One of the important ethical considerations in survey research as well as other enquiries where feedback is expected to be given to a third party is that of seeking consent and confidentiality, among others. One of the advantages of assuring participant anonymity and the confidentiality is that it enables the respondents to be more open and thus, address issues as they are. To assure the confidentiality, names, posts and any other information that can help to identify the respondents have not been used in the study. With the help of an information letter,

the purpose of the study was explained to the respondents and they were assured that their participation was voluntary and as such can withdraw at any point in time. After explaining to them the purpose of the research and their role in the study, the researcher obtained signed consent forms from participants to ensure that they are fully agreed to be a part of the study and understood all of its details.

3.7. Limitations.

The methodology selected for the study limits its scope and it is important to explicitly mention these limitations to guide future researcher planning to implement the same methodology. First, the selection of positivism as the research philosophy and quantitative research as the research approach limits the scope of the study to a description of the objective realities. Therefore, the study can provide answers to what and how questions but is not suitable for why questions. Despite the importance of this limitation for future researcher interested in answering why questions, this limitation is of lesser concern for the present study as the study is descriptive in nature. Second, a survey method offers a number of disadvantages, along with the *aforementioned* advantages. These include limits to in-depth details of data, limited control over timeliness, low response rates, untrue responses, and subjective interpretation of data (Hair, Bush, & Ortinau; 2006). The data produced in this study is mainly based on the selection of categories by the respondent and did not provide the complete details of the present situation. The problem of no control over timeliness was also faced by the researcher as the researcher has to wait for days before receiving the filled questionnaire, which can be filled in not more than 15 minutes. However, the response rate was adequate enough and the researcher was able to survey 75% of the study population. Since the study is based on people's opinions about the eMED*Renal* system and no particular personal information was asked from the respondents there

was lesser chances of untrue responses. To deal with the issue of subjective interpretation, the researcher selected those statistical tests for data analysis that have been widely used in previous studies.

CHAPTER 4

RESULTS AND DISCUSSION

4.1. Introduction

In this chapter the results obtained from the statistical analysis of the survey data are presented and discussed. The chapter begins with a description of the reliability of the results of the statistical analysis followed by the narration of the socio-demographic details of study participants. Descriptive statistics has been analysed to examine the degree of acceptance of the eMEDRenal system among doctors and nurses of two hospitals in Ireland. Bivariate correlation analysis has been performed to test the hypotheses derived from the literature review. The results described in these sections are compared with the previous findings and their implications are considered in the last section on discussion.

4.2. Reliability Analysis

To examine the reliability of the scale, a Cronbach's Alpha test was performed. For Letterkenny participants, the Cronbach's Alpha coefficient value was found to be 0.802 and for Sligo participants, it was found to be 0.812. Therefore, the items in the scale have high internal consistency and the scale is reliable.

4.3. Socio-Demographics

Before embarking upon the statistical analysis it is important to describe the socio-demographic make-up of our sample. Such information can serve as contextual knowledge and can aid in understanding the findings obtained from the statistical analysis. Of the study population of 70

users of the eMEDRenal system, 53 completed and returned the questionnaire. Of these 53 study participants, 28 were from Letterkenny Hospital and 25 were from Sligo Hospitals. The socio-demographics of these 53 study participants, which include their age, gender, level of education and profession, are provided in the following sub-sections.

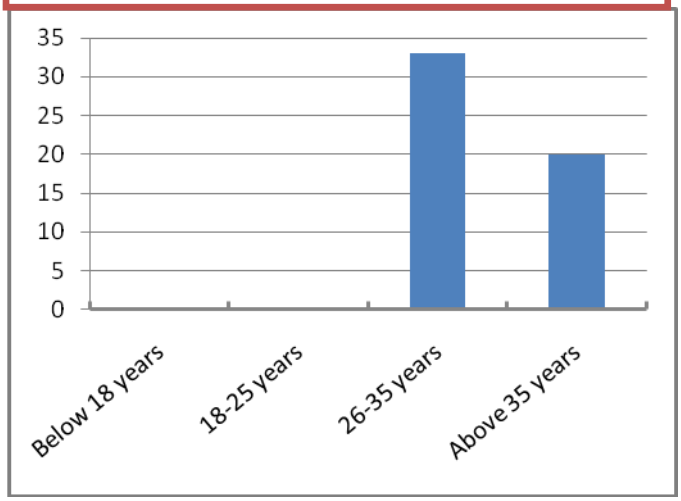
4.3.1. Age

In the questions of age, four categories were provided to the study participants – Below 18 years, 18-25 years, 26-35 years and above 35 years. All of the study participants belong to the last two categories, and none of them were below 26 years of age. It is quite expected as they were in the professional stages of their life and the profession they belong to requires considerable time for education and training. The age distribution of the sample is provided in the table 4.1 and figure 4.1 .

Table 4.1: Age distribution of study sample

Age	Number of participants
Below 18 years	0
18-25 years	0
26-35 years	33
Above 35 years	20

Figure 4.1: Age distribution of study sample



4.3.2. Gender:

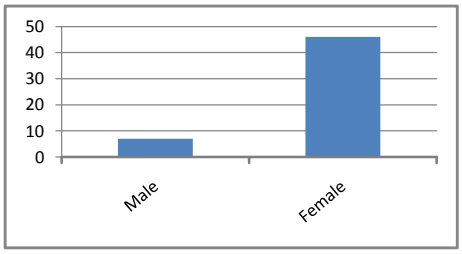
Of the 53 study participants, 46 were female and 7 were male (See Table 3.2). This distribution of the sample with respect to gender is shown in the figure 4.2. This higher percentage of female respondents in the sample is important to note as in Ireland, the percentage of women using

information technology is much lower than that of men using the same technology (Gallagher, Doherty, Moran & Kartalova-O'Doherty, 2008). However, being educated and professional women, it is equally possible that the female respondents in our sample have both education and experience of using information technology and might feel no problem in getting familiar with information systems like the eMEDRenal system (Gallagher, *et al.*, 2008).

Table 4.2: Gender distribution of study sample

Gender	Number of participants
Male	7
Female	46

Figure 4.2: Gender distribution of study Sample



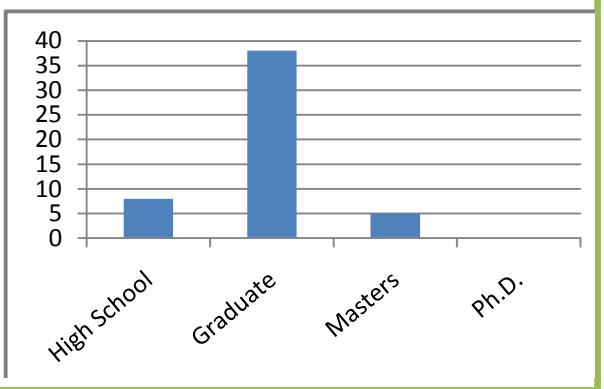
4.3.2. Level of Education

When respondents were asked about their education, two respondents did not answer this question. Of the remaining 51 respondents, most had graduated and only a small percentage had pursued a Master's degree, as shown in the table 4.3 and figure 4.3.

Table 4.3: Sample's level of education

Level of education	Number of participants
High School	8
Graduate	38
Masters	5
Ph.D.	0

Figure 4.3: Sample's level of education



As shown in the table and figures above, few respondents reported passing high school and none had pursued a doctoral degree. This low level of education with high age shows that our sample might have good experience and have been serving the field of medicine for many years. However, because the respondents were not asked about their experience in the field, nothing can be said with confirmation.

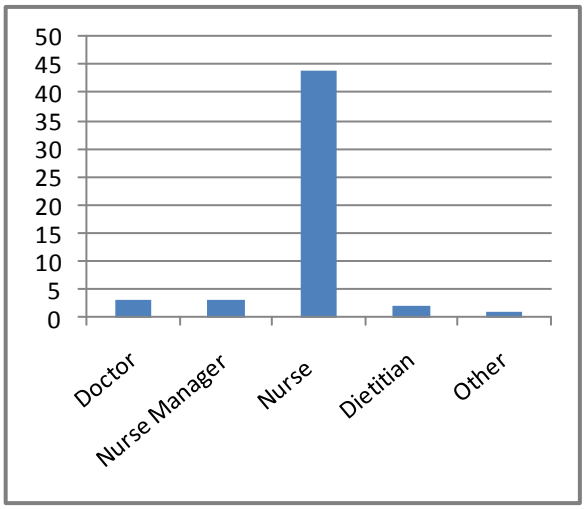
4.3.4. Profession

In terms of education, the researcher had planned to examine user acceptance among the doctors, nurses and administrative staff. Quite surprisingly, however, more than 75% of participants comprised of nurses with few doctors and administrative staff completing the survey (See table 4.4 and Figure 4.4). It shows that the main users of the eMED*Renal* system in the two selected hospitals are nurses and therefore, it is important to include the use of information systems in the education and training plan of nurses.

Table 4.4: Sample's Profession

Profession	Number of participants
Doctor	3
Nurse manager	3
Nurse	44
Dietician	2
Other healthcare professional	1 (Pharmacist)

Figure 4.4: Sample's Profession



4.4. Descriptive Statistics

Descriptive statistics of the scores of study participants on PU, PEOU, SN, PR, AT and BI is shown in the table 4.5. As can be seen, the descriptive statistics of the two hospitals is provided separately to compare the technology acceptance among the staff of the two hospitals.

As defined earlier, PU is the extent to which an individual realizes that the application of a particular technology/system would help increase their overall professional performance. Therefore, the mean score of study participants indicates the extent to which staffs considers the application of the eMED*Renal* system as useful for their professional performance. In both hospitals the mean PU is quite high with participants from Sligo hospital having a better PU (4.1) than participants in Letterkenny hospital (3.8). The standard deviation for participants from Letterkenny Hospital is 0.744 and 0.529 for participants from Sligo Hospital, thus showing that the scores of PU for participants of Letterkenny Hospital were more varied than the scores of PU for participants from Sligo Hospitals. This is evident from the table as the range of scores in the Letterkenny Hospital was between 2 and 4.83 while the range of scores in the Sligo Hospital was limited to the high scores i.e. 3.16 to 5.

Table 4.5: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Hospitals
PU	28	2	4.833333	3.8036	0.744049	Letterkenny
	25	3.166667	5	4.1000	0.529238	Sligo
PEOU	28	2.6	5	3.9250	0.536536	Letterkenny
	25	3	4.6	4.0400	0.454606	Sligo
SN	28	2.75	4.5	3.7321	0.490316	Letterkenny
	25	2	4.25	3.5100	0.522813	Sligo
PR	28	2.333333	3.666667	3.1071	0.363494	Letterkenny
	25	2.333333	3.666667	3.1467	0.441798	Sligo
AT	28	3.5	5	4.2797	0.469334	Letterkenny
	25	3.25	5	4.3500	0.525397	Sligo
BI	28	4	5	4.3929	0.497347	Letterkenny
	25	3.5	5	4.4200	0.513971	Sligo

In the case of PEOU, which determines the level to which an individual believes that employed technology/system would be maximally easy to use, the participants from Letterkenny Hospital (3.9) are slightly less agreed than the participants from Sligo Hospital (4.0). There is also little difference in the degree of variance for both samples. Taken together, it can be said that staff members of both hospitals considered the eMED*Renal* system to easy to use.

The participants of both hospitals have moderate scores in the SN (Letterkenny: 3.73; Sligo: 3.51), which measures of the individuals' perceptions about the importance of other beliefs about the eMED*Renal* system. A more in-depth inquiry of this variable showed that the majority of the participants, in both hospitals, disagreed with the statement that "senior management of hospital

has been helpful in using the eMED*Renal* system." This indicates that there is a lack of hospital's support for the use of the eMED*Renal* system and the hospital management should take the necessary measures to ensure that their role is more positive to the use of the eMED*Renal* system.

In the case of PR, the scores of participants are quite encouraging. Out of a maximum possible score of 3.67, the average score of participants from Letterkenny Hospital was 3.10 while participants from Sligo Hospital scored 3.14. This shows that the staff members from both hospitals were familiar with information technology and were technically ready to use the eMED*Renal* system. This confirms that female healthcare professionals in Ireland have both the knowledge and the experience of using computers and the internet, as most of the participants in this sample were female.

The overall attitude of staff members towards the eMED*Renal* system was very positive. The mean score of AT for participants from Letterkenny Hospital was 4.27 and participants from Sligo Hospital had a score of 4.35. The score ranged between 3 to 5 showing that all the participants agreed that the eMED*Renal* system is a good and wise idea and its use is liked and pleasant. However, the degree of variance for Letterkenny Hospital was slightly lower than the degree of variance for Sligo Hospital, showing more agreement among the participants from Letterkenny Hospitals with regard to their attitude towards the eMED*Renal* system.

Similarly, participants of both hospitals were interested in using the eMED*Renal* system, as indicated by their mean scores for BI. For Letterkenny Hospital the mean score was 4.39 and for Sligo Hospital the mean score was 4.42. The scores of the participants from Sligo Hospital were

more varied than the scores of participants from Letterkenny Hospital, again indicating a consensus among staff members from Letterkenny hospital.

Taken together, we can say that there is little difference in the degree of technology acceptance of the eMED*Renal* system between participants from Letterkenny Hospital and Sligo Hospital. The staff members of both hospitals have good acceptability of the eMED*Renal* system. No particular problem was identified with regard to technology acceptance of the eMED*Renal* system among its users in both hospitals, except the issue relating to the lack of support from senior management. This is an important finding and will be discussed in the last section of this chapter.

4.5. T-test:

While reviewing the literature on the subject, the researcher found that studies have shown significant difference in the views of doctors and nurses with regard to EHRS. Therefore, the researcher decided to empirically investigate whether the difference is statistically significant or not. For this purpose independent sample T-test was performed on the scores of doctors and nurses in the sample. The null hypothesis for the T-test was $\mu 1 \neq \mu 2$ meaning that the average score of selected variables for doctors was not equal to the average scores of same variables for nurses. The level of significance for this test was set at 0.05. The table 4.6 compares the scores of the doctors and nurses as measured with the help of the questionnaire.

Table 4.6: Comparison of Doctors' and Nurses' Scores

		N	Mean	Std. Deviation	Std. Error Mean
PU	Doctors	4.3889	0.38490	0.22222	
	Nurses	3.8485	0.67036	0.10106	
PEOU	Doctors	3.7333	0.57735	0.33333	
	Nurses	3.9795	0.52099	0.07854	
SN	Doctors	3.8333	0.28868	0.16667	
	Nurses	3.5909	0.53671	0.08091	
PR	Doctors	3.6667	0.00000	0.00000	
	Nurses	3.0379	0.36808	0.05549	
AT	Doctors	4.5000	0.00000	0.00000	
	Nurses	4.2633	0.46760	0.07049	
BI	Doctors	4.3333	0.57735	0.33333	
	Nurses	4.3864	0.48060	0.07245	

The above table shows that doctors have a higher average scores in PU as compared to the scores of nurses. This indicates that doctors consider the eMED*Renal* system to be more useful for their professional careers as compared to nurses. However, since the average score of nurses is 3.85, it cannot be said that nurses have negative perception about the usefulness of the eMED*Renal* system. Instead, the perception of doctors was relatively more positive than nurses. Furthermore, the degree of variance was so high among nurses that there is a fair chance that a number of nurses also scored very high in PU.

By contrast, the score of PEOU for nurses was relatively higher than that for doctors indicating that nurses consider the use of the eMED*Renal* system relatively easier than doctors. This is not

understandable as nurses have a lower average score in PR, which shows that their familiarity of and experience with the information systems was not better than the doctors. An interesting finding is that there is no variance in the score of PR for doctors indicating a similar level of readiness for using the eMED*Renal* system i.e. 3.67.

In the case of SN, doctors scored better than nurses suggesting that the doctors have better support from the people around them to use eMED*Renal.* Nurses, in contrast, suffer from a lack of support from senior management and the people around them. In the case of doctors, as well, the score is not very encouraging and actions should be taken in order to improve the SN of both doctors and nurses in the two selected hospitals. Doctors were also found to have better attitude towards the eMED*Renal* system with a mean score of 4.5 and no variance at all. Nurses had a slightly lower score in AT with a Std. Deviation of 0.46.

The final measure of technology acceptance among the users of the eMED*Renal* system in the two selected hospitals was BI. There was little difference between the score of doctors and nurses and both scored higher than 4 showing a highly positive intention to use the eMED*Renal* system. However, the scores of doctors were more varied than the scores of nurses showing little difference in the nurses about their intention to use the eMED*Renal* system.

However to statistically prove the significance of the difference in the scores of nurses and doctors, it was important to take into account the impact of the difference in the degree of variance of the two scores. Levene's test was performed to check whether two groups have approximately equal variance on the selected dependent variables or not. The outcome of the Levene's test is shown in the table 4.7.

Table 4.7: Levene's Test for Equality of Variance

	F	Sig.
PU	0.468	0.498
PEOU	0.186	0.668
SN	1.157	0.288
PR	6.647	**0.013**
AT	11.993	**0.001**
BI	0.022	0.881

As can be seen, the variances are approximately equal for 4 variables i.e. PU, PEOU, SN and BI because the p-value is greater than 0.05. However, the variances are not equal for PR and AT, because its significance value is less than 0.05. Therefore, for PR and AT the assumption of equal variance is not valid.

T was calculated to check whether the difference between the scores of nurses and doctors, as was shown in the table 4.5 was significant or not (The outcome of the T-test is shown in appendix D). For PU, doctors had better scores than nurses but the difference was found to be not significant ($p = 0.177 > 0.05$). Similarly for PEOU, nurses had better scores than doctors but this difference was also not significant ($p = 0.435 > 0.05$). The difference between the scores of SN for doctors and nurses was also found to be not significant as the probability of error was greater than level of significance ($p = 0.446 > 0.05$). However, the probability of error for PR was lesser than the level of significant ($p = 0.000 < 0.05$) and it can be said that doctors have a significantly better PR for using the eMED*Renal* system. The higher scores of doctors in AT was also found to be significant as $p = 0.002 < 0.05$. There was not any particular difference in the

scores of doctors and nurses with regard to their BI and the difference was also found to be not significant ($p = 0.856 > 0.05$). Thus, there is little difference in the technology acceptance of the eMED*Renal* system among doctors and nurses except for PR and AT for which the equal variance was not assumed. Therefore, it is possible that if the two groups had equal variance for PR and AT, their difference would not be significant as well.

4.6. Bivariate Correlation Analysis

To test the hypotheses, bivariate correlation analysis was conducted by computing Pearson correlation coefficient. For the sample from Letterkenny hospital, the PR was found to have a significant positive correlation with BI, but the correlation is relatively weak (See table 4.8). The correlation of BI with PU and SN was not significant (See table 4.8).

Table 4.8: Correlation Analysis for Hypothesis 1 – Letterkenny Sample

		BI	PU	SN	PR
BI	Pearson Correlation	1	-0.067	-0.160	0.441*
	Sig. (2-tailed)		0.734	0.416	0.019
	N	28	28	28	28
PU	Pearson Correlation	-0.067	1	-0.133	0.249
	Sig. (2-tailed)	0.734		0.501	0.129
	N	28	28	28	28
SN	Pearson Correlation	-0.160	-0.133	1	-0.075
	Sig. (2-tailed)	0.416	0.507		0.703
	N	28	28	28	28
PR	Pearson Correlation	0.441*	0.294	-0.075	1
	Sig. (2-tailed)	0.019	0.129	0.703	
	N	28	28	28	28

* Correlation is significant at the 0.05 level (2-tailed)

However, for data collected from Sligo participants, the PU has a significant strong positive correlation with BI, but BI is not correlated with SN and PR (See table 4.9). Thus, at the bivariate level, hypothesis one is partially supported.

Table 4.9: Correlation Analysis for Hypothesis 1 – Sligo Sample

		BI	PU	SN	PR
BI	Pearson Correlation	1	0.682**	0.294	0.146
	Sig. (2-tailed)		0.000	0.154	0.487
	N	25	25	25	25
PU	Pearson Correlation	0.682**	1	0.348	0.469*
	Sig. (2-tailed)	0.000		0.089	0.018
	N	25	25	25	25
SN	Pearson Correlation	0.294	0.348	1	0.324
	Sig. (2-tailed)	0.154	0.089		0.114
	N	25	25	25	25
PR	Pearson Correlation	0.146	0.469*	0.324	1
	Sig. (2-tailed)	0.487	0.018		0
	N	25	25	25	25

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

For both samples, the r value of PEOU indicates a positive correlation with PU with a p value less than the level of significance. In the case of Sligo participants, this correlation is weak but in the case of Letterkenny, the correlation is moderate (See table 4.10 and 4.11). The correlation between SN and PU was not significant. Thus, Hypothesis 2 is also partially supported by the bivariate correlation analysis.

Table 4.10. Correlation Analysis for Hypothesis 2 – Letterkenny Sample

		PU	PEOU	SN
PU	Pearson Correlation	1	0.661**	-0.133
	Sig. (2-tailed)		0.000	0.501
	N	28	28	28
PEOU	Pearson Correlation	0.661**	1	-0.297
	Sig. (2-tailed)	0.000		0.124
	N	28	28	28
SN	Pearson Correlation	-0.133	-0.297	1
	Sig. (2-tailed)	0.501	0.124	
	N	28	28	28

** Correlation is significant at the 0.01 level (2-tailed)

Table 4.11. Correlation Analysis for Hypothesis 2 – Sligo Sample

		PU	PEOU	SN
PU	Pearson Correlation	1	0.421*	0.348
	Sig. (2-tailed)		0.036	0.089
	N	25	25	25
PEOU	Pearson Correlation	0.421*	1	0.007
	Sig. (2-tailed)	0.036		0.973
	N	25	25	25
SN	Pearson Correlation	0.348	0.007	1
	Sig. (2-tailed)	0.089	0.973	
	N	25	25	25

* Correlation is significant at the 0.05 level (2-tailed)

Hypothesis 3 was completely supported by the correlation analysis on the data obtained from Sligo hospital (See table 4.12). The r values of PU (0.768) and PEOU (0.515) shows a moderate positive correlation with AT. The correlation is significant as both p values are less than the level of significance. AT, in turn, has a significant moderate positive correlation with BI. However, the hypothesis was not supported by the correlation analysis on the data obtained from Letterkenny Hospital (See table 4.13). No significant correlation was found between AT and PU and AT and PEOU. However, the correlation between AT and BI was found to be positive and significant.

Table 4.12. Correlation Analysis for Hypothesis 3-Letterkenny Sample

		BI	AT	PU	PEOU
BI	Pearson Correlation	1	0.622**		
	Sig. (2-tailed)		0.000		
	N	28	28		
AT	Pearson Correlation	0.622**	1	-0.043	0.182
	Sig. (2-tailed)	0.000		.828	0.354
	N	28	28	28	28
PU	Pearson Correlation		-0.043	1	0.661**
	Sig. (2-tailed)		0.828		0.000
	N		28	28	28
PEOU	Pearson Correlation		0.182	0.661**	1
	Sig. (2-tailed)		0.354	0.000	
	N		28	28	28

** Correlation is significant at 0.01 level (2-tailed)

Table 4.13. Correlation Analysis for Hypothesis 3-Sligo Sample

		BI	AT	PU	PEOU
BI	Pearson Correlation	1	0.764**		
	Sig. (2-tailed)		0.000		
	N	25	25		
AT	Pearson Correlation	0.764**	1	0.768**	0.515**
	Sig. (2-tailed)	0.000		0.000	0.008
	N	25	25	25	25
PU	Pearson Correlation		0.768**	1	0.421*
	Sig. (2-tailed)		0.000		0.036
	N		25	25	25
PEOU	Pearson Correlation		0.515**	0.421*	1
	Sig. (2-tailed)		0.008	0.036	
	N		25	25	25

** Correlation is significant at 0.01 level (2-tailed)
* Correlation is significant at 0.05 level (2-tailed)

Figure 4.5 shows the results of the bivariate correlation analysis for the Letterkenny participants. As can be seen, not many hypotheses have been supported in this sample. By contrast, the participants from Sligo Hospital supported several hypotheses of the selected conceptual model, as shown in figure 4.6. However, even for this sample the correlation between SN and PU, SN and BI and PR and BI was not found to be significant. This contrasts with the findings of previous studies that showed these correlations to be significantly positive.

Figure 4.5: Results of Bivariate Correlation Analysis – Letterkenny Sample

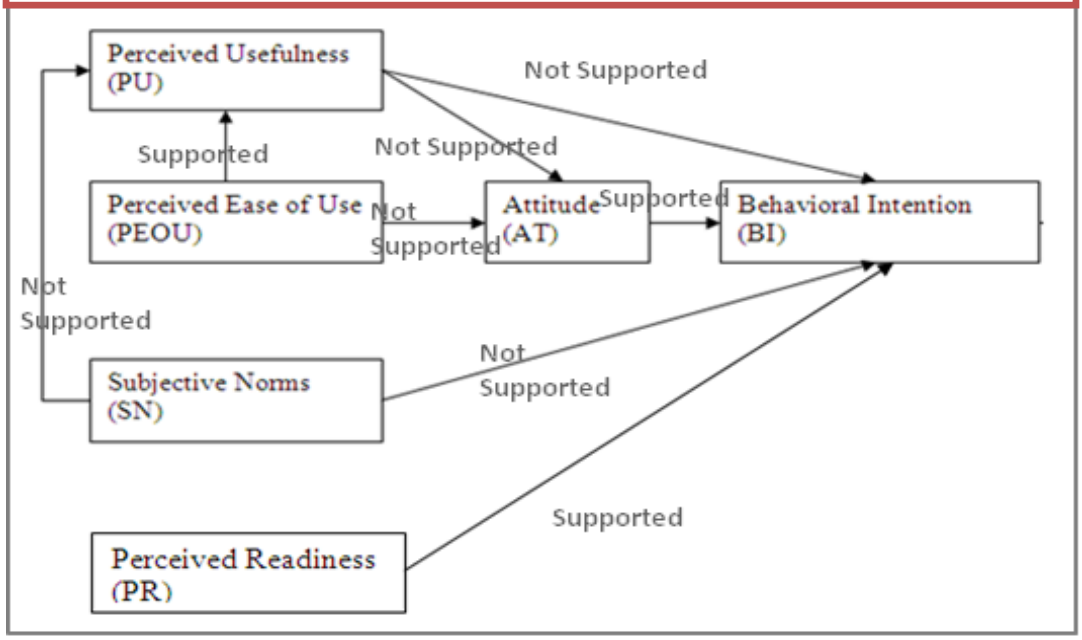
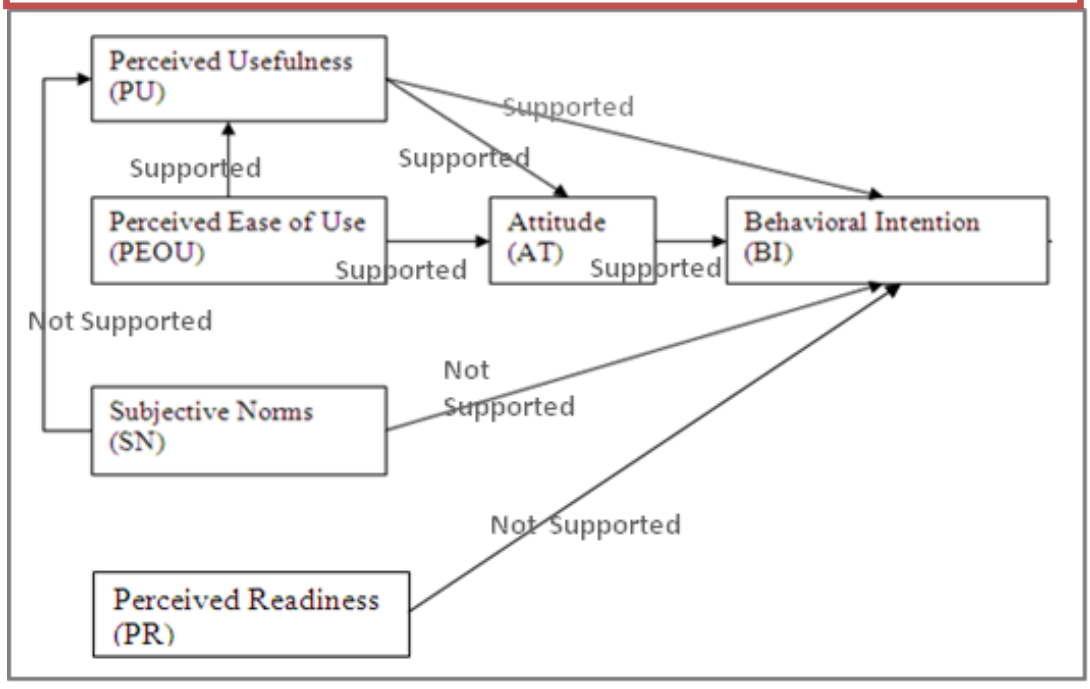


Figure 4.6: Results of Bivariate Correlation Analysis – Sligo Sample



When the data obtained from the two hospitals was combined, almost all hypotheses were proved showing that the initial failure in proving the hypothesis might be due to the small sample

size. The outcome of the bivariate correlation analysis for hypothesis 1 is shown in the table 4.14.

Table 4.14: Correlation Analysis for Hypotheses 1

		BI	PU	SN	PR
BI	Pearson Correlation	1	0.225	0.057	0.285*
	Sig. (2-tailed)		0.105	0.685	0.038
	N	53	53	53	53
PU	Pearson Correlation	0.225	1	0.007	0.359**
	Sig. (2-tailed)	0.105		0.958	0.008
	N	53	53	53	53
SN	Pearson Correlation	0.057	0.007	1	0.124
	Sig. (2-tailed)	0.685	0.958		0.377
	N	53	53	53	53
PR	Pearson Correlation	0.285*	0.359**	0.124	1
	Sig. (2-tailed)	0.038	0.008	0.377	
	N	53	53	53	53

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

As evident, all three variables have a positive correlation with BI. However, the PR is significantly correlated with BI and the correlation of PU and SN with BI is not significant. In case of hypothesis 2, again PEOU was found to significantly predict PU. Their relationship was strongly positive, as shown in the table 4.15. Similar to the above findings, SN did not have significant correlation with PU.

Table 4.15. Correlation Analysis for Hypothesis 2

		PU	PEOU	SN
PU	Pearson Correlation	1	0.583**	0.007
	Sig. (2-tailed)		0.000	0.958
	N	53	53	53
PEOU	Pearson Correlation	0.583**	1	-0.181
	Sig. (2-tailed)	0.000		0.194
	N	53	53	53
SN	Pearson Correlation	0.007	-0.181	1
	Sig. (2-tailed)	0.958	0.194	
	N	53	53	53

** Correlation is significant at the 0.01 level (2-tailed).

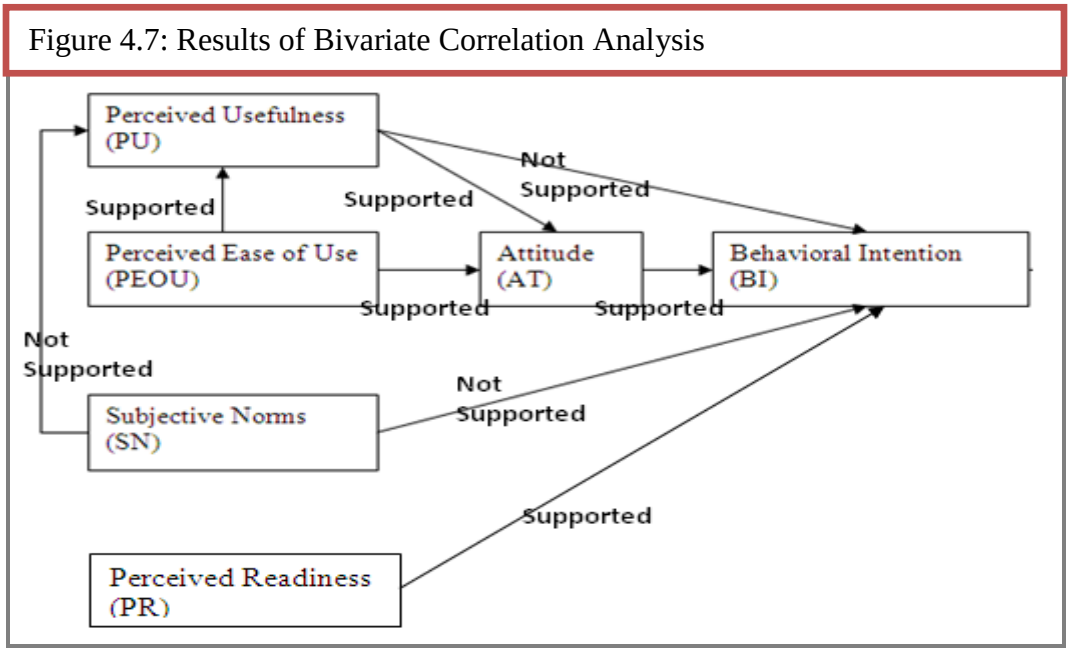
Hypothesis 3 was completely supported by the correlation analysis on the data obtained from Sligo hospital. As shown in table 4.16, The r values of PU (0.394) and PEOU (0.336) shows a moderate positive correlation with AT. The correlation is significant as both p values are less than the level of significance. AT, in turn, has a significant strong positive correlation with BI (0.693; p = 0.000). Thus, for the combined data, Hypotheses 1 and 2 are partially proved and Hypothesis 3 is completely proved. Figure 4.7 shows the results of the bivariate correlation analysis for the study participants of both Letterkenny Hospital and Sligo Hospital.

Table 4.16. Correlation Analysis for Hypothesis 3

		BI	AT	PU	PEOU
BI	Pearson Correlation	1	0.693**		
	Sig. (2-tailed)		0.000		
	N	53	53		
AT	Pearson Correlation	0.693**	1	0.294*	0.336*
	Sig. (2-tailed)	0.000		0.033	0.014
	N	53	53	53	53
PU	Pearson Correlation		0.294*	1	0.583**
	Sig. (2-tailed)		0.033		0.000
	N		53	53	53
PEOU	Pearson Correlation		0.336*	0.583**	1
	Sig. (2-tailed)		0.014	0.000	
	N		53	53	53

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Figure 4.7: Results of Bivariate Correlation Analysis



4.7. Discussion on Study Findings:

The study was aimed at investigating the technology acceptance of the eMED*Renal* system among the healthcare professionals in two Irish hospitals, where the eMED*Renal* system has recently been installed. The researcher wanted to empirically determine the degree of technology acceptance among the target population and to take into consideration all the factors that can contribute to this acceptance. Therefore, the researcher reviewed a number of technology acceptance model and after thorough examination of their strengths and weaknesses developed a model based on TAM – a popular model for benchmarking acceptance of information systems. A few changes were made to the original version of TAM in order to make it suitable for benchmarking the acceptance level of physicians, nurses and other healthcare professionals. However, the findings reported in this study show that the designed model, despite its good reliability and inter-item consistency, did not produce precise measurement of the acceptance of the eMED*Renal* system among its users. With different populations in hand, the model produced different results. For Letterkenny hospitals, the BI of the users of the eMED*Renal* system for using it was significantly predicted by their PR and AT. By contrast, PU and AT predicted the BI of the users for using the eMED*Renal* system in the sample of Sligo Hospital. When the samples of the two hospitals were combined PR and AT were again found to be the significant predictors of BI.

However, one common finding was the non significant relationship between SN and BI. This disproves the claim of Taylor and Todd (1995) who suggested that the TAM is a weak model because of the absence of SN as this study's findings indicate that SN did not produce any significant impact on BI. This finding also contradicts the Theory of Planned Behaviour in which SN has been modelled as a predictor of BI (Holden & Karsh, 2009). SN is also found to be a non

significant factor in predicting the PU, as was proposed by Venkatesh and Davis (2000). Thus on the whole, SN being the measurement of users' perception of the importance of other people's beliefs about the system in use, was found by the study to be a non significant factor in predicting the technology acceptance of the eMED*Renal* system amongst its users at the two research sites. Thus, for staff members of Letterkenny hospital and Sligo hospital, the external support from hospital administration and other important persons around them was not critically important and it was found to produce no particular impact on their perception about the usefulness of the system and their intention to use it. Another important point to note with regard to SN was its moderate score by the participants of both hospitals. As provided above, staff members of both hospitals reported that senior management of the hospital were not helpful in using the eMED*Renal* system. While comparing the scores of doctors with nurses, the researcher further found that the managerial support for using the eMED*Renal* system was perceived as good by doctors but not by nurses and it were actually nurses who mainly complained about the lack of support from senior management. At a result, the researcher strongly recommends that hospitals' management provide the necessary support to those nurses using the eMED*Renal* system. However, this present finding of a non significant value of SN shows that the users of the eMED*Renal* system have full intention to use the system even without the support of hospital management.

Holden and Karsh (2009) have also raised some concern about the predictive power of SN, having reviewed 8 studies, the authors that four failed to find a significant correlation of SN with BI. The two explanations given for the non-significant effect of SN was the independence of doctors from peer-influence and the mandatory use of the system (Holden and Karsh, 2009). In our case, the first explanation is not applicable as there were only a few doctors in the sample

and the majority of the sample were composed of nurses for whom SN matters a lot. Furthermore, the difference between the score of SN for doctors and nurses was not significant. However, the eMED*Renal* system is mandatory in both hospitals and this can explain the reasons behind the absence of the effect of SN on BI.

Another common result produced by the analysis of the responses in all three cases was the significant correlation between PU and PEOU. This finding is in concordance with the findings of Mathieson, Peacock, and Chin (2001) and Gong, Xu, and Yu (2004) who argued that PEOU can impact on PU of a system. That is, if the participants feel a system to be easy to use they will perceive it as useful for their professional career. This highlights the importance of training the users of an information system before making them use the system. NDS (2008) have found some issues with the use of the eMED*Renal* system and it was reported that the issues are related to the lack of training. However, in the present study, staff members of both hospitals were found to perceive the eMED*Renal* system as easy to use. This indicates that staff members of both hospitals received some training by hospital management. To confirm this finding, the researcher contacted the management of the two hospitals and it was found that in both hospitals training was provided to staff members.

Another possible reason behind the high score of hospital staff in PEOU is the high score of staff members in PR. PR measures of the extent to which users are already familiar with information systems and computer technology and are thus technically ready to use the eMED*Renal* system. The researcher found that in both hospitals, the staff members are quite familiar with the information systems and have high scores in PR. Although in the technology acceptance model of the study, no relationship was predicted between PR and PEOU. The findings clearly shows that the variables are closely linked. Familiarity of hospital staff with computer system and

information technology can help them a lot in using the eMED*Renal* system and perceiving it as an easy-to-use system. Furthermore, this finding can also be used to confirm the claim of Mediqal HI (2009a) that the eMED*Renal* system is a user-friendly system that is developed in a way that allows it to be managed and used by people from all sectors of life through its user accessibility and ease of use features. The domain and module approach of the eMED*Renal* system is particularly important in making it an easy-to-use application for doctors and nurses.

However, in the case of the prediction of AT by PU and PEOU, there were contradictions in the results of the analysis of data from both hospitals. In the sample from Letterkenny hospital neither PU nor PEOU significantly predict AT but in the sample from Sligo hospital both were found to have significant positive correlation with AT. When combined together, the two factors again predict AT significantly and positively. In previous studies, PU and PEOU have significantly predicted AT (Wu *et al.*, 2008; Horan *et al.*, 2004; Holden and Karsh, 2009). It is quite difficult to explain this contradiction in the findings and there is a need for contextual understanding in explaining why PU and PEOU failed to predict AT in the sample from Letterkenny hospital. Since the present study is quantitative in nature, it is not possible to have a comprehensive contextual understanding. Hence, it is suggested that caution must be applied while interpreting the relationship of AT with PU and PEOU.

Similarly PR has been shown as a significant predictor of BI for the sample from Letterkenny hospital but not for the sample from Sligo hospital. Therefore, its status as a predictor of BI is also not fully supported by our study. This again contradicts findings of previous studies, which have shown PR to be an important predictor of BI (Horan *et al.*, 2004).

The findings of the study successfully proved the significant correlation between AT and BI. The correlation between AT and BI was shown in all three analysis as strongly positive ranging from 0.6 to 0.7. Holden and Karsh (2009) noted found that of the 6 studies reviewed by them to investigate the relationship between AT and BI, 5 reported the predicted relationship to be significant. Therefore, this finding of the study corroborates similar findings reported in the other studies in this field.

Previous studies reported that doctors and nurses differ a lot in their behaviour toward EPRS. However, in our study, the two samples differed only in their score of PR and AT. In the case of PR, doctors scored higher than nurses and it is quite understandable as doctors have better education facilities and opportunities than nurses have. In previous studies as well, doctors have little complaints about the lack of understanding of the computer system, however their main concern in the use of EPRS has always related to confidentiality and professional privacy (Delpierre *et al.*, 2004; Ginneken, 2002; Jensen, & Aanestad, 2007). Since the eMED*Renal* system has been reported to be compliant with the standards of EHR which includes confidentiality and privacy of information, it is understandable that the attitude of doctors toward the eMED*Renal* system was more positive than the attitude of nurses. This finding was not reported in any previous studies and, therefore, is an important discovery of the present research. Further testing of this finding is nevertheless recommended.

In previous studies examining doctors' attitudes toward EPRS, doctors were reported to be pleased with the system due to the improvement in their knowledge of patient's medical history and their better performance in the medical examination (Delpierre *et al.*, 2004; Halford, Obsterfelder, & Lotheringtong, 2010). The present study empirically proved doctors' good perception about the usefulness of EPRS for their profession, as evident from their high score in

PU (4.39 out of 5). However, in PEOU, doctors scored lower than nurses despite their higher score on PR. This shows that apart from the familiarity of the user with computer system, there are other factors that can influence a user's PEOU of a system. In the case of the eMED*Renal* system, the system was designed with particular attention to the knowledge of nurses and doctors separately. However, since the difference in the PEOU between doctors and nurses was not significant, it can be said that the difference was merely by chance.

Nurses, like doctors have also has very good scores in PU (3.85 out of 5) showing that they also consider the eMED*Renal* system to be important for their professional career. This is in accordance to what has been stated by Jensen and Aanestad (2007) who suggested that nurses consider EPRS as a tool to enhance their role in medical practice. Though the score of Nurses in AT was significantly lower than that of doctors, their score was quite good (4.26 out of 5), which shows that the attitude of Nurses toward EPRS was also good.

BI – which was the main measure of acceptance of the eMED*Renal* system amongst its users the findings indicate that– both doctors and nurses have almost equal positive intention of using the eMED*Renal* system. Staff members of both hospitals have similar scores in BI. Therefore, taken together, it can be said that BI to use the eMED*Renal* system was high among both nurses and doctors of both selected hospitals. According to TRA, BI is the main determinant of the actual use of a system so the high score of BI implies that staff members of both hospitals are actually using the eMED*Renal* system. As stated in the literature review, there is a critical need for an EPRS in Ireland, which records and shares of renal patients data. The eMED*Renal* system has recently been introduced into the two selected hospitals and the findings of the present study clearly indicate that the staff members of both hospital are pleased with it due to its user-friendliness and compliance with EHR and Renal Registry Standards.

CHAPTER 5

CONCLUSIONS AND RECOMMENATIONS

5.1. Introduction

The present study was conducted to examine the acceptance of the eMEDRenal system among users in two hospitals in Ireland. For this purpose the researcher conducted both secondary and primary research and the findings obtained from the research were presented and discussed in detail in the preceding chapters. In this chapter, conclusions are drawn after the thorough analysis and discussion of the study's findings. The conclusions arising from the study's findings are answers to the research questions raised at the beginning of the study. The chapter also contains recommendations for future research and practice based on the experience of the researcher. At the end of the chapter, the limitations of the study are provided in detail.

5.2. Conclusions

The study aimed to answer three research questions about the acceptance of the eMED*Renal* system among its users. With the help of a review of previous studies on the subject and an analysis of the survey responses of the users of the eMED*Renal* system in two hospitals of Ireland, the researcher has been successful in providing answers to these research questions. These answers serve as the conclusions of the study and are provided as follows.

5.2.1. Acceptance of the eMEDRenal system among Hospital Staff

The acceptance of the eMEDRenal system was benchmarked using a number of factors that can affect user acceptance of technology. The study noted that staff members from both hospitals considered the eMEDRenal system to be useful for their professional career and claimed that it

was easy to use. Staff members also regarded themselves as ready to use an EPRS and had a positive attitude towards the eMEDRenal system. Furthermore, staff members showed a positive intention with regard to the use of the eMEDRenal system. Based on these findings, the study concludes that users of the eMEDRenal system in Irish hospitals have a good acceptance of this EPRS. However, since proper training was provided to staff members in both hospitals, any future plans of introducing the eMEDRenal system in other Irish haemodialysis units should provide the necessary training as the study concluded that training of the staff members is important for increasing acceptability of EPRS among its users.

5.2.2. Acceptance of the eMEDRenal system among Doctors and Nurses

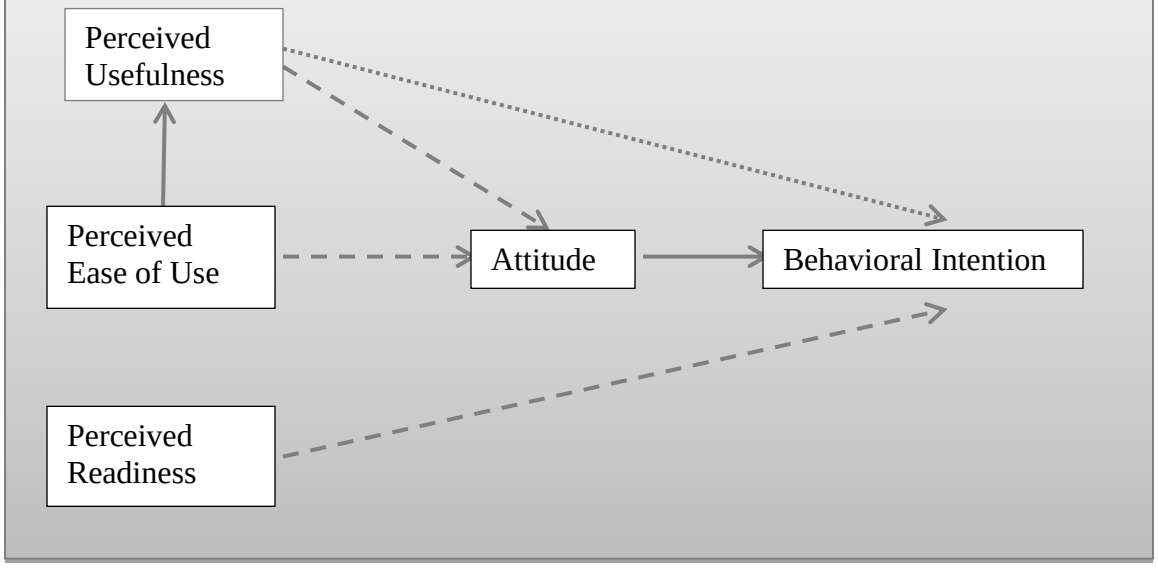
In the previous studies on the use and acceptability of EPRS, scholars treated doctors and nurses as different from each other. In the present study, the researcher in compliance with the previous studies gives consideration to these differences and analysed the responses of doctors and nurses separately to examine their differences. The study found that there was little difference in the acceptance of the eMED*Renal* system among doctors and nurses. As compared to nurses, doctors considered themselves as more technically sound for using the eMED*Renal* system because of their knowledge and experience of using information systems and computers. Similarly, the attitude of doctors toward the eMED*Renal* system was more positive than the attitude of nurses. Apart from these two factors, both doctors and nurses showed almost similar and positive acceptance toward the eMED*Renal* system.

5.2.3. Revised Technology Acceptance Model

One important purpose of the study was to develop a conceptual model for benchmarking the acceptance of the eMED*Renal* system among hospital staff members. After reviewing the literature, the researcher developed a model based on TAM a popular technology acceptance

model, which took into consideration factors important for understanding technology acceptance in the population under study (See Figure 5.1). However, the developed model failed to predict user acceptance of the eMED*Renal* system. Therefore, it is important to revise the model in accordance to the findings of the present study. The model was tested on three populations – respondents from Letterkenny hospital, respondents from Sligo hospital and a combined population of both hospitals. In the revised model, shown below, dashed lines indicates the relationship that were proved significant by any two of the populations while dotted line indicates the relationship that were shown significant by only one population. The normal lines show that the relationship between these two variables is significant as confirmed by all three populations.

Figure 5.1: Revised Technology Acceptance Model for eMED*Renal*.



From the above model, it can be concluded that if the users consider the eMED*Renal* system to be easy in usage, they will also consider it useful for their profession and there is a strong

probability that their attitude toward the eMED*Renal* system will be positive. Similarly, perceived usefulness of the eMED*Renal* system among its users can influence their attitude toward the system and there are weak chances that it can directly influence their behavioural intention as well. In addition, the indirect relationship between perceived useful and behavioural intention through attitude was confirmed by the study. The study also concludes that perceived readiness of the users to use the eMED*Renal* system can impact upon their intention to use it. However, subjective norm was not a significant factor and all three populations rejected the hypothesis that it can influence perceived usefulness or behaviour intention to use the eMED*Renal* system. Therefore, subjective norm has been removed from our model. Further research on the appropriateness of this model involving a similar population is needed.

5.3. Recommendations

The findings of research have both practical and theoretical importance as they can serve as the basis for future research on the subject and can also aid in improving the practices related to the research problem. The present study is based on the eMED*Renal* system an EPRS to record and share renal patients' data in the hospitals of Ireland. Being a newly introduced EPRS, the present study not only provides assistance to future studies on the eMED*Renal* system and similar EPRS for renal patient records in Irish hospitals but also makes a number of suggestions for hospital management and users of the eMED*Renal* system in order to ensure better implementation and management. These recommendations are provided in the following sub-sections.

5.3.1. Recommendations for Future Research

Research being a cyclic process of learning, in an attempt to answer some questions also raises some new questions, which can be answered in future studies. The present study is also successful in answering the three research questions but has highlighted many questions in need

of further research. First, the relationship of attitude with perceived usefulness and perceived ease of use requires further research. A cross sectional study on different populations using the eMED*Renal* system which test these relationship is recommended. Similarly, it is also important to investigate whether perceived readiness can serve as a significant predictor of behavioural intention. Most questionable among these is the effect of perceived usefulness on behavioural intention on which future investigation is important. Another important question to be answered by future research is whether renal patients in Ireland are also satisfied with the eMED*Renal* system and are ready to submit their data into the system. The use of the eMED*Renal* system was obligatory in the two hospitals, which took part in the present study. Therefore, the third question to be answered in future studies is whether the acceptance remains similar if the use becomes voluntary.

Besides these topic recommendations, the present study also aids the future researcher in deciding the methodology that could underpin further studies in this area. The survey questionnaire used in the present study is a reliable questionnaire and can be used by future researchers. Quantitative methodology, despite its limitations, is suitable for similar studies on the acceptance of EPRS among its users. However, if any researcher wants to conduct a detailed inquiry of the subject and, instead of describing the acceptance of users, wants to explain the reason behind their acceptance and non-acceptance, qualitative research using interviews or observational methods could be a better choice.

5.3.2. Recommendations for Practice

The findings produced by the present study have a number of important practical implications. Because the study has found the eMED*Renal* system to be an acceptable EPRS for recording and sharing renal patients' data in the two hospitals of Ireland, it is suggested that the eMED*Renal*

system ought to be introduced into other haemodialysis units as well. However, to improve perceived readiness and ease of use among the users, it is important to provide training on the use of the eMED*Renal* system to staff members prior to its introduction into haemodialysis units across Ireland. The study also suggests that if the use of the eMED*Renal* system is necessary for the hospital staff, the role of management can be neglected but for the voluntary use of the eMED*Renal* system and to encourage the use of this EPRS by staff members of other units, it is important for the management to make its role more supportive and encouraging.

5.4. Limitations

Two important caveats need to be noted regarding the present study. First, the study, which is descriptive research only describes the acceptance of the eMED*Renal* system among the hospital staff of two selected hospitals. The study does not include a detailed investigation of the reasons behind the responses of the study participants. However, a little attempt has been made to explain these findings with the help of contextual information gathered by the researcher from the scholarly data. Secondly, the population selected for the present study was hospitals staff of two selected hemodialysis units in Ireland; therefore, the research outcome may differ if applied to other hospitals of Ireland. However, at the time of this research only two hospitals in Ireland had introduced the eMED*Renal* system and it was therefore not possible to examine the acceptance of the eMED*Renal* system in other hospitals. Furthermore, as the sample size is 75% of the population size the study findings are highly generalizable for the study population and there is a high probability that the findings will be replicable in staff members of other hospitals because of the similarity in their professional requirements.

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APPENDICES

Appendix A: Survey Questionnaire

Questionnaire

I am Ali Al-iady, a student of Health Informatics in Trinity College Dublin. I am conducting a study on the acceptance of eMED*Renal* – a new electronic patient record system introduced in Ireland for the management of renal patients. For this study I am surveying the people using eMED*Renal* to measure the degree to which they are satisfied with the new technology and are ready to use it. I am thankful to you for being part of my study as survey respondent. However, before filling this questionnaire, I request you to sign the attached consent form after reading it thoroughly.

The purpose of this questionnaire is to measure the level of your acceptance of the model. The information you provide will be confidential and will only be used for the research purpose. The questionnaire contains 24 items which you will have to rate with the help of the scales given below each statement/question. Before start rating this questionnaire, kindly provide your personal information.

A. Socio-Demographic Information:

1. Age:
    - Below 18
    - 18 – 25 years
    - 26 – 35 years
    - Above 35 years

2. Gender:
    - Male
    - Female
3. Level of Education:
    - High School
    - Graduate
    - Masters
    - Ph.D.
4. Profession:
    - Doctor
    - Nurse
    - Healthcare professional (other than doctor and nurse)
    - Patient

B. Perceived Usefulness

1. Using eMED*Renal* in my job would enable me to accomplish tasks more quickly.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

2. Using eMED*Renal* would improve my job performance

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

3. Using eMED*Renal* in my job would increase my productivity

1	2	3	4	5

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. Using eMED*Renal* would enhance my effectiveness on the job

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

5. Using eMED*Renal* would make it easier to do my job

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

6. I would find eMED*Renal* useful in my job

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

C. Perceived Ease-of-Use

1. Learning to operate eMED*Renal* would be easy for me.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

2. I would find it easy to get eMED*Renal* to do what I want it to do.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

3. My interaction with eMED*Renal* would be clear and understandable.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

4. It would be easy for me to become skillful at using eMED*Renal*.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

5. I would find eMED*Renal* easy to use.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

D. Subjective Norm

1. People who influence my behaviour think I should use eMED*Renal*

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

2. People who are important to me think I should use eMED*Renal*

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

3. Senior management of hospital has been helpful in using eMED*Renal*

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

4. Hospital supports the use of eMED*Renal.*

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

E. Perceived Readiness

1. How often do you use computer system?

1	2	3	4	5
Never	**Rarely**	**Sometimes**	**Often**	**Very Often**

2. Do you use office applications (MS office, lotus)?

1	2	3
Never	**Yes, Sometimes**	**Yes, Always**

3. Do you use Internet browsers?

1	2	3
Never	**Yes, Sometimes**	**Yes, Always**

F. Attitude

1. Using eMED*Renal* is a good idea

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

2. Using eMED*Renal* is a wise idea

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

3. I like the idea of using eMED*Renal*

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

4. Using eMED*Renal* would be pleasant

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

G. Behavioural Intention

1. I intend to use eMED*Renal* in my work

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

2. I intent to use eMED*Renal* every day.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Appendix B: Information Letter and Consent Form.

Information Letter

You are being invited to take part in a research study titled "Technology Acceptance of eMED*Renal* in Ireland." Before you decide whether or not to take part, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully

The purpose of the current study is to measure the level of acceptance of eMED*Renal* - a new electronic patient record system introduced in Ireland for the management of renal patients – among physicians and nurses. The idea behind this research is to examine whether physicians and nurses are satisfied with the new electronic patient record system and ready to use this new system. To achieve this purpose the study will survey the physicians and nurses of two hospitals in Ireland where this system has been installed. The survey questionnaire has been designed with the help of previous survey questionnaire used in similar studies. The data gathered from the filled questionnaire will be analysed statistically to generate findings that will further our understanding of the subject.

Now, it is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep with you and be asked to sign a consent form. If you have decided to take part in this study, you are still free to withdraw at any time and without giving a reason.

If you agree to take part in the study you will be provided a survey questionnaire after signing the consent form. Time involved in completing the questionnaire may range from 10 minutes to

20 minutes. The questionnaire contains 24 items which you will have to rate with the help of the scales given below each statement/question. Prior to these rating items, there are some questions regarding your age, gender, level of education, and profession. The purpose of gathering this personal information is not to identify the study participant but to analyse the findings in the light of socio-demographic data. All the information you will provide in the questionnaire including your personal information will be confidential and will only be used for the research purpose. No information will be sold or rented or used for any commercial purpose. In addition, your participation in the paper will be voluntary and you will be free to (on not to) answer the questions you want.

I am conducting this research as a student of Department of Computer Since at Trinity College Dublin. The research has been approved by the University Ethics Committee. If you have any concern about the procedure of this research, you can contact the Committee. You can also contact me anytime for further details through my email id: _____.

Thanks for taking time to read the paper. If you agreed to participate in the study, please sign the attached consent form.

Consent Form for Study Participants

I consent to serve as a research subject in the project "Technology Acceptance of eMED*Renal* in Ireland" The project is conducted by Mr. Ali, a Masters of Health Informatics candidate. He represents the Trinity College Dublin.

I am aware that the project involves the following procedure: I will complete a survey questionnaire measuring the level of my acceptance of eMED*Renal* by using a conceptual model designed to benchmark the technology acceptance of electronic patient record systems. Mr Ali has designed this model with the help of models used in previous studies.

Time involved in completing the questionnaire may range from 10 minutes to 20 minutes. I understand that I will be asked to rate a 24-item questionnaire. The information I will provide in the questionnaire will be confidential and I will be provided with complete anonymity. The information I will provide in the questionnaire will not be sold or rented or used for any commercial purpose.

I recognize that my participation in this study is voluntary. No penalty exists for refusal to participate, and I am free to withdraw consent and end my participation at any time. I am also aware that no remuneration is provided to research subjects. I understand that this study is not expected to involve risks greater than those ordinarily found in daily life.

If questions arise about the data collection procedure, the analysing method, or any other aspect of the study, I am free to contact Mr. Ali through this e-mail Id: _____.

Signature: _____

Date: _____

Appendix C: Tables of Bivariate Correlation Analysis

Letterkenny Sample

Correlations

		Behavioural Intention	Perceived Usefulness	Subjective Norm	Perceived Readiness
Behavioural Intention	Pearson Correlation	1	-0.067	-0.160	0.441*
	Sig. (2-tailed)		0.734	0.416	0.019
	N	28	28	28	28
Perceived Usefulness	Pearson Correlation	-0.067	1	-0.133	0.294
	Sig. (2-tailed)	0.734		0.501	0.129
	N	28	28	28	28
Subjective Norm	Pearson Correlation	-0.160	-0.133	1	-0.075
	Sig. (2-tailed)	0.416	0.501		0.703
	N	28	28	28	28
Perceived Readiness	Pearson Correlation	0.441*	0.294	-0.075	1
	Sig. (2-tailed)	0.019	0.129	0.703	
	N	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Perceived Usefulness	Perceived Ease of Use	Subjective Norm
Perceived Usefulness	Pearson Correlation	1	0.661**	-0.133
	Sig. (2-tailed)		0.000	0.501
	N	28	28	28
Perceived Ease of Use	Pearson Correlation	0.661**	1	-0.297
	Sig. (2-tailed)	0.000		0.124
	N	28	28	28
Subjective Norm	Pearson Correlation	-0.133	-0.297	1
	Sig. (2-tailed)	0.501	0.124	
	N	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Attitude	Perceived Usefulness	Perceived Ease of Use
Attitude	Pearson Correlation	1	-0.043	0.182
	Sig. (2-tailed)		.828	0.354
	N	28	28	28
Perceived Usefulness	Pearson Correlation	-0.043	1	0.661**
	Sig. (2-tailed)	0.828		0.000
	N	28	28	28
Perceived Ease of Use	Pearson Correlation	0.182	0.661**	1
	Sig. (2-tailed)	0.354	0.000	
	N	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Behavioural Intention	Attitude
Behavioural Intention	Pearson Correlation	1	0.622**
	Sig. (2-tailed)		0.000
	N	28	28
Attitude	Pearson Correlation	0.622**	1
	Sig. (2-tailed)	0.000	
	N	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

Sligo Sample

Correlations

		Behavioural Intention	Perceived Usefulness	Subjective Norm	Perceived Readiness
Behavioural Intention	Pearson Correlation	1	0.682**	0.294	0.146
	Sig. (2-tailed)		0.000	0.154	0.487
	N	25	25	25	25
Perceived Usefulness	Pearson Correlation	0.682**	1	0.348	0.469*
	Sig. (2-tailed)	0.000		0.089	0.018
	N	25	25	25	25
Subjective Norm	Pearson Correlation	0.294	0.348	1	0.324
	Sig. (2-tailed)	0.154	0.089		0.114
	N	25	25	25	25
Perceived Readiness	Pearson Correlation	0.146	0.469*	0.324	1
	Sig. (2-tailed)	0.487	0.018	0.114	
	N	25	25	25	25

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Perceived Usefulness	Perceived Ease of Use	Subjective Norm
Perceived Usefulness	Pearson Correlation	1	0.421*	0.348
	Sig. (2-tailed)		0.036	0.089
	N	25	25	25
Perceived Ease of Use	Pearson Correlation	0.421*	1	0.007
	Sig. (2-tailed)	0.036		0.973
	N	25	25	25
Subjective Norm	Pearson Correlation	0.348	0.007	1
	Sig. (2-tailed)	0.089	0.973	
	N	25	25	25

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Attitude	Perceived Usefulness	Perceived Ease of Use
Attitude	Pearson Correlation	1	0.768**	0.515**
	Sig. (2-tailed)		0.000	0.008
	N	25	25	25
Perceived Usefulness	Pearson Correlation	0.768**	1	0.421*
	Sig. (2-tailed)	0.000		0.036
	N	25	25	25
Perceived Ease of Use	Pearson Correlation	0.515**	0.421*	1
	Sig. (2-tailed)	0.008	0.036	
	N	25	25	25

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Behavioural Intention	Attitude
Behavioural Intention	Pearson Correlation	1	0.764**
	Sig. (2-tailed)		0.000
	N	25	25
Attitude	Pearson Correlation	0.764**	1
	Sig. (2-tailed)	0.000	
	N	25	25

**. Correlation is significant at the 0.01 level (2-tailed).

Both Letterkenny and Sligo Sample

Correlations

		BI	PU	PEOU	SN	PR	AT
BI	Pearson Correlation	1	0.225	0.281*	0.057	0.285*	0.693**
	Sig. (2-tailed)		0.105	0.041	0.685	0.038	0.000
	N	53	53	53	53	53	53
PU	Pearson Correlation	0.225	1	0.583**	0.007	0.359**	0.294*
	Sig. (2-tailed)	0.105		0.000	0.958	0.008	0.033
	N	53	53	53	53	53	53
PEOU	Pearson Correlation	0.281*	0.583**	1	-0.181	0.278*	0.336*
	Sig. (2-tailed)	0.041	0.000		0.194	0.044	0.014
	N	53	53	53	53	53	53
SN	Pearson Correlation	0.057	0.007	-0.181	1	0.124	0.212
	Sig. (2-tailed)	0.685	0.958	0.194		0.377	0.128
	N	53	53	53	53	53	53
PR	Pearson Correlation	0.285*	0.359**	0.278*	0.124	1	0.459**
	Sig. (2-tailed)	0.038	0.008	0.044	0.377		0.001
	N	53	53	53	53	53	53
AT	Pearson Correlation	**0.693****	0.294*	0.336*	0.212	0.459**	1
	Sig. (2-tailed)	0.000	0.033	0.014	0.128	0.001	
	N	53	53	53	53	53	53

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix D: Tables of Independent Sample t-test

Group Statistics

Comparison Between Physicians and Nurses		N	Mean	Std. Deviation	Std. Error Mean
PU	Physicians	3	4.3889	0.38490	0.22222
	Nurses	44	3.8485	0.67036	0.10106
PEOU	Physicians	3	3.7333	0.57735	0.33333
	Nurses	44	3.9795	0.52099	0.07854
SN	Physicians	3	3.8333	0.28868	0.16667
	Nurses	44	3.5909	0.53671	0.08091
PR	Physicians	3	3.6667	0.00000	0.00000
	Nurses	44	3.0379	0.36808	0.05549
AT	Physicians	3	4.5000	0.00000	0.00000
	Nurses	44	4.2633	0.46760	0.07049
BI	Physicians	3	4.3333	0.57735	0.33333
	Nurses	44	4.3864	0.48060	0.07245

Comparison Between Physicians and Nurses		Levene's Test for Equality of Variances	
		F	Sig.
PU	Equal variances assumed	0.468	0.498
	Equal variances not assumed		
PEOU	Equal variances assumed	0.186	0.668
	Equal variances not assumed		
SN	Equal variances assumed	1.157	0.288
	Equal variances not assumed		
PR	Equal variances assumed	6.647	**0.013**
	Equal variances not assumed		
AT	Equal variances assumed	11.993	**0.001**
	Equal variances not assumed		
BI	Equal variances assumed	0.022	0.881
	Equal variances not assumed		

		t-test for Equality of Means						
							95% Confidence Interval of the Difference	
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PU	Equal variances assumed	1.372	45	0.177	0.54040	0.39400	-0.2531	1.33397
	Equal variances not assumed	2.214	2.907	0.117	0.54040	0.24412	-0.2507	1.33156
PEOU	Equal variances assumed	-0.788	45	0.435	-0.24621	0.31245	-0.8755	0.38310
	Equal variances not assumed	-0.719	2.228	0.540	-0.24621	0.34246	-1.5842	1.09185
SN	Equal variances assumed	0.769	45	0.446	0.24242	0.31516	-0.3923	0.87719
	Equal variances not assumed	1.309	3.046	0.281	0.24242	0.18527	-0.3421	0.82703
PR	Equal variances assumed	2.929	45	**0.005**	0.62879	.21470	0.1963	1.06122
	Equal variances not assumed	11.332	43.000	**0.000**	0.62879	0.05549	0.5168	0.74069
AT	Equal variances assumed	0.868	45	0.390	0.23674	0.27275	-0.3126	0.78609
	Equal variances not assumed	**3.358**	**43.000**	**0.002**	0.23674	0.07049	0.0945	0.37891
BI	Equal variances assumed	-0.183	45	0.856	-0.05303	0.28959	-0.6362	0.53023
	Equal variances not assumed	-0.155	2.193	0.890	-0.05303	0.34112	-1.4035	1.29747

Appendix E: Ethics Committee Application Forms.

School of Computer Science and Statistics Research Ethical Application Form

Part A

Project Title: Applying The Technology Acceptance Model Of National Electronic Renal Record

Name of Lead Researcher (student in case of project work): Ali Al-aidy

TCD E-mail: aliadya@tcd.ie Contact Tel No.: 00353863898446.

Course Name and Code (if applicable): MSc Health Informatics CS8004 ……

Estimated start date of survey/research: ……Week 18th April 2011 ……

I confirm that I will (where relevant):

Familiarize myself with the Data Protection Act and guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
Should the research be observational, ask participants for their consent to be observed
Tell participants that their participation is voluntary
Tell participants that they may withdraw at any time and for any reason without penalty
Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
Verify that participants are 18 years or older and competent to supply consent.
If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
Declare any potential conflict of interest to participants.
Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.

Signed: ..... Date: ..... 29/03/2011 .....
Lead Researcher/student in case of project work

	Yes/No
Please answer the following questions.	
Has this research application or any application of a similar nature connected to this research project been refused ethical approval by another review committee of the College (or at the institutions of any collaborators)?	***No***
Will your project involve photographing participants or electronic audio or video recordings?	***NO***
Will your project deliberately involve misleading participants in any way?	No
Is there a risk of participants experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any such problems (e.g. who they can contact for help).	No
Does your study involve any of the following? Children (under 18 years of age)	No
People with intellectual or communication difficulties	No
Patients	NO

Part B

School of Computer Science and Statistics
Research Ethical Application Form

Details of the Research Project Proposal must be submitted as a separate document to include the following information:

1. Title of project
2. Purpose of project including academic rationale
3. Brief description of methods and measurements to be used
4. Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants
5. Debriefing arrangements
6. A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Cite any relevant legislation relevant to the project with the method of compliance e.g. Data Protection Act etc.

Part C

I confirm that the materials I have submitted provided a complete and accurate account of the research I propose to conduct in this context, including my assessment of the ethical ramifications.

Signed: ..... Date: .... 29/03/2011 .....
Lead Researcher/student in case of project work

There is an obligation on the lead researcher to bring to the attention of the SCSS Research Ethics Committee any issues with ethical implications not clearly covered above.

Part D

If external ethical approval has been received, please complete below.

External ethical approval has been received and no further ethical approval is required from the School's Research Ethical Committee. I have attached a copy of the external ethical approval for the School's Research Unit.

Signed: ..... Date: .....
Lead Researcher/student in case of project work

Ali Al-iady <aliadya@tcd.ie>

Request Ethical Approval from SCSS.TCD

From: Ali Al-iady [mailto:aliadya@tcd.ie]
Sent: 29 March 2011 13:57
To: research-ethics@scss.tcd.ie
Subject: Request Ethical Approval

I am Ali Al-iady, a Master student of Health Informatics in the Trinity College Dublin. I am preparing to undertake my research dissertation in April 2011 in part fulfilment of this course. The working of my proposed study is the acceptance of eMedRenal - a new electronic patient record system introduced in Ireland for the management of renal patients-. For this study I am surveying the people (Health professional staff) using eMedRenal to measure the degree to which they are satisfied with the new technology and are ready to use it. The data collection instrument in this proposed study is a questionnaire with 24 questions(please see the attached file). It is planned that the health professional staff who are working in the renal unit will complete the questionnaire which I will collect or will be returned to the researcher in the stamped addressed envelope provided.
I am writing to you to request permission to conduct the study at the renal units on Letterkenny General Hospital and Sligo General Hospital. A research supervisor Dr. Gaye Stephens from Trinity College will be overseeing the proposed study. I am available to meet with you at your convenience to discuss this study farther and provide farther details and clarification. My phone number is 086- 3898446 should you wish to contact me to schedule a meeting.
The following documents were attached with each application:
1-SCSS Ethical Approval Form.
2-Participants Consent Form.
3-Research Project Proposal.
4-Intended questionnaire.
I look forward to hear from you,

Thanking you
Yours sincerely
Ali Al-iady

_____

Request Ethical Approval from Letterkenny General Hospital

Ali Al-iady <aliadya@tcd.ie>

From Ali Al-iady <aliadya@tcd.ie>
26/03/2011 08:21 AM
To aisling.mcdonald@hse.ie
Cc gstephen@scss.tcd.ie
Subject :Request permission to conduct a study

Ms Aisling McDonald
Research Ethics Committee
Letterkenny General Hospital
Letterkenny
Co Donegal.

Dear Ms Aisling McDonald;
I am Ali Al-iady, a Master student of Health Informatics in the Trinity College Dublin. I am preparing to undertake my research dissertation in April 2011 in part fulfilment of this course. The working of my proposed study is the acceptance of eMedRenal – a new electronic patient record system introduced in Ireland for the management of renal patients–. For this study I am surveying the people using eMedRenal to measure the degree to which they are satisfied with the new technology and are ready to use it. The data collection instrument in this proposed study is a questionnaire with 24 questions(please see the attached file). It is planned that the health professional staff who are working in the renal unit will complete the questionnaire which I will collect or will be returned to the researcher in the stamped addressed envelope provided.
I am writing to you to request permission to conduct the study at the renal unit on Letterkenny General Hospital. A research supervisor (Dr. Gaye Stephens) from Trinity College will be overseeing the proposed study. I am available to meet with you at your convenience to discuss this study farther and provide farther details and clarification. My phone number is 086- 3898446 should you wish to contact me to schedule a meeting.
I look forward to hear from you,
Thanking you
Yours sincerely
Ali Al-iady

Request Ethical Approval from Sligo General Hospital

STANDARD APPLICATION FORM

For the Ethical Review of Health-Related Research Studies

which are not

Clinical Trials of Medicinal Products For Human Use as defined in S.I. 190/2004

DO NOT COMPLETE THIS APPLICATION FORM
IF YOUR STUDY IS A CLINICAL TRIAL OF A MEDICINAL PRODUCT

This Application Form is divided into Sections.

Sections A, B, C, D, E, J, K, L are Mandatory

Sections F, G, H, and I are optional. Please delete Sections F, G, H, and I if these sections do not apply to the application being submitted for review.

IMPORTANT NOTE: It is imperative that the Standard Application Form is not completed if there is any possibility that the study for review is a clinical trial of medicinal product as defined by Statutory Instrument 190/2004.

IMPORTANT NOTE: Please refer to **Section I** within the form before any attempt to complete the Standard Application Form. **Section I** is designed to assist applicants in ascertaining if their research study is in fact a clinical trial of a medicinal product.

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

SECTION A GENERAL INFORMATION

SECTION A IS MANDATORY

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

A1 Title of the Research Study:

A2 Principal Investigator(s):

Title: Mr. **Name:** Ali Al-iady
Qualifications: Master In Health Informatics
Position: Clinical Nurse Manger 1.
Dept: Haemodialysis Unit
Organisation: The Adelaide and Meath Hospital, Dublin Incorporating the National Children's Hospital. (AMNCH)
Tel: 00353863898446.
E-mail: aliadya@tcd.ie .

A3 (a) Is this a multi-site study? Yes

A3 (b) Please name each site where this study is proposed to take place and state the lead investigator for each site:

Site:	Lead Investigator:
Letterkenny General Hospital	Ali Al-iady

A3 (c) For any of the sites listed above, have you got an outcome from the research ethics committee (where applicable)? Yes.

A4. Co-Investigators: N/A

A5. Overall contact person who is to receive correspondence in relation to this application / who is to be contacted if a query arises in relation to this application.

Title: Mr . **Name:** Ali Al-iady
Address: .
Tel (work): **Tel (mobile):** 00353 86 3898446
E-mail: aliadya@tcd.ie .

A6. Please provide a lay description of the study.

This study is intended to investigate the usability and acceptability features of a newly developed renal care patient management application called eMedRenal. This application is developed under the Irish patient management authorities, and is currently implemented at two hospital locations within the country. Therefore, before its large scale country wide application and implementation, its usability and accessibility features are to be analyzed thoroughly. For this purpose, this study will employ TAM (technology acceptance model) based recommendations to identify the ease-of-use and acceptability features offered by eMedRenal to its patient management users. In this regard, data will be collected with the help of a primary research survey, and analyzed through the framework recommendations of TAM; which suggest that two important factors of any technology application (i.e. perceived ease of use and perceived usefulness) collectively develop the behavioral intention of a user to use specific technology, resulting in acceptance and actual usage of technology.

A7 (a) Is this study being undertaken as part of an academic qualification?
Yes;

A7 (b) If yes, please complete the following:
Student Name: Ali Al-iady **Course**: Master of Health Informatics.
Institution: Trinity College **Academic Supervisor**: Dr. Gaye Stephens

SECTION B STUDY DESCRIPTORS

SECTION B IS MANDATORY

B1. Provide information on the study background.

In this regard, the core subject of this study is to be brought under the limelight of investigation. This subject is eMedRenal, which is a patient management software application developed with an intention to combine and integrate the clinical and non-clinical patient data from both external and internal sources in order to maintain a dynamic and easily available current patient record for different renal service providers. It was developed by Its development

was led by the initiative that most of renal service providers were observed to be using arbitrary data and multi-dimensional customer records to diagnose the status of their renal functioning and disorders, and therefore, with the development of this application environment, all the arbitrary records are supposed to be centralized and synchronously available to multiple renal service provision locations. The eMedRenal patient management application provides its users with effective functionally focused modules known as 'user domains' which are developed to meet the various aspects of patient management required by the latest and multi-disciplinary renal care team. In this application, patient data/information is entered through maintaining a combination of current patient states and previous reflections, in order to draw multiple health status figures and facts. In this manner, the sole intention of eMedRenal application is to keep dynamically updated data of all renal patients in a synchronized and electronic manner.

The eMedRenal software architecture covers following significant dimensions associated with the renal patients and their record management procedures:

13. Hemodialysis
14. Transplantations
15. Patient correspondence recording
16. Synchronized reporting
17. Registry reporting
18. Patient administration
19. Hospital & HD interfacing
20. Clinical record management
21. Medication management
22. Data viewer
23. Pre-ERF
24. Peritoneal dialysis

It is through the coverage of these important aspects, that eMedRenal seeks to provide effective renal patient management environment. Moreover, its integrated architecture also includes support interfaces to the hospital laboratory/pathology system, the centralized hospital-based patient administration systems, and hemodialysis machine software system. However, this application has been developed to be interacted and managed by human beings therefore, it

should be providing some sort of user accessibility or ease-of-use features. Actually, this is the very fundamental concept of any technological application; its easiness and interactive features provides it with a leverage of acceptance between masses. For this reason, any software application (regardless of the high-tech technology it offers) if fails to capture the attention of human elements due to its complexity or rigid interface, it is considered to be of no use.

In this specific regard, this study approaches the case of eMedRenal (which itself is a wonderful development for patient management procedures) with respect to a specific user acceptability model, known as TAM (technology acceptance model). This model was developed by two scientists named Fred Davis and Richard Bagozzi and was outlined within their respective studies. This model is actually a theory which deals with the concept of how users come to accept and use a specific technology that is introduced to them. In this regard, TAM suggests multiple factors that operate behind decision of human elements regarding the acceptance of particular technology (including its design, architecture, user mindset, ability, awareness, etc.) but majorly deals with two basic aspects of technology that cover the remaining factors. These factors can be stated as PU (Perceived Usefulness) and PEOU (Perceived Ease-of-Use): PU refers to the level to which an individual realizes that application of a particular technology/system would help towards increasing overall professional performance, and PEOU represents the level to which an individual believes that employed technology/system would be maximally easy to use (i.e. free of complex operating efforts). With conceptual scales maintained by these two factors, TAM approaches the 'usability' features of a technology application and examines its easiness and effectiveness perceived by the users. Therefore, for this reason, this study project has maintained its goal to evaluate the usability of eMedRenal software application by assessing it under the guidelines of TAM, and to measure how its users experience it, and what are their points of views regarding it.

B2. List the study aims and objectives.

Following are the formal objectives developed for this study:

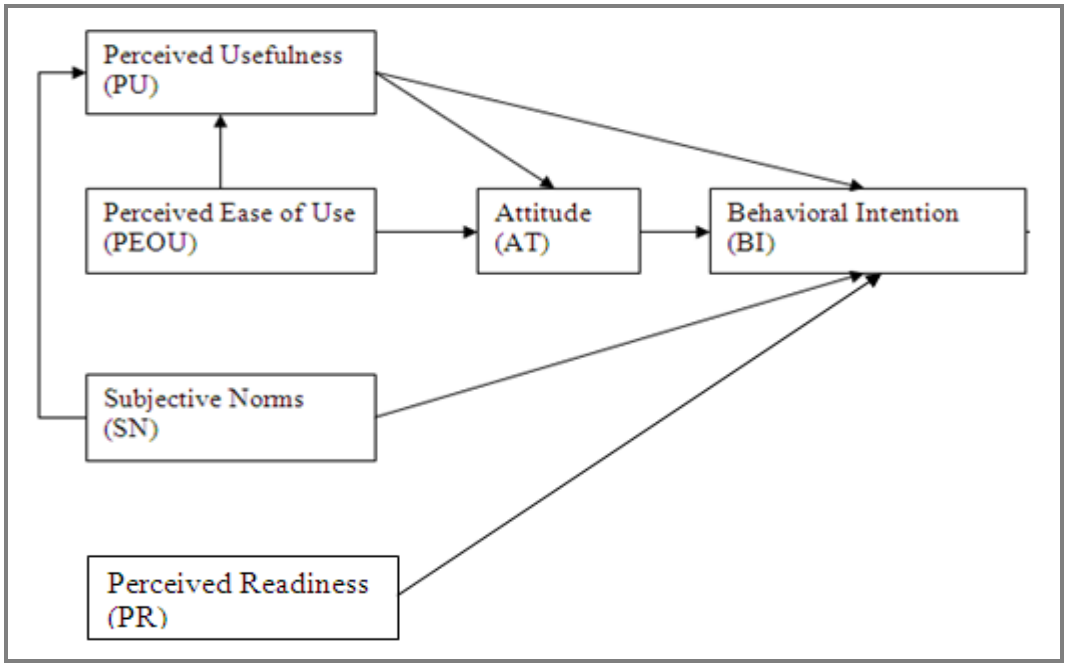
1. To obtain the behavioural responses of users of eMedRenal and to analyse them with technology acceptance model's recommendations.

2. To evaluate the eMedRenal application from the point of application's ease-of-use, application's perceived usefulness, and users' intention to use it.
3. To predict any major user resistance behaviours (expected to be faced) after the planned large scale implantation of eMedRenal in different hospitals across Ireland.

B3. List the study endpoints (if applicable).

It is to test how the technology acceptant model applies to the use of electronic renal patient record and to be investigated the usability of the eMedRenal by the staff employing its usage.

B4. Provide information on the study design.



The model – shown in above figure – following hypotheses have been proposed for the present study.

H1: *Perceived Usefulness, Subjective Norm and Perceived Readiness have direct impact on the Behavioural Intention to use eMedRenal.*

H2: *Perceived Ease of Use and Subjective Norms have direct impact on the Perceived usefulness of eMedRenal*

H3: *Perceived Usefulness and Perceived Ease of Use have direct impact on Attitude which in turn has direct impact on Behavioural Intention to use eMedRenal*

H4: *Behavioural Intention to use eMedRenal can significantly predict the actual use of the system*

B5. Provide information on the study methodology.

This study will conduct a full scale primary research to obtain feedback from current users who are being facilitated through eMedRenal system, with the help of a survey questionnaire. This questionnaire will be developed over the specific recommendations of technology acceptance model (TAM) and through it; an empirical scale would be developed to analyze the responses for reaching conclusions.

B6. What is the anticipated start date of this study?

25th April 2011

B7. What is the anticipated duration of this study?

Approximately two weeks.

B8 (a) How many research participants are to be recruited in total?

As many as possible, Depend on how many Renal health professional (ie nurses, Doctors, dietitians,,,) available in renal unit.

B8 (b) How many research participants are to be recruited per treatment group (if applicable)?

N/A

B8 (c) Provide information on the statistical approach to be used (if appropriate) / source of any statistical advice.

I have provided some hypotheses. From the questionnaire I will note the ratings of the health-care professionals for each item and will take the average of the items to show the rating for each variable. For instance, Perceived usefulness has six items, the average rating of the six items will show the rating of Perceived usefulness. The rating/score of each variable will be use to test the hypothesis . I am thinking to use bi variate analysis followed by multivariate analysis of the variables. For multivariate analysis, I would use the stepwise multiple regression.

B8 (d) Please give a brief justification of sample size and details of the sample size calculation (including minimum clinically important difference).

Based upon papers by Mohd, H., & Muhamad, S.M.S. 2005. Acceptance Model of Electronic Medical Record. *Journal of Advance Information and Management Studies*, 2(1), pp. 75-92., typical survey response rates are approximately 20%. Thus, the anticipated sample size is approximately 150.

SECTION C study PARTICIPANTS

SECTION C IS MANDATORY

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

SECTION C1 PARTICIPANTS – SELECTION AND RECRUITMENT

C1. 1 How many research participants are to be recruited? At each site (if applicable)? And in each arm of the study (if applicable)? N/A

C1.2 How will the participants in the study be selected?

All health professional are using eMedRenal in renal unit will be selected to participate in the study..

C1.3 How will the participants in the study be recruited?

I intend to recruit all nurses, doctors and other health professional who are working in renal department of the both hospital. The questionnaires will be in a paper format and will be given to the participants at their working area. The participants will complete the questionnaire which I will collect or will be returned to the researcher in the stamped addressed envelope provided.

C1.4 What are the main inclusion criteria for research participants? (please justify)

The health professional who are using the EmedRenal software and working on renal unit is the main inclusion criteria for research participants.

C1.5 What are the main exclusion criteria for research participants? (please justify)
Who is not working on the renal unit or not using eMedRenal.

C1.6 Will any participants recruited to this research study be simultaneously involved in any other research project?
Not to my knowledge

SECTION C2 PARTICIPANTS – INFORMED CONSENT

C2.1 (a) Will informed consent be obtained?
No

C2.1 (b) If no, please justify.
completing the questionnaire is implied consent and the data are completely anonymous.

SECTION C3 adult participants - CAPACITY

C3.1 (a) Will all adult research participants have the capacity to give informed consent? YES

SECTION c4 participants under the age of 18

C4.1 (a) Will any research participants be under the age of 18 i.e. Children?

No

SECTION C5 PARTICIPANTS - CHECKLIST

Please confirm if any of the following groups will participate in this study. This is a quick checklist for research ethics committee members and it is recognised that not all groups in this listing will automatically be vulnerable or lacking in capacity.

C5.1 Patients No
C5.2 Unconscious patients No
C5.3 Current psychiatric in-patients No
C5.4 Patients in an emergency medical setting No
C5.5 Relatives / Carers of patients No
C5.6 Healthy Volunteers No
C5.7 Students No
C5.8 Employees / staff members Yes
C5.9 Prisoners No
C5.10 Residents of nursing homes No
C5.11 Pregnant women No
C5.12 Women of child bearing potential No
C5.13 Breastfeeding mothers No
C5.14 Persons with an acquired brain injury No
C5.15 Intellectually impaired persons No
C5.16 Elderly / aged persons > No

C5.17 If yes to any of the above, what special arrangements have been made to deal with issues of consent and assent (if any)? N/A

SECTION D research PROCEDURES

SECTION D IS MANDATORY

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

D1. What research procedures or interventions (over and above those clinically indicated and/or over and above those which are part of routine care) will research participants undergo whilst participating in this study?

The participants are staff members, normal is the normal working day, additional care is completing the questionnaire.

D2. If there are any potential harms resulting from any of the above listed procedures, provide details below:

Due to the nature of the study, there are no risks to the above mentioned patients.

D3. What is the potential benefit that may occur as a result of this study?

Although there are no specific direct benefits to individual participants of the study, it is anticipated that by completing this study, results of this study will be useful for renal clinicians to identify and access a body work on renal registries.

D4 (a) Will the study involve the withholding of treatment?

No

D4 (b) Will there be any harms that could result from withholding treatment?

No

D4 (c) If yes, please elaborate.

D5. How will the health of participants be monitored during and after the study?

N/A

D6 (a) Will the interventions provided during the study be available if needed after the termination of the study? No

D6 (b) If yes, please state the intervention you are referring to and state who will bear the cost of provision of this intervention?

D7. Please comment on how individual results will be managed.

The researcher plans to disseminate the research in dissertation form within Trinity College Dublin, including a presentation to postgraduate colleagues also undertaking the Masters in Health Informatics and lecturers from the Computer Science Department. Staff within the field of nephrology have expressed great interest in the study. Following this, the researcher hopes to have the study published in a peer reviewed nursing journal, such as the Nephrology Nursing Journal.

D8. Please comment on how aggregated study results will be made available.

A copy of dissertation can be made on request.

D9. Will the research participant's general practitioner be informed the research participant is taking part in the study (if appropriate)? Non-applicable.

D10. Will the research participant's hospital consultant be informed the research participant is taking part in the study (if appropriate)? Non-applicable.

SECTION E data protection

SECTION E IS MANDATORY

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

SECTION E1 data processing - consent

E1.1 (a) Will consent be sought for the processing of data? No

E1.1 (b) If no, please elaborate.
Completing the questionnaire is implied consent and the data are completely anonymous.

SECTION E2 data processing - GENERAL

E2.1 Who will have access to the data which is collected?
Access to the data will be confined to the named researcher only.

E2.2 What media of data will be collected?
Self-filled questionnaire in paper format.

E2.3 (a) Would you class the data collected in this study as anonymous, irrevocably anonymised, pseudonymised, coded or identifiable data?

Anonymous

E2.4 Where will data which is collected be stored?
Data and all identifying information will be kept in separate locked filing cabinets within my personal work locked office.

E2.5 Please comment on security measures which have been put in place to ensure the security of collected data.
In order to uphold the participants' right to confidentiality, Data and all identifying information will be kept in separate locked filing cabinets within my personal

work locked office and access to computer files will be password protected which are to be available to the named researchers only.

E2.6 (a) Will data collected be at any stage leaving the site of origin? No

E2.6 (b) If yes, please elaborate.

E2.7 Where will data analysis take place and who will perform data analysis (if known)?

The data will be analysis on my personal work office, the named researcher the only one perform data analysis.

E2.8 (a) After data analysis has taken place, will data be destroyed or retained?

The data will be Destroyed

E2.8 (b) Please elaborate.

Data will be kept securely for five years from the date of publication of the Research. Then will be destroyed .

E2.8 (c) If destroyed, how, when and by whom will it be destroyed?

Data will be shredded and disposed of in a confidential document bin by the researcher five years following the date of publication of the research.

E2.9 Please comment on the confidentiality of collected data.

In order to uphold the participants' right to confidentiality, the research will be conducted with complete anonymity of participants. To ensure anonymity will exist, the researchers will not know the identity of participants as participants are part of a random sample and are required to return responses with no form of personal identification. This study will not require access to participants personnel records. Data will be analysed as group data so that individuals cannot be identified by their responses.

E2.10 (a) Will any of the data collected consist of audio recordings / video recordings?

No

E2.11 (a) Will any of the data collected consist of photographs / video recordings?

No

E2.11 (b) If yes, please elaborate.

SECTION e3 ACCESS TO HEALTH CARE RECORDS

E3.1 (a) Does the study involve access to healthcare records (hard copy / electronic)?
No

E3.1 (b) If yes, please elaborate.

E3.1 (c) Who will access these healthcare records?
N/A

E3.1 (d) Will consent be sought from patients for research team members to access their healthcare records?
N/A

E3.2 (a) Who or what legal entity is the data controller in respect of the healthcare records?
N/A

E3.2 (b) What measures have been put in place by the data controller which may make access to healthcare records permissible without consent?
N/A

f1 Bodily Tissue / Bodily Fluid Samples - general

F1 1 (a) Does this study involve human biological material? No

f2 Bodily Tissue / Bodily Fluid Samples prospectively collected

F2.1 Does this study involve the prospective collection of human biological material?
No

F3 Bodily Tissue / Bodily Fluid Samples retrospectively collected

F3.1 Does this study involve accessing retrospectively collected human biological material?
No

SECTION jINDEMNITY

SECTION J IS MANDATORY

J1 (a) Is each site in which this study is to take place covered by the Clinical Indemnity Scheme (CIS)? Yes

J2 (a) Is each member of the investigative team covered by the Clinical Indemnity Scheme (CIS)? Yes

J2 (b) If no, do members of the investigative team not covered by the Clinical Indemnity Scheme (CIS) have either current individual medical malpractice insurance (applies to medical practitioners) or current professional liability insurance either individually or as provided by their hosting/employing institution (generally applies to allied healthcare professionals, university employees, scientists engineers etc.)?

The researcher is an employee of AMNCH Hospital and thus is covered by the Clinical Indemnity Scheme

J3 (b) What additional indemnity arrangements has the sponsor put in place for this research study in case of harm being caused to a research participant (if any)? N/A

SECTION k COST AND RESOURCE IMPLICATIONS and funding

SECTION K IS MANDATORY

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying *Guidance Manual* for more in-depth advice prior to deleting any question.

K1 (a) Are there any cost / resource implications related to this study? No

K1 (b) If yes, please elaborate.

K2 (a) Is funding in place to conduct this study? No

K2 (b) If no, has funding been sought to conduct this study? N/A

K2 (c) Please state the source of funding (industry, grant or other) and the amount of funding.

K2 (d) Is the study being funded by an external agency? No
K2 (e) Is the external agency a 'for profit' organisation? N/A

K2 (f) Do any conflicts of interest exist in relation to funding? Please elaborate.
N/A

SECTION lETHICAL ISSUES

SECTION L IS MANDATORY

L1. Please identify any ethical issues which this project raises and discuss how you have addressed these issues.

The researcher does not feel that any specific ethical issues will arise during the course of this study.

LOCAL COMMITTEE DECLARATION AND SIGNATORY PAGE:

Name of Committee: Sligo General Hospital Research Ethics Committee

Title of Study: **APPLYING THE TECHNOLOGY Acceptance Model of National Electronic Renal Record**

DECLARATION OF PRINCIPAL INVESTIGATOR:

- The information on this form is accurate to the best of my knowledge and I take full responsibility for it.
- I undertake to abide by the ethical principles underlying the Declaration of Helsinki
- I undertake to submit an annual status report as per Ethical Approval SOP to the REC.
- I am aware of my responsibility to comply with the Data Protection Act 1988 and 2003.
- I understand that research records/data may be subject to inspection for audit purposes if required in the future.
- I understand that personal data about me as a researcher in this application will be held by the REC and that this will be managed according to the Data Protection Act 1988 and 2003.

Name of Principal Investigator: __Ali Al-iady .

Signature of Principal Investigator: _____

Name of Academic Supervisor, if applicable: _____Dr. Gaye Stephens

Signature of Academic Supervisor, if applicable: _____

Date Proposal Form Submitted: 13/04/2011.

Request Permission To Conduct A Study(Sligo)

Ali Al-iady <aliadya@tcd.ie>

19 April 2011 09:26

From Ali Al-iady <aliadya@tcd.ie>
To: Michael.Shannon@hse.ie

Michael Shannon;
Director of Nursing,
Sligo General Hospital,
Sligo

Dear **Sister Michael Shannon**;
I am Ali Al-iady, a Master student of Health Informatics in Trinity College Dublin. I am preparing to undertake my research dissertation in April 2011 in part fulfilment of this course. The working of my proposed study is the acceptance of eMedRenal – a new electronic patient record system introduced in Ireland for the management of renal patients–. For this study I am surveying the people using eMedRenal to measure the degree to which they are satisfied with the new technology and are ready to use it. The data collection instrument in this proposed study is a questionnaire with 24 questions (see attached files).It is planned that the health professional staff who are working in the renal unit will complete the questionnaire which I will collect or will be returned to the researcher in the stamped addressed envelope provided. I have sought **favourable ethical opinion approval** from the appropriate ethics committe in **Sligo General Hospital** (chairman Dr. John Williams).

I am writing to you to request permission to conduct the study at the renal unit on **Sligo General Hospital**. A research supervisor (Dr. Gaye Stephens) from Trinity College will be overseeing the proposed study. I am available to meet with you at your convenience to discuss this study farther and provide farther details and clarification. My phone number is 086- 3898446 should you wish to contact me to schedule a meeting.
I look forward to hear from you,
Thanking you
Yours sincerely
Ali Al-iady

Ali Al-iady <aliadya@tcd.ie>

Request permission to conduct a study

Ali Al-iady <aliadya@tcd.ie> **19 April 2011 13:21**
To: Emer.Melvin@hse.ie

Emer Melvin,
CNM 2, Renal Dialysis Unit,
Sligo General Hospital

Dear Emer;

I am Ali Al-iady, a Master student of Health Informatics in Trinity College Dublin. I am preparing to undertake my research dissertation in April 2011 in part fulfilment of this course. The working of my proposed study is the acceptance of eMedRenal – a new electronic patient record system introduced in Ireland for the management of renal patients–. For this study I am surveying the people using eMedRenal to measure the degree to which they are satisfied with the new technology and are ready to use it. The data collection instrument in this proposed study is a questionnaire with 24 questions.It is planned that the health professional staff who are working in the renal unit will complete the questionnaire which I will collect or will be returned to the researcher in the stamped addressed envelope provided. I have sought favourable ethical opinion approval from the appropriate ethics committe in Sligo General Hospital (chairman Dr. John Williams) and I Sought permission from Ms Ann Marie Loftus Director of Nursing. and I have spoke and sought permission from Ms AnnG Hayes CNM3 in RDU who advised me to contact you to get your permission to conduct my study.

With your permission I would like to invite all the staffs in Renal units to participate in this study. It will be my pleasure if you could let me start this study in next Friday 20th April. A research supervisor (Dr. Gaye Stephens) from Trinity College will be overseeing the proposed study.

I am available to meet with you at your convenience to discuss this study farther and provide farther details and clarification. My phone number is 086- 3898446 should you wish to contact me to schedule a meeting.

I look forward to hear from you,

Thanking you

Yours sincerely

Ali Al-iady

Appendix F: Ethics Approval Letter

Ethics Approval Letter From SCSS.TCD :

Ali Al-iady <aliadya@tcd.ie>

Al-iady - E305

Research Ethics <research-ethics@scss.tcd.ie> **11 April 2011 15:45**

To: Ali Al-iady <aliadya@tcd.ie>

Cc: Research Ethics <research-ethics@scss.tcd.ie>

Dear Ali Al-iady,

Thank you for these revisions. You may now proceed with this study. We wish you success in your research.

Kind regards,

Gillian

From: Ali Al-iady [mailto:aliadya@tcd.ie]
Sent: 08 April 2011 11:51
To: Research Ethics
Cc: gstephen@scss.tcd.ie
Subject: Re: Al-iady - E305

[Quoted text hidden]

Permission To Conduct A Study (Sligo Hospital)

Ali Al-iady <aliadya@tcd.ie>

AnnMarie.Loftus@hse.ie <AnnMarie.Loftus@hse.ie> **19 April 2011 10:43**

To: Ali Al-iady <aliadya@tcd.ie>

Cc: AnnG.Hayes@hse.ie

Ali

I note on your e-mail you have **ethics** sought & approved - please confirm with Ms A Hayes CNM3 on the process to proceed date etc once staff have had communications

Regards

AnnMarie Loftus,
Director of Nursing & Midwifery,
Sligo General Hospital
The Mall
County Sligo
071 91 74539
annmarie.loftus@hse.ie

Permission To Conduct A Study (Letterkenny Hospital)

Ali Al-iady <aliadya@tcd.ie>

permission to conduct a study

Aisling.McDonald@hse.ie <Aisling.McDonald@hse.ie> **1 April 2011 14:17**

To: Ali Al-iady <aliadya@tcd.ie>

Dear Ali,

I refer to your recent email in relation to proposed study. I have been in touch with Dr. Anne Flood, Director of Nursing & Midwifery & member of Ethics Committee at LGH and I have also forwarded your email to Ms. Noreen Harley, Asst. Director of Nursing/ Service Manager for Renal Service. From their perspective there are no issues in relation to you carrying out proposed study and therefore permission has been granted for same.

Can i wish you well with your study.

Regards
Aisling McDonald
General Manager's Office
Letterkenny General Hospital
Co. Donegal
Phone: 074 9123501
aisling.mcdonald@hse.ie

Ali Al-iady <aliadya@tcd.ie>

26/03/2011 08:21 AM

To aisling.mcdonald@hse.ie

cc gstephen@scss.tcd.ie

Subject Request permission to conduct a study