Swansea University
Prifysgol Abertawe

Exploring the factors that affect the acceptance and use of Electronic Health Records amongst secondary care staff in Kuwait: A mixed- methods study

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1 Abstract

Background: Despite investments into healthcare reform and health information technology (HIT), Kuwait has not fully utilised Electronic Health Records (EHR) in the public secondary care sector. As a result, adoption and maturity levels vary.

Aims: The present study aimed (1) to evaluate the acceptance of EHR in public secondary care hospitals in Kuwait, (2) to explore experiences and perceptions of EHR, (3) to understand barriers to the EHR, (4) to devise potential strategies to enhance user acceptance.

Methods: In order to address the aims, the research has adopted a mixed-methods design utilising quantitative and qualitative methods. The quantitative study was conducted as an online survey of 399 Healthcare professionals in six public hospitals in Kuwait. It used the Technology Acceptance Model 2 (TAM 2) questionnaire to collect data. The qualitative study consisted of two phases. Phase one data were collected through semi-structured interviews with thirty healthcare professionals in three public hospitals. Phase two consisted of three semi-structured interviews with health care leadership in non-government secondary care sites that had already implemented EHR successfully.

Results and findings: The TAM 2 survey found overall negative user attitudes. Perceived Ease of Use and Perceived Usefulness both predicted Intention to Use. However, user perceptions demonstrated that HCPs trusted in EHRs to improve quality of care, reduce clinical errors and save time. Furthermore, HCPs experienced a lack of interoperability, information technology (IT) infrastructure, resources, and a lack of organisational cohesion and teamwork as barriers to EHR adoption and use. In addition to that, interviewees expressed concerns about the safety and privacy of patient data.

Conclusion: The evidence underscores the importance of strategic managerial investment into EHR adoption and use in Kuwaiti secondary care public hospitals. The study identified a need for better IT infrastructure, more appropriate staff training and monitoring of EHR implementation and use as strategies to enhance user acceptance.

2 Declarations and Statements

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed ....[redacted]date)

Date ....**15/02/2022**...

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s). Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed ....[redacted]

Date .... **15/02/2022**..

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

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STATEMENT 3

This research has followed the University's ethical procedures and ethical approval has been granted.

Signed ....[redacted]....... (candidate)

Date ......**15/02/2022**...

Contents

3 Acknowledgements

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4 List of Presentations

Albazzaz, N. (2021). *My PhD Journey*. Teaching slot for the MSc Health Informatics students, Swansea University, UK.

Albazzaz, N. (2019). Experience of electronic health record use in Kuwait: A hermeneutic analysis of health care professionals' perceptions, motivations and emotions. Poster presented at the 14th World Congress on Healthcare & Technologies Conference, London, UK. (see Appendix A).

Albazzaz, N. (2019). Trust and Resistance: A hermeneutic analysis of Health Care Professionals' experience of Electronic Health Records in Kuwait. Poster presented at the Research Students Annual Conference, Swansea University, UK.

5 List of Tables

6 List of Figures

8 Abbreviations

Applied Social Sciences Index and Abstracts	ASSIA
Central Agency for IT	CAITS
Clinical Information System	CIS
Computerised patient record	CPR
Computerised Patient Record System	CPRS
Computerised Physician Order Entry	CPOE
Cumulative Index to Nursing & Allied Health Literature	CINAHL
Department of Information Systems	DoIS
Electronic health	e-health
Electronic health care record	EHCR
Electronic health record	EHR
Electronic Health Record System	EHRS
Electronic Medical Record	EMR
Electronic Patient Record	EPR
Electronic Referral System	E-Referral
Health and Social Care Network	HSCN
Health care professional	HCP
Health Information Technology for Economic and Clinical Health	HITECH
Heath Information Technology	HIT
Human Resources	HR
Information Communication Technology	ICT
Information Technology	IT
International Organisation for Standardisation	ISO
Ministry of Health	MoH
National Accreditation Program for Hospitals	NAPH
National Health Service	NHS
National Network for the NHS	N3
Perceived Ease of Use	PEOU
Perceived Usefulness	PU
Personalized Health and Care	PHC
Primary Care Information System	PCIS
Quality and Accreditation Directorate	QAD
Technology Acceptance Model	TAM
Theory of Reasoned Action	TRA
The National Program for IT	NPfIT
Theory of Reasoned Action	TRA
Unified Theory of Acceptance and Use of Technology	UTAUT
United Kingdom	UK
United States	US
United States of America	USA
World Health Organization	WHO

1 Chapter One: Introduction

1.1 Introduction

This chapter aims to contextualise the research and introduce the reader(s) to some of the key ideas that have been developed throughout this thesis. It begins by presenting the topic and context of the research before setting out the aims, theoretical and methodological approaches the study has taken. The chapter then highlights the study's relevance and potential contribution to the wider field of health informatics research. The chapter ends by providing an overview of the structure of the thesis.

1.2 Structure of the Thesis

These ideas are presented in the thesis that follows in ten chapters, followed by reference list and appendices.

Chapter One: Introduction

This chapter aims to contextualise the research and introduce the reader(s) to some of the key ideas that have been developed throughout this thesis. It begins by presenting the topic and context of the research before setting out the aims, theoretical and methodological approaches the study has taken. The chapter then highlights the study's relevance and potential contribution to the wider field of health informatics research. The chapter ends by providing an overview of the structure of the thesis.

Chapter Two: Literature Review and Research Aims

This chapter describes the search strategy used to identify all relevant literature, which criteria were developed to include relevant literature and exclude irrelevant literature. It critically evaluates the existing body of research on the topic, identifying gaps in the existing literature. It further describes how the aims of the thesis were developed in response to the research gaps identified.

Chapter Three: User Acceptance and Technology Acceptance Models

This chapter provides an overview of the origin and evolution of some of the most prominent models used to measure technology acceptance quantitatively. It discusses the Technology Acceptance Model (TAM), TAM 2, Unified Theory of Acceptance and Use of Technology (UTAUT) and TAM 3. Finally, it explores the use of the different models and their limitations.

Chapter Four: Methodology

The methodology chapter outlines the philosophical and epistemological underpinning of the thesis. It engages critically with positivist and interpretive frameworks and creates an argument for conducting a mixed-methods study as a way of bridging the limitations of both interpretivist and positivist perspectives.

Chapter Five: Methods

The methods chapter provides an overview of the qualitative and quantitative research methods used. In addition, it describes information on the process of data collection, analysis and interpretation.

Chapter Six: Quantitative study Results

This chapter describes the statistical analysis and findings from the quantitative study, an online survey with three healthcare professionals in six public hospitals in Kuwait. It lists the statistical tests carried out and provides the analysis using TAM 2. Furthermore, it discusses the impact of demographic factors on the findings. It evaluates the study's limitations and concludes by summarising the findings.

Chapter Seven: Qualitative Study Findings

This chapter describes the findings from phase one of the qualitative study, the hermeneutic analysis of 30 semi-structured interviews with secondary health care staff in three public hospitals in Kuwait. This chapter also presents the findings from phase two of the qualitative study, three interviews with health care leaders.

Chapter Eight: Mixed-Methods Results and Findings

This chapter provides the mixed-methods analysis and interpretation. It draws interpretations from the qualitative and quantitative studies and, as it is common in convergent mixed-methods designs, compares some of the results to determine whether they confirm, disconfirm or expand on each other.

Chapter Nine: Discussion

This chapter discusses the findings from both empirical studies. In addition to that it discusses the limitations of the research. Furthermore, it explores how the qualitative and quantitative study findings and results addressed the research aims.

Chapter Ten: Conclusion

This chapter provides the overarching conclusions of the thesis concerning the research aims. Furthermore, it provides recommendations to increase the acceptance and use of EHRs in secondary care in Kuwait.

1.3 Research Topic

This mixed-methods design consisting of a cross-sectional survey and semi-structured qualitative interviews explores the limited use of electronic health records (EHRs) amongst Kuwait's secondary care staff in public hospitals. It takes the position that while it is well documented that EHRs have much potential to improve both the delivery and quality of health care services, secondary care staff in Kuwait public hospitals have been slow to embrace such systems. Therefore, this study explores secondary care staff's use of EHRs, their experiences with EHR systems in their everyday role, and perceived barriers to their use.

1.4 Context of the research

According to the International Organisation for Standardisation (ISO) (2005) an EHR is a repository of information regarding the health status of a subject of care in computer processable form. A variety of health information systems may include features and functionality that could be characterised as belonging to an EHR system. The main differences between systems can be found in the scope and purpose, integration and interoperability and who has access to the system, i.e. patients, health care professionals, administrative staff or researchers (Häyrinen et al., 2008; Tang et al., 2006). Häyrinen et al. (2008) have provided an overview of the different types of EHR's, see

Table 1.1.

Table 1.1 Types of EHR according to ISO (2005) compiled by Häyrinen et al. (2008)

Electronic medical record (EMR)	Generally focused on medical care; contains information entered by a single hospital department, for example, radiology reporting system, intensive care records, anaesthesia records, pharmacy system or emergency department systems
Interdepartmental EMR	Contains information from two or more hospital departments
Hospital EMR	Contains all or most patient information from a particular hospital
Inter-hospital EMR	Contains patient's medical information from two or more hospitals
Electronic patient record (EPR) or Computerised patient record (CPR)	Contains all or most patient's clinical information from a particular hospital
Electronic health care record (EHCR)	Contains all patient health information
Personal health record	Controlled by the patient and contains information at least partly entered by the patient
Computerised medical record	Created by image scanning of a paper-based health record
Digital medical record	a web-based record maintained by a healthcare provider
Clinical data repository	an operational data store that holds and manages clinical data collected from the health service provider
Electronic client record	The scope is defined by healthcare professionals other than physicians, e.g. by physiotherapists or social workers
Population health record	contents aggregated and usually de-identified data

This overview shows a need to distinguish between other commonly used terms, such as electronic medical records or patient records. In this thesis, for consistency, EHRs are defined following Tang (2006) as digital versions of paper-based clinical records that can be accessed by clinicians and contain information collected by several Health Care Professionals (HCP)s that enable the HCP to make better medical decisions. This definition has been chosen because the thesis explores EHR in the context of patient care and evaluates levels of use and user satisfaction as perceived by healthcare professionals, including clinical users such as doctors and nurses and administrative users.

Globally, the adoption of EHRs has become part of a more significant shift towards implementing advanced health information systems. Electronic health records form part of the broader movement towards e-health, i.e. a more cost-effective and secure use of information and communication technologies supporting health and health-related fields (WHO, 2016a). The introduction of EHRs came about with other advances in Health Information Technology (HIT) during the transition from paper-based to computerised records. By the end of the 1980s, the hardware had become more affordable in many western countries. In addition to that, there was more widespread access to personal computers, local area networks and the internet. According to Evans (2016), all these technological advances were crucial in causing the drive to implement EHRs since the 1990s. However, the full potential of EHRs has not been fully realised despite global efforts and investments into advancing these systems (Reisman, 2017; Saigí-Rubió et al., 2021).

Electronic health records (EHRs) are accessed by different users, for example, healthcare professionals, administrative staff and researchers. Physicians use EHR's to note down the complaint or symptoms, past medical history, physical examination, any relevant diagnosis and tests. They also use the EHR to put the instructions for patient care and treatment into the system electronically and to prescribe medication (Estes et al., 2012). Nurses use EHR's for daily charting, medication administration, physical assessment, admission nursing notes and nursing care plans (Häyrinen et al., 2008). Radiologists, laboratory technicians, pharmacists and radiographers are also frequent users of different components of EHR systems (Häyrinen et al., 2008). A nonclinical user group of EHR's are administrative staff who use components of the EHR concerned with care coordination and organisation of processes and procedures (Häyrinen et al., 2008). Researchers also use EHR to collect and review large datasets, for example, to support decision making about the effectiveness of drugs. A recent example is the national and international sharing of epidemiological data during the COVID-19 pandemic (Dagliati et al., 2021).

Advantages of EHRs

EHRs promised to revolutionise healthcare on the level of clinical, organisational, and social outcomes by improving care coordination, care-based evidence, and patient satisfaction (Menachemi & Collum, 2011). The global drive to implement EHR's has been fuelled by several positive claims about the advantages of EHR's.

Figure 1.1 provides an overview of the EHR objectives and benefits for quality assurance as reviewed by Alpert (2016a).

Figure 1.1 EHR Objectives and Benefits for Quality Assurance as reviewed by Albert (2016)

EHR Objectives and Benefits for Quality Assurance	
• Access detailed patient information • Document patient progress • Assist in chronic disease management • Facilitate disease coding for billing and disease demographics • Create educational patient handouts • Reduce errors related to misreading handwritten notes • Reduce errors related to prescription writing	• Improve communication between healthcare providers with information that is easily accessible and legible • Provide healthcare staff with decision support tools • Help track health maintenance and preventive medical interventions • Indicate clear authorship of each medical note • Quickly identify changes in medical notes

Electronic health records can support healthcare providers in documenting, storing, and retrieving patient information, such as a patient's medical history or lab diagnostics. On the level of documenting a patient's medical history and progress, research has shown that EHR's can reduce the illegibility of practitioners handwriting (Edwards & Moczygemba, 2004). EHR's can also significantly reduce the risks associated with storing paper records, for example, misfiling records, pages falling out, or notes being entered in the wrong order (Al Farsi & West, 2006). Since these EHRs can be backed up remotely, there is also a lower risk of EHR loss or damage relative to paper-based records (Mechalakos & Dieterich, 2016). These advantages have been evaluated as some of the main reasons EHRs are believed to reduce medical error significantly (Cheung et al., 2013). Barsley et al. (2017) further add that from a legal perspective, EHRs are more beneficial than paper-based records since they are more organised, legible, structured, and contain fewer errors.

Furthermore, EHR being remotely accessible has brought benefits to clinical, organisational and broader social levels. Before implementing EHR and information technology (IT)-related systems, access to data for research, clinical, administrative, and financial purposes was limited due to its hardcopy nature. It could take researchers and practitioners anywhere from one to six months to access due to its time to complete and disseminate the data – often to only one researcher at a time (Ozair et al., 2015). Even then, there was no certainty that the data received would be entirely accurate or complete. With EHRs, billing and collection information transmission can be organised more efficiently (Pfoh et al., 2012).

Additionally, the ability to share health records through web-based secure access allows for easier availability of healthcare information to healthcare providers, patients and researchers (Mechalakos & Dieterich, 2016). Having access to patient information remotely and automatically has improved communication between practitioners because the information is more readily available and can be shared more easily (Pfoh et al., 2012). This means EHR's can be instrumental in aiding evidence-based clinical decision support (Jha et al., 2008). Furthermore, automating access to patient information can also increase the potential to streamline clinicians' workflow (Alpert, 2016a).

EHR also can make communication between practitioner and patient more efficient and make medical information more accessible to patients (Pfoh et al., 2012). EHR's streamline and coordinate information. The improved accessibility of information has advantages on the level of communication and can also support clinical decision-making by reconciling medication or flagging potentially harmful medical interactions for patients (Mechalakos & Dieterich, 2016). EHR's potential to collect and display relevant patient information, such as diagnosis, treatment, and responses to treatment (Denny & Xu, 2014), has also been utilised as an invaluable tool for clinical research.

It was hoped that EHR's potential to streamline documentation and clinical workflow and allow for the collection of large datasets for research would, in the long run, lead to a significant reduction of costs (Denny & Xu, 2014). However, research on the impact of EHR and healthcare quality has provided mixed results, as demonstrated by a recent systematic review (Campanella et al., 2016). The authors found that EHRs can improve health care quality, for example, by increasing time efficiency and reducing medication errors. However, their systematic review also demonstrated that an appropriate implementation strategy and effort is crucial in achieving quality of care improvements and that often in practice, quality improvements are not being achieved due to implementation difficulties.

These purported advantages have led to a global drive to implement EHR, first in America, Canada and United Kingdom (UK), and more recently in the Middle East.

EHR adoption in the UK

The UK National Health Service (NHS) started adopting EHR technology as early as 1998. The UK has the largest public healthcare system globally and invests relatively less than the United States (US) in its healthcare system (Wilson & Khansa, 2018). In terms of specific laws to govern HIT, the EHR adoption policy, "The National Program for IT (NPfIT), was enacted in 2002 (effective in 2011) and called for a nationwide transfer to paperless health records by 2020. Other targets under this policy included improved interoperability (i.e., streamlining EHR technology across all providers) and the facilitation of healthcare research through retracted (i.e., anonymous) patient data. Following the enactment of the NPfIT was the "Personalized Health and Care (PHC) 2020 Strategy", which had an effective implementation date of 2018. Similar to the NPfIT, the goals were to go paperless, promote interoperability, and facilitate healthcare research. Additional goals were to "allow patients to make more informed decisions about their care" as well as "reduce healthcare costs and improve value" (Wilson & Khansa, 2018, p. 3).

Interestingly, the UK took a more "top-down" approach to implement a national EHR system since it was the central government rather than individual healthcare facilities who signed contracts with EHR technology companies (thereby effectively posing sanctions against competitor companies). However, the top-down approach caused some resistance among critical stakeholders in public health – particularly healthcare administrators and physicians – who felt that they had no say in what EHR technology they would like to adopt. Therefore, hospitals and many other healthcare providers refused to take EHRs seriously (Wilson & Khansa, 2018). Due to its inability to satisfy stakeholders, the NPfIT reportedly failed, resulting in approximately £10 billion in sunk costs (Wilson & Khansa, 2018). Furthermore, the British example demonstrates that "when users are not brought in to new technologies, adaptation becomes extremely difficult" (Wilson & Khansa, 2018, p. 7). This issue has led some researchers (Sheikh et al., 2014) to downplay the success of the UK's NPfIT policy, despite some evidence that points to its success, as discussed below.

Despite the failure of the NPfIT to achieve all its targets, in the UK, EHR adoption did reach 100% in three healthcare jurisdictions: primary care, community care facilities, and long-term hospice care facilities – which is a significant success, not only in and of itself but also in comparison to the US where the EHR adoption rate in primary care was under 30% at that time (Johnson et al., 2014). Much of the UK success has been attributed to rigorous testing of EHR systems, a lifelong (as opposed to "episodic") EHR strategy, and several HIT laws that protect patient data. For instance, some HIT policies that govern EHR systems in the UK include specific privacy laws (e.g., the Computer Misuse Act of 1990 and the Data Protection Act of 1998) to criminalise unauthorised access or use of electronic personal data (Wilson & Khansa, 2018). Additionally, the Data Protection Act allows access to personal health records from healthcare providers to patients requesting their data. Finally, the NHS – the primary governing public health body in the UK – has a three-part code of practice that applies to EHR systems: "(1) Guidelines for record management; 2) Rules for information security management; and 3) Rules of confidentiality, security, and release of personal information" (Wilson & Khansa, 2018, p. 5).

Another successful tactic used by the UK government was the National Network for the NHS (N3). This national broadband network allowed all NHS general practitioner surgeries and acute hospitals to quickly and safely transfer electronic health information (Wilson & Khansa, 2018). Owing to its success, it is being upgraded to the Health and Social Care Network (HSCN) by 2019 to integrate social/community-level care with primary care. In other words, despite seeing some resistance to the top-down EHR implementation process, the UK has demonstrated successful EHR implementation in terms of its interoperability in primary care. These factors form the foundation for best practices related to the implementation and maintenance of EHR systems. Now 100% of all primary care practices in the UK have adopted EHR (Payne et al., 2011). A patient's lifelong records reside with the primary care physician in the UK. Secondary care facilities such as hospitals only store EHRs in a more episodic fashion (Kataria & Ravindran, 2020). Therefore, evaluating adoption rates in primary care are more relevant for this thesis.

EHR adoption globally

In the United States of America (USA), in 2004, US President George W. Bush took an active role in increasing the use of EHRs by passing policies to ensure that most, if not all, Americans would have EHRs within a decade. This goal was driven by the fact that upwards of 100,000 Americans were dying from medical errors every year (Wilson & Khansa, 2018, p. 6). In the USA, EHR adoption was driven further by the implementation of the Health Information Technology for Economic and Clinical Health (HITECH) Act (2009) (Blumenthal, 2009). Methods for increasing EHR use included incentivising medical practitioners by offering opportunities to participate in several insurance and benefits plans (e.g., Medicare, Medicaid, Tridare), and other Federal Health Benefits programs) as well as creating a "new sub-cabinet level position – the national health IT coordinator" to overlook HIT standards and facilitate partnerships between governmental agencies. As a result, the country invested more than $30 billion, and as of 2020, 96% of hospitals have adopted EHR's (Centers for Medicare and Medicaid Services, 2020).

Similar to the UK, the US EHR systems (at least on paper) are governed by HIT policies such as interoperability-related health regulations (e.g. efficient and secure transfers of patient data between facilities), security/privacy laws, and policies to protect patient safety (Wilson & Khansa, 2018). However, while the UK adopted a centrally-driven, top-down EHR implementation process, the US used a more process- and reinforcement-based approach (Davis & Khansa, 2016; Wilson & Khansa, 2018). Instead of telling healthcare providers what technology to adopt, the US government provided a list of the EHR software's functional capabilities.

The US government's approach gave physicians a choice of what EHR system provider they would like to use. However, what made the idea of transitioning to an EHR system enticing were the financial incentives offered to users – thereby igniting competition between private technology firms to inspire innovation and, ultimately, improve service delivery. Although individual office-based practitioners readily adopted EHR systems, larger hospitals did not, owing to one caveat of igniting competition in the private sector: different companies do not like to share their consumer base or allow their software to integrate. What resulted was a complete lack of inoperability between different facilities using different EHR service providers (Davis & Khansa, 2016). Therefore, while actual EHR adoption increased, interoperability remained (and remains) to be an issue in the US.

Canada and Australia were two other forerunners on the global drive for EHR adoption. Australia has started considering EHRs as part of the national e-health strategy as early as the year 2000 and had established a nationwide EHR in 2012 (Xu et al., 2013). Australia has chosen a middle way between the English top-down and the US bottom-up national strategy to EHR implementation (Morrison et al., 2011). According to Morrison et al. (2011), Australia offered the choice on the level of provider and system selection, local consultation, central government support, and national standards for interoperability and system maturity. Australia is now driving attempts to seamlessly integrate data held by different health providers through implementing an opt-out medical record option for its citizens (Kataria & Ravindran, 2020).

In Canada, EHRs have been introduced since 2006 and are now at various stages of implementation, depending on the health strategy in each province. The country's journey into interoperable medical records started in 2001 with the creation of Canada Health Infoway (McGinn et al., 2012). From very early on in the process, Canada has been one of the forerunners in evaluating the adoption and maturity rates of EHR systems (Gheorghiu & Hagens, 2016). The six core domains of integrated EHR availability in Canada are client registry, provider registry, diagnostic imaging, laboratory test results, drugs dispensed and clinical reports. The aggregated data were collected over ten years and is publicly available (Gheorghiu & Hagens, 2016).

EHR adoption in the Middle East

Implementation of EHR in the Middle East started later than in the Western countries. For example, Saudi Arabia's Health Improvement Committee first put health information services on the national agenda in 2000 after a comprehensive review of health care services earlier in the year had highlighted a lack of health informatics as a major challenge in the Saudi health system. The lack of IT infrastructure led to establishing a "five-year national E-health strategy and five-year roadmap" (MoH Saudi Arabia, 2021) in 2008. The programme's objectives were to build a quality health system focusing on patient-centred care guided by unified standards and supported by E-health (Uluc & Ferman, 2016). Since then, Saudi Arabia has been active in developing and implementing EHR systems. In Saudi Arabia, however, medical services are provided in part by the country's ministry of health and through other government agencies and private service providers – all of which use their own EHRs. As a result, Saudi Arabia does not have an integrated national medical records network, which has created several technical and human challenges and barriers (Al-Barnawi et al., 2019).

With these issues in mind, it is worth noting that plans have been put into place by the Kingdom of Saudi Arabia to redress the underlying issues affecting the country's current EHR systems and to establish a "National Model of Care", which will include the application of a wide variety of digital health technologies – including EHRs (Al Kuwaiti et al., 2018). However, these plans are still in their development stages and will not be fully implemented until 2020 (Kingdom of Saudi Arabia, 2017). However, the COVID-19 pandemic has demonstrated that there is still a lack of effective e-health frameworks, including EHR, in place to collect and monitor population health-related data effectively (Alsharif, 2020). When fully implemented, however, this new model of care is expected to facilitate access to health services, improve the quality and efficiency of healthcare services, and promote the prevention of health risks.

Oman is one of the first countries in the Gulf region to fully implement and integrate an electronic health record system (EHRS) in its government hospitals. Like Kuwait, Oman is a Middle Eastern and GCC country with a well-developed healthcare system. Also similar to Kuwait, public healthcare in Oman is regulated by the Ministry of Health (MoH) and is free to citizens and foreign residents (and their families) with work visas. (Al Farsi &West, 2006). EHRs were first introduced in Oman in the early 1990s within primary care centres and were later implemented across hospitals and other secondary/tertiary care centres. Oman made the adoption of EHRs mandatory for all new health centres created after 1999 (Al-Gharbi et al., 2015). By 2004 the project goal was to develop a national healthcare management system that was unified. According to Al-Gharbi et al. (2015), this goal was reached around 2008 when the previously separate primary and secondary care systems were integrated into one system, the Al-Shifa 3plus. Al-Gharbi et al. (2015) claim the system is fully integrated, allowing data transfer between units.

Study setting and population

This research was conducted in Kuwait. Kuwait is a small Middle Eastern country on the Arabian Peninsula, comprising 17,818 km². It shares borders with the Republic of Iraq in the north and west and the Kingdom of Saudi Arabia in the south-west. The Arabian Gulf in the East bounds it. The country has a population of approximately four million, out of which just one third are Kuwaiti. Kuwait has the fifth fastest-growing population worldwide, averaging an annual 4.8%. Life expectancy at birth is at 75.6% for females and 73.3% for males (United Nations, 2021). Currently, expatriate workers make up around 29 per cent of the total workforce in Kuwait (Nagraj, 2021). The demographic imbalance has been a long-standing issue for over fifty years and has been caused by a small population and a call for labour support from outside the country, leading to a demographic imbalance (Nagraj, 2021). The large percentage of foreign residents is because of many expatriates and unqualified skilled workers (UNESCWA, 2015). However, this number has dropped due to the COVID-19 pandemic, which terminated many foreign workers (Nagraj, 2021). According to Nagraj (2021), the Health and Education sector has been most heavily affected by the reduction in numbers of foreign workers as it had previously employed 65 per cent of expatriate workers.

Well-developed access to healthcare in Kuwait is associated with the highest life expectancy (77.2 years) rates among Gulf Cooperation Council (GCC Countries) (Mogli, 2012). Kuwaitis are served by Kuwait's public healthcare system for free or a small service fee. Foreign workers and expatriates are expected to have public insurance to pay for health-related costs (WHO, 2016b). Kuwait heavily invested in providing universal access to healthcare services (Salman et al., 2020). Currently, 70% of the healthcare services are being provided by the public sector, overseen by the MoH (WHO, 2016b).

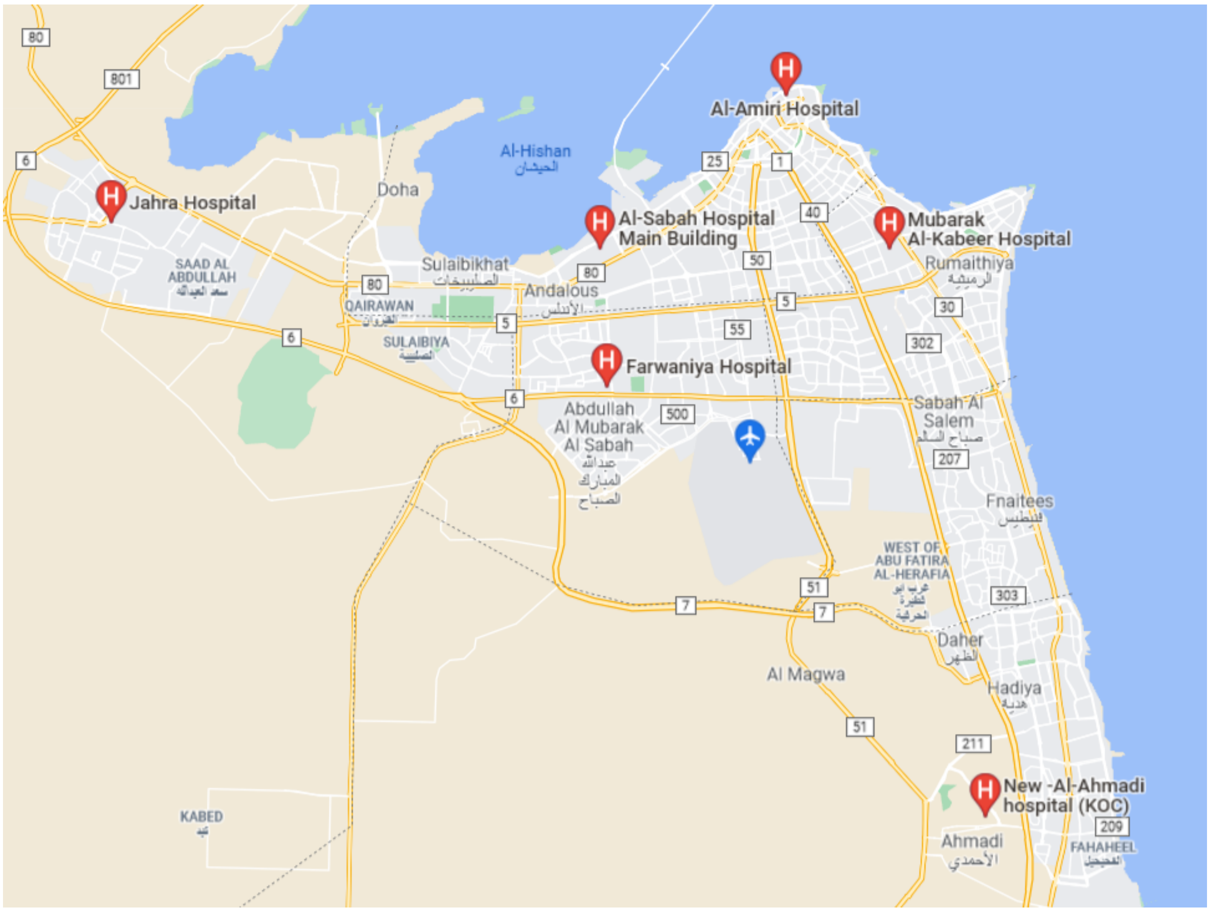
The public healthcare system is organised into Kuwait's six governorates (see figure 1). It is divided into primary (general medicine, unspecialised), secondary, and tertiary (highly specialised) care (Lemay et al., 2018). Primary care encompasses general practitioners, maternity, child and family services, diabetes care, dentistry, nursing, and pharmaceutical care. Secondary care consists of specialist inpatient care, for example, general surgery, obstetrics, and gynaecology. Furthermore, outpatient services emergency and casualty services also fall under the umbrella of secondary care. Finally, tertiary care is provided in twenty specialist centres, specialising, for example, in cancer, rehabilitation, or dermatology. According to the WHO (2016), Kuwait has "one of the most modern health care infrastructures" (p. 1). The primary healthcare system in Kuwait is made up of approximately one hundred primary health centres (predominantly "general and specialised polyclinics"), spread across six health regions:

Kuwait City, Hawali, Ahmadi, Jahra, Farwaniya, and Al Suabah (Conway et al., 2014; Lemay et al., 2018, p. 481; WHO, 2016). The six health regions can be found in Figure 1.2 below.

Figure 1.2 Kuwait Health regions (https://www.netmaps.net/digital-maps/kuwait-political-map/)

Six general MoH hospitals in Kuwait provide secondary care, and more than twenty specialised healthcare centres make up Kuwait's tertiary healthcare system (Ministry of Health [MoH], 2013, as cited in Lemay, 2018). Figure 1.3 shows the locations of the MoH hospitals.

Figure 1.3 MoH Secondary Care hospitals in Kuwait (Source: https://www.google.com/maps)



Despite having a modern healthcare infrastructure with excellent coverage, several challenges have been faced in recent years. For example, increasing life expectancy and the rising socio-economic status of the population meant that the demands to the healthcare sector are increasing (Gulseven, 2016; Younis et al., 2015). One of the significant health challenges in Kuwait is the high prevalence of diabetes which affects around 15% of the Kuwaiti population (International Diabetes Federation, 2019). There is a hope that e-health, including EHR, can be used to support the prevention and treatment of diabetes and other non-communicable diseases (Feroz et al., 2018).

Medical tourism is another issue affecting Kuwait. Currently, the Kuwait City Ministry of health funds travel, living expenses and treatment costs for patients who need treatments that are not available in the country or deemed too complex (Alhendi et al., 2020). It is hoped that e-health could reduce the costs associated with medical tourism (Totten et al., 2016). Another current major challenge to public health is antimicrobial resistance. Multidrug-resistant strains have been reported in the Arab Gulf region (Balkhy et al., 2016), and there is a need for a national strategy to combat antimicrobial resistance (Alghamdi et al., 2018). It is hoped that

EHRs could support and integrate a national surveillance system and an electronic prescribing support system (Salman et al., 2020).

Healthcare Reform in Kuwait

In order to achieve successful healthcare reform, effective adoption of HIT solutions is crucial (Koru et al., 2016). Unfortunately, Kuwait's health sector historically lacked robust IT infrastructure, and there was a particular lack of locally sourced health IT infrastructure to meet the demands of the health sector (Khalfan & Alshawaf, 2003). In order to combat this challenge, Kuwait has invested heavily in mechanisms to expand the digital tools, systems and infrastructure since the early 2000s (Weber et al., 2017). For example, Kuwait established its Central Agency for IT (CAIT) in 2006. CAIT's mission was to build IT infrastructure, develop policies and plans to coordinate the implementation of E-government, including e-health which led to an improvement in sourcing IT locally (Buabbas & Alshawaf, 2019).

The Department of Information Systems (DoIS) is responsible for implementing IT infrastructure, strategies, and policies overseen by the MOH. The DoIS published the first plans for IT infrastructure improvements in 2013. However, efforts to implement IT solutions have been underway for more than thirty years (Alaslawi et al., 2019). The DoIS initially implemented EHRs between 1999 and 2003 in primary care centres (Al-Azmi et al., 2006; Al-Jafar, 2013). The initial focus was on creating one single record system to connect patient records in primary and secondary care (Alaslawi et al., 2019). Following the primary care centres were secondary care hospitals (Alquraini et al., 2007). However, despite widespread EHR implementation efforts, there is a significant variation in these IT solutions' maturity and adoption levels. To date, only two out of six government hospitals have integrated their EHR's with other digital systems such as radiology and laboratory information systems (Alhuwail, 2020). EHR implementation in secondary care hospitals has been made mandatory by DoIS as part of the information management standard (Alhuwail, 2021). Unfortunately, the data available on the outputs and performance of healthcare organisations, for example, the number of outpatient visits or patient admissions per hospital, is limited. In addition, there is no public data available confirming to what extent individual hospitals have implemented EHR (Alhuwail, 2021). However, Alhuwail’s (2020) study using anonymised data suggests that only three out of six government secondary care hospitals currently have fully functioning EHRs. Alhuwail’s (2020) study also indicates a need for all hospitals surveyed to develop an information management plan and invest in staff training.

Some steps have been taken to evaluate these programs' success more formally. For example, the Quality and Accreditation Directorate (QAD) at MoH created the National Accreditation

Program for Hospitals (NAPH) in 2008, intending to create globally recognised maturity standards for IT systems and health information management (Alhuwail, 2020). The NAPH is based on Accreditation Canada's Client Centred Accreditation Program (Ladha-Waljee et al., 2014). It is hoped for the NAPH to contribute significantly to improving care quality and patient safety.

Despite heavy investment in its health sector, the most significant strategic challenges remain to facilitate the shift from curative to preventative services and increase the connectivity between different health services and systems (Conway et al., 2014, p. 45). Kuwait's public health policymakers are often challenged to meet patients' expectations for care that meet international standards (Alaslawi et al., 2019; Conway et al., 2014). Some reasons include an emphasis on treating established diseases "in an episodic fashion," "investment in curative rather than preventative services" and healthcare delivery that has "limited connectivity between primary and secondary care systems" (Conway et al., 2014, p. 45). It is hoped that EHRs can make a significant contribution to tackling these challenges by increasing connectivity between systems, automating data collection and reducing costs by not having to duplicate tests and examinations (Alhuwail, 2020; Alkhaledi et al., 2020).

The challenge of EHR implementation is possibly more pressing in the secondary care sector than in the tertiary care sector (Alhuwail, 2021). Whilst tertiary care usually provides a more focussed range of services, secondary care services need to respond to a wider variety of customer and patient needs. According to Alhuwail (2021), the increased complexity in secondary care service delivery might be one of the reasons why tertiary care centres were, on average, more able to improve their compliance with quality standards and the information management plan.

1.5 Statement of the problem

Despite the strong impetus from the Kuwait government for the better integration of information systems across all sectors, the adoption of EHR systems in Kuwait's healthcare has been limited, with only two government hospitals integrating their EHRs with other digital systems such as radiology and lab information systems, while other institutions were only adopting fragments of digital solutions (Alhuwail, 2020; Alkhaledi et al., 2020). Given the specific healthcare challenges in Kuwait and the recent investment in new hospitals to meet these challenges, there is a pressing need to identify the significant issues, challenges and barriers affecting the current use and adoption of EHRs in Kuwait secondary care public hospitals.

1.6 Significance of the study to the field of Health Informatics

Health informatics can broadly be understood as the study and application of how IT is used in the health sector. According to Imhoff et al. (2001), heath informatics is more than the simple application of IT in the health care setting. According to the authors, health informatics is health information management, and health informatics has become increasingly important since HCPs are dealing with increasing information overload. Health informatics is therefore crucial in supporting clinical decision making.

An essential part of health information management is better understanding how humans interact with health IT. However, there is a lack of research on EHR adoption and use in Kuwait, particularly on user perspectives and experiences. Almutairi (2011) conducted the only study which explored benefits and barriers to EHR adoption and identified strategies for EHR implementation. However, this study was conducted in a different setting, in primary care and was conducted in 2011. Almutairi's (2011) study found that improving timely access to medical records, delivery of chronic illness care and the overall quality of care to the patient were perceived as the most important facilitators to EHR adoption by primary care HCPs and policy makers. Furthermore, Almutairi (2011) found that barriers to EHR adoption were EHR not improving communication with patients, lack of EHR awareness, system maintenance, system downtime, loss of clinical data and not sharing medical information, lack of computer skills and experience.

One more recent study on health information management practices in Kuwait public hospitals was carried out by Alhuwail (2020). Alhuwail's (2020) study focused on uncovering the status quo of information management practices in public hospitals and offering recommendations to improve them. Alhuwail's study analysed qualitative and quantitative accreditation related data pertaining to compliance with the information management standard. The study found that public hospitals are making progress in compliance with information management standards. However the study found that there are issues with developing and implementing an information management plan, involving the appropriate stakeholders in selecting health IT solutions and access to the internet. Alhuwail's study made an essential contribution to more widely evaluating health information management practices in Kuwait's public hospitals. However, Alhuwail's study did not focus on evaluating EHR acceptance specifically and did not explore user experiences and perceptions.

The present study contributes to the current knowledge and addresses gaps in knowledge around EHR use and adoption in Kuwait by adding to the knowledge base on facilitators and barriers to EHR adoption and use in Kuwait. Kuwait is an example of a high per capita GDP county that faces information management challenges. Insights from this study can inform health information management and health informatics research and practice in other developing and developed countries.

1.7 Aims

Within this context, this thesis aims to contribute to these knowledge gaps. The study has four main aims:

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals
2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in three government hospitals
3. To understand perceived barriers to the EHR from the perspective of secondary care staff
4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

1.8 Research methodology and methods

A mixed methods research approach taken was taken to explore these aims. This thesis adopted a convergent mixed-methods design consisting of a qualitative and quantitative study. The qualitative and quantitative studies were designed, conducted and analysed independently. The quantitative study was conducted as a cross-sectional survey with 399 Healthcare professionals in six public hospitals in Kuwait. It used the TAM 2 questionnaire to collect data. The data were analysed using statistical analysis. The qualitative study consisted of two phases. The first phase was a series of semi-structured interviews with thirty Health Care Professionals (HCPs) in three public hospitals in Kuwait. The data were described and interpreted using hermeneutic analysis. Phase two of the qualitative study consisted of three brief semi-structured interviews with healthcare leaders who had successfully implemented EHR in their respective institutions. In a last step, the results from the quantitative study and the findings from the qualitative study were interpreted by comparing and contrasting as suggested by Creswell and Creswell (2018).

1.9 Summary

This introduction provided an overview of the structure of the thesis. It introduced the research topic and situated it in a specific context. Following that, it provided an overview of the research problem and the specific aims of the thesis. Furthermore, it provided an overview of the methodology and methods used. Finally, it listed the contents of each chapter.

2 Chapter Two: Scoping review of existing research into the facilitators and barriers concerning EHR adoption and use

2.1 Introduction

The previous chapter provided the context and the rationale of the research. This chapter presents a scoping review of the existing literature following a systematic approach. It explores **existing research into the facilitators and barriers concerning EHR adoption and use**. The scoping review of the literature was used to understand gaps in existing research. Those gaps in existing knowledge informed the research aims.

Scoping reviews describe existing literature and other sources of information and commonly include findings from different study designs and methods (Davis et al., 2009). Furthermore, as Munn et al. (2018) note, scoping reviews are often used where the review aims to identify knowledge gaps and scope a body of literature, mainly aiming to point out the types of available evidence in a field. It was decided to use a scoping review methodology for this thesis as it has a broader scope and more expansive inclusion criteria than for example a systematic review. Hence a scoping review methodology was most suitable for the purpose of this study. Tricco et al. (2018) developed a reporting guideline for scoping reviews, the PRISMA Extension for Scoping Reviews (PRISMA-ScR). The authors provided a checklist with twenty essential reporting items and two optinal items addressing structure and summary, rationale, objective, eligibility criteria, information sources, search, evidence selection, data charting, data items, critical appraisal of evidence, synthesis of results, summary of evidence, limitatios and conclusions. The PRISMA-ScR checklist utilised to quality assess papers for this scoping review can be found in Appendix B.

The chapter begins by stating the specific aims of the literature review before discussing the methods used to undertake the review, including study selection and eligibility, information sources, and the search strategy. The key findings of the review are summarised and presented thematically. The chapter ends by identifying gaps in knowledge and research and explaining how these informed the aims of this study.

2.2 Aims of the Literature review

This scoping review has three main aims. These are to:

1. Synthesise existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within the existing literature
2. Synthesise existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within Kuwait

3. Identify gaps in existing knowledge and research to inform research aims

2.3 Study identification and eligibility

As a first step, inclusion and exclusion criteria were established. Publications that met the following criteria were included:

(1) was published between January 2011 and October 2021;

(2) examined facilitators and barriers influencing the adoption or use of EHR in healthcare prior to, during and after implementation

(3) the publication was written in English language and either a peer-reviewed article, doctoral thesis, conference paper or report

The timeframe from January 2011 until October 2021 was chosen because it was assumed that papers published more than ten years ago would have been too outdated, not sufficiently taking into account the technological development in the sector. Undergraduate or Masters level dissertation research, conference posters, blogs, websites and technical papers were excluded from the search. Studies were excluded if they were not concerned with EHR uptake or acceptance. For example, they only discussed EHR adoption concerning financial benefits or medical error reduction. The scoping review aimed to examine the views of all health care professionals to gain a broad insight into facilitators and barriers affecting all staff groups. It encompassed published literature concerned with the Primary, Secondary and Tertiary Health Care Sector. Whilst this thesis focuses on adoption in the Secondary Care sector, it was essential to gain a more in-depth understanding of facilitators and barriers on all three levels of health care provision.

Key questions that were guiding the scoping review were:

- What facilitators and barriers influence the adoption of EHR?
- What facilitators and barriers influence the use of EHR?

2.4 Information sources, search strategy and analysis

Five databases were accessed to search for relevant literature: Web of Science, Cochrane Library, PubMed, Cumulative Index to Nursing & Allied Health Literature (CINAHL) and the Applied Social Sciences Index and Abstracts (ASSIA). The databases were chosen because they encompassed published literature across academic disciplines, namely health sciences, health Informatics, management studies and social sciences.

Table 2.1 presents a description of each database and its scope.

Table 2.1 Scope of Databases

Database	Description	Scope
Web of Science (http://wok.mimas.ac.uk)	A scientific citation indexing service that provides a comprehensive citation search encompassing science, social science, arts and humanities; includes: Science Citation Index, Social Science Citation Index, Arts and Humanities Citation Index, Conference Proceedings	International scope, no full-text articles, coverage from 1970 onwards, weekly updates, conference database from 1990
Cochrane Library https://www.cochranelibrary.com	leading journal and database for systematic reviews in health care; includes Cochrane Database of Systematic Reviews (CDSR), Cochrane Central Register of Controlled Trial (CENTRAL), Cochrane Clinical Answers	International scope
PubMed https://pubmed.ncbi.nlm.nih.gov/	Biomedical and life science literature includes MEDLINE, PubMed Central (PMC) and Bookshelf	International scope, includes articles published since 1996
Cumulative Index to Nursing & Allied Health Literature (CINAHL) https://www.ebsco.com/products/research-databases/cinahl-complete	The A database indexing literature related to all aspects of nursing, midwifery and allied health.	International scope, 5.2 million records from 5000 journal titles, some full texts articles
Applied Social Sciences Index and Abstracts (ASSIA) https://about.proquest.com/en/products-services/ASSIA-Applied-Social-Sciences-Index-and-Abstracts/	abstracting tool covering health, social services, psychology, sociology, economics, politics, race relations and education.	Records from over 500 journals published in 16 different countries, including USA and UK

The search in each database was limited to publications from January 2011 until October 2021. Relevant keywords were: ***Electronic health record, barrier and facilitator.*** Synonyms or similar alternative words for these search terms were included by using Boolean operators.

An example of the string of search terms used to search Web of Science title, abstract, and keywords can be found below:

(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS) AND (Barrier* OR Facilitator) AND (Adoption or Implementation)

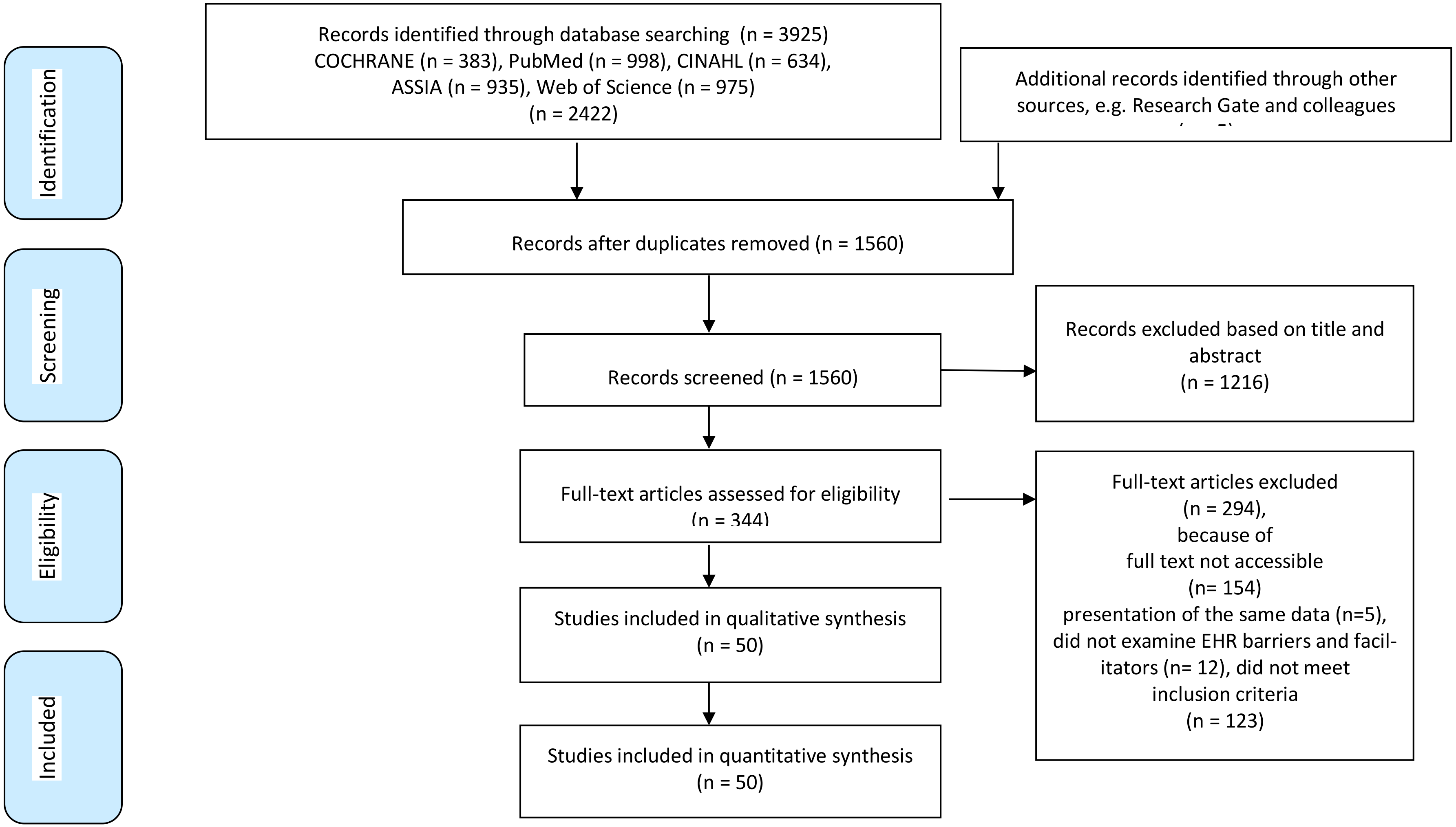
According to the inclusion criteria, searches were limited to the time period from 2011-to 2021. Several searches were conducted in each database, using a systematic process of adding and removing keywords until the results were relevant to the questions guiding the scoping review. A complete overview of all the searches conducted and the process of determining the final search terms in all five databases can be found in Appendix C.

The initial database search took place in February 2018. Following the initial search, an alert was set up in all the searched databases, which notified the researcher when new literature was published that matched the search criteria. These new papers were added to the scoping review following the method described. All databases were searched again in October 2021 to include more recent publications.

Overall, 3925 relevant publications were identified through database search. The next step of the scoping review was to identify relevant literature by removing duplicates and screening the title and abstract of the remaining publications for relevance. The full text for the remaining 344 publications was accessed following the screening process to determine eligibility. Finally, the bibliographies of all relevant publications were searched for additional relevant publications. Fifty articles were accessible and met eligibility criteria. Those are included in the scoping review.

Figure 2.1 below shows a PRISMA diagram detailing how publications were identified, screened and reviewed for eligibility

Figure 2.1 PRISMA Diagram according to Moher et al. (2009)



As a next step, a standardised charting form was developed to capture the following domains: Publication details (Authors, year and country), Study design (if applicable), Type of review (if the publication was a literature review), Setting (Primary Care, Secondary Care, Tertiary Care), staff group focus (Doctors, nurses, administrative staff, health care professionals, management and leadership), purpose and objective of the article, key findings. The charting form can be found in Appendix D. The scoping review results were synthesised by identifying themes across papers using thematic analysis. The findings were groups into themes. The synthesising phase provided an opportunity to validate individual papers' findings and critically examine inconsistencies, contradictions, or lack of clarity across all papers reviewed, for example by examining how individual papers addressed each theme.

2.5 Key findings from the scoping review

Overall, the scoping review included fifty publications. Of these publications, 44 were peer-reviewed journal articles. The remaining publications were review articles (2), conference papers published in conference proceedings (2), one PhD thesis and one report. Out of all publications reviewed, 35 were empirical studies, eleven were literature reviews, and four were descriptive publications. The empirical studies included in the scoping review consisted of twenty-eight cross-sectional study designs, four longitudinal designs and three case studies. Among the empirical studies there was a clear dominance of quantitative studies (27), using survey type questionnaires. Four studies used a qualitative study design (Davis and Khansa 2016, McAlearney et al. 2012, McCullough et al. 2014 and Cucciniello et al. 2015) and four studies utilised a mixed-methods approach (Dastagir et al. 2012, Pantaleoni et al. 2015, Alhuwail 2020 and Ancker et al. 2013).

More than half of the empirical studies (18) focussed on the US healthcare sector. Only four studies were concerned with facilitators and barriers to EHR use and adoption in Kuwait (Alhuwail, 2020; Ali et al., 2015; Almutairi, 2011; Buabbas & Alshawaf, 2019).

Table 2.2 provides an overview of the individual papers which formed part of the eleven literature review papers included in the scoping review of fifty publications in total. This table shows the existing research that was of high enough empirical quality to be included in either systematic or other types of literature review. The table shows the type of literature review, details on the number of papers reviewed and the range of publication dates included, country focus and objective of the review.

Table 2.2 Overview of individual empirical papers included in Literature Reviews

Author(s)	Year of Publication	Type of literature review	Literature reviewed	Country focus	Objective
Jeyakumar et al.	2021	Systematic review	17 articles, published until 2019	worldwide	To understand the most effective educational strategies and approaches to enable health care providers to use an HIS optimally.
Alanazi et al.	2020	Systematic review	14 articles, published between Jan 2006 and Dec 2017	GCC	To understand Health Care Professionals perceptions about the Adoption and Use of EHRs in GCC countries
Alkhaledi et al.	2020	Literature review and content analysis	172 articles, published between 2009-2019	GCC	To examine the challenges and barriers affecting the use and adoption of EHR by GCC countries.
Alaslawi et al.	2019	Narrative literature review	30 studies (published up until Oct 2017)	Kuwait	To explore Kuwait's current e-health tools and applications and the factors that affect their adoption and implementation.
Weber et al.	2017	Systematic review	306 articles, published up until December 2014	GCC	To retrieve all research on e-health in the GCC and to categorize and analyse it qualitatively to reveal the current state of e-health research and development in the region.
Kruse et al.	2016	Systematic review	31 articles, published between Jan 2012 and Jan 2015	USA	To compile a current and comprehensive list of facilitators and barriers to the adoption of the EHR in the United States.
Strudwick et al.	2015	Scoping review	12 articles, published between 2003 and 2015	Middle East	Using the technology acceptance model and the DeLone and McLean model for information system success, the authors have reviewed the published studies that have applied these models to both nurses and electronic health records.
Ben-Zion et al.	2014	Literature review and prescriptive analysis	published between 2001-2013, does not state how many studies included	USA	To propose critical success factors for electronic health record adoption.
Ajami & Bagheri-Tadi	2013	Sub-systematic literature review	27 articles (time frame not specified)	worldwide	To determine barriers perceived by physicians to the adoption of EHRs.
Boonstra and Broekhuis	2012	Systematic review	22 articles, published between 1998 and 2009	worldwide	To identify, categorize, and analyse barriers perceived by physicians to the adoption of Electronic Medical Records (EMRs) in order to provide implementers with beneficial intervention options.
McGinn et al.	2011	Systematic review	60 articles, published between 1999 and 2009	worldwide	To synthesize current knowledge of the barriers and facilitators influencing shared EHR implementation among its various users

2.5.1 Existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within the literature

Table 2.3 provides an overview of the barriers and facilitators identified in the scoping review. They were synthesised into four domains: external, infrastructural, organisational, technical and Individual barriers and facilitators. The overview demonstrates how some factors, such as training or EHR system and functionality, could be identified as barriers or facilitators simultaneously.

Table 2.3 Overview of barriers and Facilitators to EHR adoption and use

	Barrier	Facilitator
External factors		
Socio-demographic and socio-political background	Boonstra and Broekhuis 2012, Iqbal et al. 2013, Jones and Furukawa 2014, Xierali et al. 2013	Abramson et al. 2013, Ancker 2013, Kruse 2016, Iqbal et al. 2013, Shen et al. 2012
National, regional and inter-organisational support	Shen et al. 2012, Wilson and Khansa 2018, McCullough et al. 2014	Dastagir et al. 2012
Vendor related factors	Ajami & Bagheri-Tadi 2013, Ajami & Bagheri-Tadi 2013, Boonstra and Broekhuis 2012, Ozair et al. 2015, Abramson et al. 2013, McCullough et al. 2014, Wilson and Khansa 2018	McCullough et al. 2014
Infrastructural		
Resources, cost and incentives	Ajami & Bagheri-Tadi 2013, Alanazi et al. 2020, Alkhaledi et al. 2020, Audet et al. 2013, Ben-Zion et al. 2014, Khalifa 2013, Boonstra and Broekhuis 2012, Kirkendall et al. 2013, McGinn et al. 2011, Shen et al. 2012, Wang and Biedermann 2012, Alpert 2016, Abramson et al. 2013, Wilson and Khansa 2018, Abramson et al. 2013, Ajami & Bagheri-Tadi 2013, Cheung et al. 2016	Audet et al. 2013
Data entering, storage, reliability and data exchange	Ajami & Bagheri-Tadi 2013, Alaslawi et al. 2019, Davis and Khansa 2016, El Mahalli 2015, Strudwick et al. 2015, Ozair et al. 2015, Wilson and Khansa 2018, Kirkendall et al. 2013, Boonstra and Broekhuis 2012), Ben-Zion et al. 2014, Almutairi et al. 2011	Alaslawi et al. 2019, Almutairi et al. 2011, Kirkendall et al. 2013, Yontz et al. 2015
IT infrastructure and technical support	Ajami & Bagheri-Tadi 2013, Yontz et al. 2015, Boonstra and Broekhuis 2012, El Mahalli 2015, Ajami & Bagheri-Tadi 2013, Mogli 2012, Almutairi et al. 2011, Alhuwail 2020, Alkhaledi et al. 2020, Alpert 2016, Audet et al. 2013	Strudwick et al. 2015, Abdullah et al. 2016, Dastagir et al. 2012
Organisational		
Leadership and management	Boonstra and Broekhuis 2012, Alhuwail 2020	Alpert 2016, Ben-Zion et al. 2014, Kirkendall et al. 2013, McCullough et al. 2014
Organisational culture and user engagement	Boonstra and Broekhuis 2012, Kirkendall et al. 2013, Cucciniello et al. 2015, Alaslawi et al. 2019, Alhuwail 2020, Ajami & Bagheri-Tadi 2013	Pantaleoni et al. 2015, Kirkendall et al. 2013, Cucciniello et al. 2015, Dastagir et al. 2012, McAlearney et al. 2012, Jeyakumar et al. 2021
Service quality, workflow and workload	Ajami & Bagheri-Tadi 2013, Alanazi et al. 2020, Davis and Khansa 2016, McCullough et al. 2014, Top et al. 2012, Shaker et al. 2015, Shen et al. 2012, McGinn et al. 2011, Mogli	Kirkendall et al. 2013, Dastagir et al. 2012, Abdullah et al. 2016

	Barrier	Facilitator
	2012, Yontz et al. 2015, Al-Jafar 2013, Boonstra and Broekhuis 2012, Almutairi et al. 2011, Cheung et al. 2016, McGinn et al. 2011, Cheung et al. 2016	
Training	Ajami & Bagheri-Tadi 2013, Alanazi et al. 2020, Alaslawi et al. 2019, Ali et al. 2015, Alkhaledi et al. 2020, Alpert 2016, Top et al. 2012, El Mahalli 2015, Yontz et al. 2015	Stroup et al. 2017, Yontz et al. 2015, Davis and Khansa 2016, Dastagir et al. 2012, McAlearney et al. 2012), Pantaleoni et al. 2015, Vuk et al. 2015, Jeyakumar et al. 2021
Technical		
Type of EHR system; features and functionality	McGinn et al. 2011, Boonstra and Broekhuis 2012, Wilson and Khansa 2018, Ajami & Bagheri-Tadi 2013, El Mahalli 2015, Davis and Khansa 2016, Kahouei et al. 2015, McCullough et al. 2014, Pfoh et al. 2011, Alpert 2016), Alaslawi et al. 2019, Almutairi et al. 2011, Kirkendall et al. 2013	Davis and Khansa 2016, Buabbas and Al-Shawaf 2011, Davis and Khansa 2016
Security and privacy	Ajami & Bagheri-Tadi 2013, Alanazi et al. 2020, Alaslawi et al. 2019, Ben-Zion et al. 2014, Boonstra and Broekhuis 2012, McGinn et al. 2011, Weber et al. 2017, Wilson and Khansa 2018, Ozair et al. 2015	Iqbal et al. 2013, Ozair et al. 2015
Interoperability	Abramson et al. 2013, Ajami & Bagheri-Tadi 2013, Boonstra and Broekhuis 2012, McGinn et al. 2011, Wilson and Khansa 2018	Alpert 2016
Individual		
Sociodemographic factors	Cheung et al. 2016, Bahnassy 2018	Cheung et al. 2016, Jamoom et al. 2013
User knowledge and experience	Hasanain et al. 2015, McGinn et al. 2011, Stroup et al. 2017, Ajami & Bagheri-Tadi 2013, Alasmary et al. 2014, Almutairi et al. 2011, Alpert 2016, Boonstra and Broekhuis 2012, Kahouei et al. 2015, Bahnassy 2018, Alaslawi et al. 2019, Cheung et al. 2016	Kahouei et al. 2015, Bahnassy 2018, Iqbal et al. 2013, Kirkendall et al. 2013, Cheung et al. 2016, Alpert 2016, Top et al. 2012
User attitudes and perceptions	Alkhaledi et al. 2020, Iqbal et al. 2013, Kirkendall et al. 2013, Shaker et al. 2015, Ben-Zion et al. 2014, Davis and Khansa 2016, Hasanain et al. 2015, Boonstra and Broekhuis 2012, Alaslawi et al. 2019	Alpert 2016, Pfoh et al. 2011, Strudwick et al. 2015, Alaslawi et al. 2019, Iqbal et al. 2013, McGinn et al. 2011, Kirkendall et al. 2013, Cucciniello et al. 2015
User participation, engagement and support	Boonstra and Broekhuis 2012	Cucciniello et al. 2015, Kirkendall et al. 2013, Boonstra and Broekhuis 2012

2.5.1.1 External barriers and facilitators

External factors identified from the scoping review synthesis were barriers and facilitators concerning the socio-demographic and socio-political background, i.e. size, type and location of the organisation, population served. Furthermore, those were barriers and facilitators concerning national, regional and inter-organisational support or vendor related factors.

The socio-demographic background and socio-political location, for example, size, type and location of the organisation implementing and using EHR or the population served, can be an essential factor influencing adoption and use (Abramson et al., 2014; Ancker et al., 2013; Boonstra & Broekhuis, 2010a; Iqbal et al., 2013; Jones & Furukawa, 2014; Kruse et al., 2016; Shen et al., 2012; Xierali et al., 2013).

Size, type, and location of an organisation act as barriers to EHR implementation and use, particularly in clinics with a higher number of outpatient visits (Iqbal et al., 2013). Furthermore, Xierali et al. (2013) have demonstrated for the primary care sector that medically underserved locations are less likely to adopt EHR, areas with health professional shortage areas less likely to adopt EHR, and small practices less likely to adopt. A systematic review of current facilitators and barriers to adoption in the USA by Kruse et al. (2016) found that costs can serve as impediments to adopting EHR systems – particularly for smaller and rural healthcare facilities, which often experience the added challenge of accessibility to sufficient internet/bandwidth and technological services to operate EHR systems properly. Furthermore, the systematic review (Kruse et al., 2016) demonstrated that smaller healthcare centres, rural areas, and centres with high numbers of low-income patients tend to experience more difficulty adopting the EHR system. Even with federal or state governments' investments to facilitate EHR adoption, many smaller centres still encounter barriers to its incorporation (Jones & Furukawa, 2014).

Other studies identified the size of an organisation as a facilitator to EHR adoption and use (Abramson et al., 2014; Ancker et al., 2013; Iqbal et al., 2013; Kruse et al., 2016; Shen et al., 2012). It was found that bigger hospitals with more beds available were more likely to implement EHR (Abramson et al., 2014) successfully. Jones & Furukawa (2014) recommend that government policies devised to promote the adoption and implementation of EHR systems should target barriers to its implementation – such as targeting assistance towards healthcare centres in poverty areas, building the capacity to operate EHRs, and providing technical support in EHR implementation (Jones & Furukawa, 2014). However, care needs to be taken to recognize that, where EHRs are concerned, a "one size fits all" approach does not often work; there is a risk that government policies, broadly applied, can lead to management barriers insofar as they create expectations and requirements for healthcare facilities that their administrators are not equipped to address (Wang & Biedermann, 2012).

National, regional and inter-organisational support plays an essential role in adopting and using EHRs. A lack of support can act as a barrier, for example, if there is a lack of implementation guidelines, as demonstrated by Shen (2012) for the US Secondary Care sector. Wilson and Khansa (2018) identified a top-down approach to implementation and a lack of health care standards as a significant barrier. McCullough et al. (2014) identified a lack of area-level exchanges; partner organisations and strong relationships with exchange partners are significant barriers to EHR user participation on the inter-organisational level. Without exchange and strong ties between exchange partners, they found it was difficult to achieve a critical mass of users. Investing in national, regional and inter-organisational support can facilitate EHR adoption and use, as demonstrated by Dastagir (2012) for providing national help-desks as a facilitator for EHR use.

The overall lack of technical and expert support offered by vendors has been identified as a barrier (Ajami & Bagheri-Tadi, 2013). An additional concern is that medical facilities must also weigh the cost of creating their EHR system – something that most simply do not have the capacity or resources to do – versus adopting an existing, external system from a vendor. In the latter case, costs are not just limited to the vendor's initial price but can include post-sale costs such as coordination, monitoring, governance, and upgrade costs (Ajami & Bagheri-Tadi, 2013). In addition to that, using an outside vendor for an EHR system is often at the root of privacy issues (Ozair et al., 2015). Finally, a lack of competition between vendors can be a significant barrier (Abramson et al., 2014; McCullough et al., 2014). Not only is there not enough competition between vendors to create a customer support oriented product but there is also a lack of cooperation between different system providers due to market factors (Wilson & Khansa, 2018). Correspondingly, McCullough et al. (2014) identified competition between vendors to facilitate successful EHR implementation.

2.5.1.2 Infrastructural barriers and facilitators

The scoping review identified several infrastructural barriers and incentives to successful EHR implementation. Crucial factors were related to resources and costs of EHR, the process of data entering, storage and exchange and IT infrastructure and support.

Among the most prominent infrastructural barriers is the cost associated with implementation and adoption of the EHR (Ajami & Bagheri-Tadi, 2013; Alpert, 2016b; Audet et al., 2014; Ben-Zion et al., 2014; Boonstra & Broekhuis, 2010a; Khalifa, 2013; Kirkendall et al., 2013;

McGinn et al., 2011; Shen et al., 2012; Wang & Biedermann, 2012). For instance, there are financial costs associated with EHR implementation (Wilson & Khansa, 2018). Once implemented, the ongoing cost of administrating, controlling, maintaining, supporting the EHR system can prove expensive and often serve as a barrier to physician and staff buy-in (Abramson et al., 2014). Adding to this challenge, physicians often do not have the time to familiarize themselves with the various EHR systems, let alone train in their utilization and implement them (Ajami & Bagheri-Tadi, 2013). Moreover, temporary loss of productivity during implementation and workflow changes can also result in additional financial costs – which, in turn, can disincentivize hospitals and physicians from adopting and implementing an EHR system. There is often no resource available to incentivise EHR use, financially or otherwise, which poses an additional barrier (Abramson et al., 2014; Ajami & Bagheri-Tadi, 2013; Boonstra & Broekhuis, 2010a). A lack of resources can lead to unsuccessful implementation, for example, if an organisation cannot afford the cost of EHR training (Alpert, 2016b) or finds itself unable to provide adequate physical spaces to support staff members in accessing computers (Ajami & Bagheri-Tadi, 2013; Cheung et al., 2013). Resources have been mentioned as a potential facilitator in the context of incentivising staff who adopt and use EHR well (Audet et al., 2014).

Beyond associated costs, data entry into EHR can be time-consuming and labour intensive. Several publications raised the time spent entering data as a barrier (Ajami & Bagheri-Tadi, 2013; Davis et al., 2009; El Mahalli, 2015). Strudwick et al. (2015) pointed out that whilst EHRs can make data entering less time consuming for nurses than with paper-based records, nurses are often expected to keep more detailed records when using EHR and hence have to spend more time on data entry than previously. Additionally, the imputation of patient data into EHRs requires transcribing, which is subject to human error and associated time and labour costs (Ajami & Bagheri-Tadi, 2013), not to mention that the time required to complete this form of labour is not something medical practitioners always have – nor is it a skill they all possess. Consequently, the accuracy and reliability of data are not always a given and loss or destruction of data through human error occurs frequently (Ozair et al., 2015; Wilson & Khansa, 2018). An inability to adequately transfer historical medical records into the EHR system can further exacerbate issues (Wang & Biedermann, 2012). Although, in theory, EHRs should make data exchange and transfer of medical information more convenient, this is not always the case in practice. There is often a lack of data exchange (Wilson & Khansa, 2018) and a lack of adequate protocols for data exchange (Ben-Zion et al., 2014) which act as an additional barrier to EHR.

However, data exchange can also act as a facilitator, for example, when data exchange is working (Kirkendall et al., 2013). Yontz et al. (2015) suggested that the use of barcodes instead of manual entry of charge and supply could be a significant facilitator. For instance, when paper-based, signed information and consent forms are merely added to a patient's file, with EHRs, these forms can be signed electronically (e.g., signature pad) or scanned and then attached to the patient's EHR.

Data related issues are often exacerbated by a lack of technological infrastructure and support (Wang & Biedermann, 2012). Barriers identified in this scoping review included lack of computer access (Ajami & Bagheri-Tadi 2013), poor placement of work stations, too many people using one computer, limited workspace (Yontz et al. 2015), inadequate hardware (Boonstra and Broekhuis 2012), loss of access to medical records due to computer or power failure (El Mahalli 2015), slow network speed (Ajami & Bagheri-Tadi 2013) and a lack of Internet connectivity and access (Ajami & Bagheri-Tadi 2013). Furthermore, a lack of technical support was identified as another barrier (El Mahalli, 2015; Yontz et al., 2015).

However, adequate infrastructure and support can also facilitate EHR implementation. Abdullah (2016) has documented this for technical support. According to Strudwick et al. (2015), nurses use, and acceptance of EHRs was higher if they had access to bedside terminals enabling them to reduce time spent documenting. IT support desks, and on-site non-clinical support staff have also been named important facilitators (Dastagir et al., 2012).

2.5.1.3 Organisational barriers and facilitators

The barriers and facilitators discussed in this scoping review concerning organisational factors are leadership and management, culture and user engagement, service quality, workflow, workload, and training.

A Lack of support from leadership and management can be a significant barrier to EHR implementation (Boonstra & Broekhuis, 2010a). However, leadership and management support has also been identified as facilitator (Alpert, 2016b; Ben-Zion et al., 2014; Kirkendall et al., 2013; McCullough et al., 2014). In addition, the provision of an overall strategy and information management plan has been named one of the critical facilitators of management support (Ben-Zion et al., 2014).

Several studies have found that giving physicians – and, more importantly, entire healthcare teams across multiple stakeholder groups – more agency during the development and implementation phases of HIT advances within their facilities lead to more successful implementation outcomes (McAlearney et al., 2012; Pantaleoni et al., 2015). It was suggested to install EHR peer champions (Cucciniello et al., 2015; Dastagir et al., 2012; Pantaleoni et al., 2015) and to ensure appropriate user communication (Kirkendall et al., 2013) to support an organisational culture that values user engagement and therefore acts as a facilitator for EHR adoption and use. On organisational culture that is not supportive of the change process (Cucciniello et al., 2015), EHR implementation (Boonstra & Broekhuis, 2010a; Kirkendall et al., 2013), or that fails to communicate to and engage with EHR users (Ajami & Bagheri-Tadi, 2013) acts as a barrier to implementation and adoption.

The scoping review identified barriers concerned with service quality. Cheung et al. (2013) note that practitioners do not perceive EHRs during consultations as patient-friendly. Several other publications echoed this finding, naming the impact on the provider-patient relationship as a barrier to EHR use (Ajami & Bagheri-Tadi, 2013; Boonstra & Broekhuis, 2010a; McGinn et al., 2011). In addition to that, there is often a lack of patient acceptance of electronic support systems (Ajami & Bagheri-Tadi, 2013). Physicians report a lack of time to use the EHR (McGinn et al., 2011) and a loss of productivity and decreased job performance due to EHR use (McGinn et al., 2011). The use of computers can be more time-consuming for them – especially in circumstances where there is no technical support, the practitioner lacks the requisite computer skills, and there are significant computer down-times (Cheung et al., 2013). However, the barrier most frequently mentioned was disruptions to workflow and lack of integration of EHR (Ajami & Bagheri-Tadi, 2013; K. Davis et al., 2009; McCullough et al., 2014; Shaker et al., 2015; Shen et al., 2012; Top & Gider, 2012). General service quality (Abdulla et al., 2016), administrative efficiency (Kirkendall et al., 2013) and nurse support (Dastagir et al., 2012) have been identified as facilitators in this context.

Insufficient training and lead time to introduce an EHR system adequately have been identified as one of the significant barriers to EHR adoption and use (Ajami & Bagheri-Tadi, 2013; Alpert, 2016b; Top & Gider, 2012). In addition to the time required for physicians and other medical practitioners to receive the necessary training to use an EHR system, there are notable concerns regarding the sufficiency of practitioners' technical training (Ajami & Bagheri-Tadi, 2013). More specifically, there is often a lack of continuous training (El Mahalli, 2015) or practice time with the new EHR before going live (Yontz et al., 2015). Without sufficient training, there is concern that practitioners are less comfortable with using EHR systems. Some studies have observed that insufficient training can even lead to inefficiencies in the application of EHRs and, in some cases, create the perception that the system is too complicated to be efficient or effective (Boonstra & Broekhuis, 2010). This, in turn, can lead to stronger resistance in adopting the system (Pfoh et al., 2012). Many of the underlying issues affecting the adoption of EHRs can, arguably, be addressed through education and training. Notably, Wang and Biedermann (2012) suggest that training in EHR-related systems mitigates technical support issues by effectively creating that support.

Similarly, training serves as a valuable tool for educating administrators and policymakers alike on the value and benefits of EHRs (Wang & Biedermann, 2012). Unfortunately, far too often, studies have found that miscommunication and misinformation regarding the use and applicability of EHRs can lead to many problems in their implementation and adoption (Ajami & Bagheri-Tadi, 2013). As such, EHR-related training, when properly implemented and supported, can lead to better learning outcomes and meaningful use of EHR systems (McAlearney et al., 2012). To be most effective, training needs to be provided regularly (Wilson & Khansa, 2018), learning needs to be active (McAlearney et al., 2012). Other publications suggest it would be beneficial to offer off-site training (Dastagir et al., 2012) or to involve stakeholders more in the design and delivery of training (Pantaleoni et al., 2015). Vuk et al. (2015) pointed out how simulations enhance physicians' and nurses' levels of self-confidence and preparedness to use. Technical training alone is insufficient for EHRs; formal training, active learning and observation and positive role models should be installed and supported concurrently (McAlearney et al., 2012). Moreover, training programs should incorporate social and cultural considerations into their curriculums to recognize and respect learners' diverse perspectives and understandings of the educational process (Jeyakumar et al., 2021). McAlearney et al. (2012) found that training programs that recognized that different users (or groups of users) have different training needs – and, like this, incorporated multiple approaches into their learning process – were more successful than those that did not. For this reason, much of the literature on EHR training has recommended adopting adult learning theory and social cognitive theory as guiding principles for developing training programs and enhancing reception and adoption of the EHR system (Stroup et al., 2017). Specifically, adult learning theory – a theory that posits that adults "learn better in a problem based and collaborative environment, with more equality between teacher and learner" (Halalau et al., 2016, p. 186)– has been found to engender better learning outcomes by creating situations and settings where "all types of learners [can be] reached" (Pantaleoni et al., 2016, p.86). Similarly, incorporating social cognitive theory – a theory premised on the notion that individuals' behaviours (and perceptions) are informed by a set of psychological constructs that "interact with personal, behavioural and environmental factors" (Rankin et al., 2017, p. 1234) – into EHR training helps emphasize the "positive potential of EHRs" and encourage buy-in through positive reinforcement (Stroup et al., 2017, p.1000).

To this end, some studies have found that peer-led training can positively affect physicians' self-perceived efficiency and effectiveness with EHRs. In addition, peer-led training can positively impact physicians' reported job satisfaction and work-life balance, as such training allows them to engage more thoroughly with the EHR systems – systems that they have to use daily – in a supportive environment (Dastagir et al., 2012). Pantaleoni et al. (2016) added that ensuring the learning environment not only approximates the clinical setting but is close in proximity to the clinic itself facilitates scheduling and aids in ensuring end-user satisfaction.

Where possible, the application of experiential learning or simulation training – through, for instance, the application of standardized patients – can provide practitioners with a more complete and engaged EHR training experience (Jeyakumar et al., 2021). In addition, simulations provide practitioners with a greater sense of self-confidence and higher preparedness when utilizing the EHR system. Moreover, simulations and experiential learning allow for trial-and-error, wherein privacy and patient safety risks can be reduced through practice (Vuk et al., 2015).

McAlearney et al. (2012) suggest that it is often helpful to assess users' skills before introducing training and applying an active learning process. For example, the application of proficiency tests, in conjunction with web-based training modules, learning laboratories, and clinical scenarios/simulations, are effective means of determining practitioners' competencies – and allowing training facilitators to map out a learner's EHR competency before EHR training (Jeyakumar et al., 2021). Similarly, understanding the "distinct workflows" of a clinic's practitioners and groups allows curriculum developers to determine what learning modules can be taught collectively and what aspects should be catered to specific groups or individuals (e.g. administrator relative to a nurse) (Pantaleoni et al., 2016).

2.5.1.4 Technical barriers and facilitators

The following paragraphs discuss some of the technical barriers identified in the scoping review, the role of the type of EHR and its features and functionality and the role that interoperability and privacy play in facilitating or hindering the adoption and use.

Technical facilitators and barriers to successful EHR adoption start with the selection process of an EHR system (Ajami & Bagheri-Tadi, 2013). System design (McGinn et al., 2011), system features (Davis and Khansa 2016, Kahouei et al. 2015, McCullough et al. 2014) and system complexity (Ajami & Bagheri-Tadi, 2013; Boonstra & Broekhuis, 2010a; Davis & Khansa, 2016; El Mahalli, 2015) can act as a barrier to EHR adoption and use. Adoption and use become more difficult if the system lacks reliability (Ajami & Bagheri-Tadi, 2013) for when it is shutting down frequently (El Mahalli, 2015). An unstable system needs more maintenance (Davis & Khansa, 2016; Kirkendall et al., 2013) and will be less useable and accessible (Alpert, 2016b). In addition to that, two studies found that a lack of system customisability was an issue (Boonstra & Broekhuis, 2010a; El Mahalli, 2015). Pfoh et al. (2012) found deficits in tracking health maintenance information and ordering laboratory and radiology tests a significant barrier to EHR use. Unifying platforms would facilitate the use of EHR and appropriate system specifications, such as better integration of lab order collecting and result reporting (Davis & Khansa, 2016).

An underlying goal – and challenge – of EHR systems is ensuring interoperability between systems and users. In its broadest terms, interoperability refers to the "ability of two or more systems or components to exchange information and to use the information that has been exchanged" (IEEE, 1990, as cited by Benson & Grieve, 2016, p.20). In a healthcare context, the benefit of interoperability is that it allows for the provision of information "when and where required, facilitate[s] quicker and more soundly based decision making, reduce[s] waste by cutting out repeated work and improve[s] safety with fewer errors" (Benson & Grieve, 2016, p.3). When properly applied, interoperability can lead to cost-effective results that lead to a greater level of patient care (Abramson et al., 2014). In principle, the interoperability of EHR systems should allow for more efficient and effective healthcare practices; however, interoperability has proven relatively elusive (Abramson et al., 2014; Ajami & Bagheri-Tadi, 2013; Boonstra & Broekhuis, 2010a; McGinn et al., 2011; Wilson & Khansa, 2018). Part of the reason for this elusiveness stems from the relative complexity of interoperability. Specifically, interoperability in the healthcare system can be understood as involving four different layers of complexity – each of which is important for its success: technology, data, human, and institutional.

Within the technology factors is technical interoperability – which refers to transferring data from one system to the next, regardless of distance or the type/nature of shared data (Benson & Grieve, 2016). The data layer encompasses semantic interoperability –that is, the data being transferred is understood by both the sender and receiver (computers and humans). Within the human layer is process interoperability, typified by a shared and common understanding across networks, wherein sharing and communicating data in multiple contexts for the benefit of all is the underlying objective. Where healthcare is concerned, clinical operability – a subset of process interoperability that also overlaps with the institutional layer – refers specifically to the ability of physicians to transfer patient data to other physicians in ways that ensure patients can move between physicians and receive seamless care in the process (Benson & Grieve, 2016).

While, in principle, these various forms of interoperability seem straightforward and in the best interest of all involved, the reality of ensuring cohesion between them all is far from certain. Often there are competing interests between individuals and institutions – such as, for example, vendors insisting on the use of proprietary systems that do not interface with other systems – that make the introduction and application of interoperability in EHRs difficult or impossible (Benson & Grieve, 2016). Additionally, a lack of standards across industries and systems has also created a challenge for the implementation of interoperability (Wilson & Khansa, 2018). This problem is exacerbated by the fact that few – if any – regulatory bodies enforce the compliance of standards (Benson & Grieve, 2016). While users have indicated that the interoperability of EHR systems offers several benefits in terms of access to patient data, this access is often limited as a result of lack of enforced standards; incomplete or fragmented files can (and does) become a regular occurrence (Ajami & Bagheri-Tadi, 2013).

One of the most challenging aspects of maintaining an effective EHR system is privacy – i.e., being able to achieve all its objectives within a private and secure environment and without breaching the privacy and confidentiality of the patient. According to the 2021 Data Breach Investigation report, there was an increase in malware attacks in the US Health and Public Health sector. In the US healthcare sector, 86% of the breaches reported were either due to miscellaneous errors such as human error, Basic web application attacks, or system intrusion (Verizon, 2021). One of the most common data breaches in health care in 2019 occurred by erroneously mailing paperwork to the wrong patient or containing the wrong medical record (Verizon, 2019). In the UK, although there is much hope invested in supporting the nation's long-term "paperless" initiative in healthcare, "many remain doubtful about the ability of the NHS to protect their privacy" (Wilson & Khanada, 2018, p.7). Therefore, EHR implementation strategies must come face to face with (and overcome) an inevitable impasse: saving a patient's life often depends on quick access to patient's medical records; however, if a patients' files "land in wrong hands because of inadequate security safeguards, both patient safety and privacy [can] be compromised" (Wilson & Khansa, 2018, p. 2). Therefore, the biggest challenge for modern healthcare industries that aim to establish advanced HIT systems is the conflicting need to a) *share* and *access* patient information upon request while also b) protect patients' medical records from privacy breaches. For a country like Kuwait (and many other Middle Eastern countries), where the fear of confidentiality and privacy breaches in healthcare is high among the general public (Scull et al., 2014), this challenge will be a complex and vital one to overcome.

Patient privacy violations are another significant risk and concern for patients, given that electronic transfers of information are a possibility with EHR systems. Specifically, there are concerns around the interoperability of information transfers from different systems and a perceived lack of standard protocols for such exchanges (Kruse et al., 2016). Non-users of EHR systems, in particular, have raised concerns regarding the security of their information being stored in such systems – notably as it relates to the privacy and confidentiality of the information in question (Ajami & Bagheri-Tadi, 2013). Interestingly, however, physicians – more than patients – have expressed concerns regarding the potential privacy risks associated with EHR systems. Even amongst physicians who have adopted EHR systems, concern over the safety and privacy of patient data is higher than that of patients (Boonstra & Broekhuis, 2010). This concern suggests a lack of confidence on the part of physicians and underscores the degree to which the security of patient information can affect everyone involved.

Concerns have also been raised regarding the security of interoperable EHR systems (Benson & Grieve, 2016). In particular, there are concerns regarding how EHR systems are being kept secure, when and how the information in these systems are being shared, and to what degree it can be kept confidential (Benson & Grieve, 2016). Privacy and security issues are progressively being treated holistically – that is, privacy is being built into the security expectations of EHR systems (p.84). However, the process of maintaining privacy and security can be challenged by the very nature of an interoperable EHR system and its underlying purpose of sharing patient information. Specifically, Ozair et al. (2015) note that an interface between users and systems is created when two systems are integrated. These interfaces are necessary and highly problematic insofar as they are needed to ensure users can use the EHR system but can create several risks if they are not adequately designed – chief among them being inefficiencies for users and (security) weaknesses that are outside interests can exploit.

Moreover, EHR system interfaces can increase the likelihood of human error – especially amongst those who have not received sufficient training. A lack of proper standards and regulatory enforcements surrounding interoperability can similarly weaken an EHR's overall security (Benson & Grieve, 2016, p.48). Poor interoperability leads to the risk of untimely information sharing and breaches in information security, increasing the risk of conducting medical errors and jeopardizing patient safety (Davis & Khansa, 2016). What can be done to make EHR systems more safe is investing in firewalls and antivirus software and on the organisational level to ensure protective processes such as conducting random audits to ensure compliance and establishing audit trails to track all system activity (Ozair et al., 2015).

2.5.1.5 Individual barriers and facilitators

Individual barriers and facilitators to EHR use and adoption can be sociodemographic, user knowledge and experience or user attitudes and perceptions.

Cheung et al. (2013) found that sociodemographic factors can be facilitators or barriers. Bahnassy (2018) explores this in more detail and found out that lower education levels are associated with less use and adoption of EHRs. According to Jamoom et al. (2013), under 50-year-olds are more likely to adopt EHR successfully.

Studies have found that medical practitioners often lack the computer skills and experience needed to use an EHR system (Ajami & Bagheri-Tadi, 2013; Alasmary et al., 2014a; Alpert, 2016b; Bahnassy, 2018; Boonstra & Broekhuis, 2010a; Hasanain et al., 2015; Kahouei et al., 2015; McGinn et al., 2011; Stroup et al., 2017). A lack of computer knowledge has been most notably noted amongst older generations of physicians and medical practitioners who received their formal education before the widespread adoption of IT programs in the medical field (Boonstra & Broekhuis, 2010). However, it is still noted as a barrier in more recent studies. Correspondingly, computer skills and literacy are named essential facilitators (Bahnassy, 2018; Iqbal et al., 2013; Kahouei et al., 2015). If a user does not only have IT literacy but has significant clinical experience and IT knowledge, they are in an ideal position to use the EHR (Cheung et al., 2013). However, some of the most important individual factors determining whether a user will use the EHR are previous experience using it (Alpert, 2016b) and using the system frequently (Top & Gider, 2012).

A significant impediment to adopting EHRs can also stem from physicians themselves. As physicians are the primary frontline users of EHRs, their willingness to adopt an EHR system can influence whether or not other user groups in the medical field (e.g. nurses and administrative staff) adopt it (Ajami & Bagheri-Tadi, 2013). Whether they perceive the system as easy to use will determine the likelihood of using it (Shaker et al., 2015). User resistance is often identified as one of the factors leading to unsuccessful EHR implementation (Ben-Zion et al., 2014; Davis & Khansa, 2016; Hasanain et al., 2015). Reluctance to adopt a new HIT system has been shown, by Ben-Zion et al. (2014), to increase administrative costs (e.g., programming, data management) and medical errors, thereby offsetting any cost-benefits associated with EHR implementation. Compounding these results is that any advantages in healthcare quality are often difficult to interpret since processes of care (how healthcare is provided) and outcomes of care (e.g., rate of prescribing errors) are not always distinguished or operationally defined in HIT outcome studies.

User attitudes and perceptions have been identified as facilitators of EHR adoption and use. Strudwick et al. (2015) demonstrated this for nurses. Alpert (2016) and Pfoh et al. (2012) demonstrated the general importance of user attitudes for HCPs. Perceived ease of use, perceived usefulness, intention and motivation to use EHR systems have also been found to be facilitators (Iqbal et al., 2013; McGinn et al., 2011). Cucciniello et al. (2015) emphasised the importance of user buy-in and commitment to EHR. Kirkendall et al. (2013) established essential links between user attitudes and job satisfaction. The more satisfied users were with their job, the more able they were to have positive attitudes towards EHR during the transition from a simple computerised order entry system to an entire EHR system.

User attitudes and perceptions of EHR can influence their participation and engagement with the system. User participation and engagement can work as facilitators (Cucciniello et al., 2015), or conversely, a lack of participation and engagement can form a significant barrier to EHR adoption and use (Boonstra & Broekhuis, 2010a). A culture where employees feel understood and supported (Kirkendall et al., 2013) and where there is support available from colleagues (Boonstra & Broekhuis, 2010a) can make users feel like they belong and support them in remaining engaged with EHR system change.

2.5.2 Existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within Kuwait

Deciding what implementation strategies Kuwait can adopt depends on the specific barriers to EHR implementation that the country currently faces. According to previous research in Kuwait (Almutairi, 2011), decision-making professionals believe that the most significant obstacles in the implementation of EHR are "poor application design" and "non-standard and exceptional nature of medical work". Poor application design means that the EHR application/software has been developed by IT personnel without fully understanding the processes and the requirements of the healthcare sector and healthcare professionals. As a result, poor application design leads to gaps between system requirements and system availability. Medical work's non-standard and exceptional nature means that many healthcare professionals have unique employment arrangements that can vary significantly around being part-time, temporary, contractual, or on-call work. The challenge of non-standardisation means that implementing EHRs (e.g., feeding data into a single standard format) can be a challenge across all healthcare professionals and healthcare settings. Almutairi's (2011) research helps identify the barriers to EHR implementation in Kuwait and can be used in light of the lessons learned from other jurisdictions further to understand specific design elements of an EHR implementation program. These can be used to develop critical questions that should be answered before developing a nationwide EHR implementation program.

Mogli (2012) published a report detailing that EHR's have not been successful. His report is based on user feedback and his experience as a Senior Medical Record Consultant and Adviser and visiting WHO Consultant. According to Mogli (2012) inability to achieve expected results after implementing an EHR system largely owes to three factors, which he called the "Three Ts": 1) Team factors; 2) Tactics, and 3) Technology:

1. **Team-related factors**: A general lack of coordination between IT, medical/nursing, and other personnel within the healthcare environment. For instance, the practice of EHRs was inconsistent; existing training manuals were not fully understood, there was an insufficient number of people to train healthcare professionals in how to develop EHRs. Moreover, users were rarely, if ever, given opportunities to contribute to the analysis or redesign of their workflow. The lack of coordination was compounded by many senior physicians being unwilling to receive training and feared wasting time typing EHRs, and finally, older staff members showed an overall resistance towards new technology.
2. **Tactics (process):** Technical support was limited to office hours. Inadequate staff training limited to in-house IT staff demonstrations of how to type EHRs. Additionally, evaluations of newly implemented EHR systems were not carried out from end-user perspectives (e.g., feedback through surveys, interviews, and observations) or a more technological perspective (e.g., reliability, performance metrics, and interoperability). Additionally, one issue that is very important to Kuwaitis is patient privacy and confidentiality; therefore, the finding that legal, security, and privacy issues (e.g., data encryption) were not well considered was a significant issue and barrier to effective EHR implementation in and of itself. Other issues related to tactics and processes included longer patient wait times post-implementation, simultaneous use of paper-based records, and the overall lack of legislation on national EHR policies and guidelines (e.g., the lack of accreditation standards).
3. **Technology:** Overall, high-speed internet was rarely offered, which significantly impacted the use of EHRs. The limited ability to use high-capacity servers, poor IT support and maintenance, and no disaster recovery (i.e., backup recovery systems). Other technological issues included defects in unique identification numbers (UINs) for patients (which posed additional threats to patient privacy and confidentiality), alerts and reminders for medical practitioners, and inadequate hardware to implement EHRs successfully.

Unfortunately, Mogli's (2012) study was merely anecdotal and not supported by a robust empirical data collection framework. It was included because it was the only study exploring implementation barriers at this level of depth. Therefore, these findings – albeit from 2011 and not conducted in a robust fashion – provide a starting point for evaluating the scope of EHR implementation in Kuwait. In addition, they demonstrate several barriers that need to be addressed and several performance metrics that can be used to evaluate the success of EHR implementation.

2.5.2.1 Socio-political level and infrastructure

Policy makers reportedly assess the benefits of a national EHR implementation policy against Kuwait's resource infrastructure. This assessment includes resources (including financial resources) for national broadband services, protecting patient information and privacy, learning which EHR standards are the most appropriate for adopting in Kuwait, improving/updating electronic information sharing systems, setting national awareness campaigns and establishing national e-health governing board. However, recent research by Alanazi et al. (2020) and Alkhaledi et al. (2020) demonstrated that cost is still a significant barrier to successful EHR adoption and use in Kuwait. Furthermore, the time spent on data entry is resource consuming and adds to the workload of HCPs, therefore posing a barrier to EHR use (Alaslawi et al., 2019). For example, a lack of adequate infrastructure, slow network speed (Mogli, 2012) and system downtime (Almutairi et al., 2014) have been named as a barrier almost a decade ago. However, more recent studies confirm there are still barriers concerning IT infrastructure, for example, a lack of internet connectivity and access (Alhuwail, 2020) and a lack of technical support when issues occur (Alkhaledi et al., 2020).

2.5.2.2 Organisational and technical level

Decision-makers (at least as identified by Almutairi, 2011) include hospital administrators and decision-making physicians. They reportedly assess EHR implementation benefits based on uniform standards (i.e., interoperability), whether there is a mismatch between who benefits from the EHR systems and who will have increased workloads from using EHRs, and financial costs associated with EHR implementation (i.e., will they be able to operate an EHR system efficiently and within the budget allocated by the government). Specifically, as Almutairi (2011, p. 361) notes, decision-makers reportedly assess EHR benefits based on whether or not they can:

- Be accessed by multiple users simultaneously;
- Reduce the length of stay for patients at inpatient facilities" (note: the article did not indicate how or why inpatient length of stay is an indicator of EHR system performance or a positive outcome of EHRs; therefore, it is difficult to know, based on this

article, whether decision-makers even understand the full scope of EHR implementation);
- Monitor prescriptions or (unnecessary) examination requests.

On the organisational level, the scoping review of the literature revealed a lack of information management plan or strategy as a particular barrier in Kuwait (Alhuwail, 2020). Furthermore a lack of user and stakeholder involvement (Alaslawi et al., 2019; Alhuwail, 2020).

2.5.2.3 Individual Level

EHR end-users include physicians, nurses and pharmacists – i.e., individuals who will physically use EHRs as part of their daily work. End-users reportedly assess EHR benefits in terms of their awareness (or lack thereof) of EHRs, system maintenance, system downtime, loss of clinical data and frequency of failure of EHRs. While end-users want EHRs to improve patient care's overall quality and safety, they also show concern regarding whether or not EHRs will ultimately increase or decrease their work demands. In other words, similar to decision-makers, end-users are concerned about their productivity and work efficiency (higher perceived workload will result in more resistance towards EHR implementation).

Before implementing any changes in HIT, it is vital to understand the perspectives of all stakeholder groups that will be affected by EHR implementation to understand better any barriers that healthcare administrators will need to overcome as they implement these changes. Unfortunately, there are no recent user attitudes studies on EHRs in Kuwait. Two studies were not relevant for this thesis as they were concerned with patient attitudes to EHR (Al-Azmi et al., 2006; Al-Jafar, 2013). The remaining two studies will be discussed below. They were concerned with nurses (Alquraini et al., 2006) and medical receptionists (Al-Azmi et al., 2009). No studies explored the attitudes of physicians towards EHR's. In addition, no recent studies are exploring HCP user attitudes towards EHRs in secondary care. The most recent studies on EHR user perceptions in Kuwait are Alsaleh and Al-Azmi (2008) and Al Azmi et al. (2009). Those were both cross-sectional studies exploring user attitudes in primary care settings. However, it is known from more recent user attitude studies that user attitude has been a significant barrier to EHR adoption and use in Kuwait (Alkhaledi et al., 2020), particularly perceived ease of use. Alaslawi et al. (2019) corroborated this finding by identifying a lack of workers' responsibility as a barrier to use and adoption. In addition, perceived ease of use has been identified as a facilitator on the individual level (Alaslawi et al., 2019).

EHR studies conducted in the Middle East (and less so in more developed countries) often rely on surveys developed without much prior knowledge about end-user goals, attitudes, and experiences. Another issue with using surveys is that the main line of evidence used in the EHR evaluation is a self-reported measure rather than a more objective evaluation of impacts and outcomes. Furthermore, none of the studies (to the researcher's knowledge) have used longitudinal designs (to assess long-term satisfaction and EHR use over time) or experimental designs (e.g., by assessing patient satisfaction, administrative efficiency, and other outcome measures in control versus a test group).

Finally, very little research discusses how health policies specific to the country affect the use of EHR and, in turn, how EHR implementation affects health administration and policy. For example, even though the importance of patient privacy and confidentiality has been discussed at length among academics in Kuwait and the Middle East more broadly – specifically concerning mental health care, but also to primary health care in general (Almazeedi & Alsuwaidan, 2014; Kaladchibachi & Al-Dhafiri, 2018; Scull et al., 2014) – no research, particularly in Kuwait, looks at how this impacts the secure use of EHRs. Issues such as security breaches, data misuse, patient data analysis rights, secure data transfers within internal servers and between external healthcare facilities (e.g., between primary and secondary healthcare facilities), and, finally, the governing laws that outline all these factors and establish penalties/consequences for breaching EHR security policies all need to be formally established (Meingast et al., 2006). This falls equally within the domain of healthcare research as it does of public policy; health care professionals, researchers and other academics and policymakers need to establish more precise guidelines for governing the use of EHRs in Kuwait.

The scoping review reveals that the research is older in origin, and there is generally not a significant research base around EHR users and attitudes in Kuwait. In conclusion, the research base on EHRs is generally more limited in Kuwait than in countries like the UK or the USA. Moreover, only a handful of empirical research studies concerned staff perspectives on EHRs. However, the existing studies indicate that staff attitudes are generally positive, and users do not feel resistant to using EHR. Only one study (Mogli, 2012) explored EHR barriers in the context of Kuwait. This study demonstrates how barriers to EHR use are always context-specific, i.e. even if some of the barriers and issues with EHR are being observed across the globe, the specific local factors and strategies to deal with those are vastly different in different contexts.

The most crucial knowledge gaps concerning this thesis are the general lack of studies on the specific Kuwaiti context. Moreover, there is a lack of studies discussing links between EHR user attitudes and the specific conditions and contexts of EHR use in Kuwait.

2.6 How the scoping review informed research aims

The notion that advances in HIT can improve patient safety, increase efficiency in healthcare organizations, and decrease human resource shortages (re: automation) should be viewed in light of some caveats. As shown in the previous sections, attempts to integrate new technology – particularly in short-staffed, high-stress, and fast-paced environments such as healthcare – can result in healthcare professionals' resistance to (and in some cases, intimidation by) new computer technology. Additionally, it can decrease office performance and, in some cases, increase medical errors (Kruse et al., 2016). This scoping review has demonstrated that implementing an EHR system is just as (if not more) important than the actual EHR system itself. Therefore, the most imperative factors that healthcare administrators and policymakers need to consider are 1) what barriers to EHR implementation exist; and 2) how these barriers (discussed below) can be mitigated.

This thesis aims to address the problem that despite many known advantages of EHR systems, there is often underuse of the full potential of EHR systems following implementation (Boonstra & Broekhuis, 2010b; Gans et al., 2005). In addition, whilst there has been research into some of the barriers to successful implementation, there is still a lack of knowledge regarding users' experiences with EHRs. Furthermore, it is unknown how user perceptions and experiences act as barriers or facilitators to using and adopting EHRs in secondary care.

Some of the barriers that have been identified previously are concerned with the cost of system implementation (Kruse et al. 2016), including the need for a robust and adaptable IT infrastructure (Jones & Furukawa, 2014, Wang & Biedermann, 2012, Boonstra & Broekhuis, 2010) and time resources needed for training and data entry (Kruse et al. 2016, Ajami & Bagheri-Tadi, 2013). Hence successful implementation depends mainly on the availability of appropriate resources.

However, many of the barriers to successful implementation appear to be related to a lack of resources and support for the actual users, for example, lack of access to technical support (Cheung et al., 2013). Furthermore, not addressing concerns around data breaches, privacy and security sufficiently (Kruse et al. 2016, Ajami & Bagheri-Tadi, 2013), not providing adequate training and ongoing support (Kruse et al. 2016, Ajami & Bagheri-Tadi, 2013). Therefore, it is not surprising that user resistance has been identified as a significant factor in unsuccessful EHR implementation (Van der Meijden et al., 2001).

The Kuwaiti administration has focused on EHR implementation as an essential objective on their health policy agenda (Alhuwail, 2020). However, there is only limited research evaluating the success of Kuwait’s investment into its health information strategy and its current level of maturity (Alhuwail, 2021). In particular, there is a lack of research on identifying potential barriers and facilitators and how to address those.

It is known that staff resistance has been a factor preventing successful EHR implementation in the Gulf cooperation states, including Kuwait (Weber et al., 2017; Hasanain et al., 2015). However, to date, there has been no study evaluating how users experience and make meaning of the system used in the context of Kuwait. Greater knowledge and understanding of user experience are crucial to understanding the resources and changes needed for successful EHR implementation.

The literature review provided a greater understanding of the current knowledge about EHR implementation. Furthermore, it helped identify the gaps that needed to be addressed to address the overall research aim: Devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait.

1. To evaluate secondary care staff’s acceptance of EHR in their everyday role

Due to Kuwait fully embracing the EHR agenda only recently (Alaslawi et al., 2019) , there is not much research on EHR acceptance in the country, particularly regarding the specific local barriers. This thesis aims to address these gaps by reviewing and testing existing models of technology acceptance evaluation, such as the technology acceptance models (Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000), whilst also exploring user experiences more in-depth. Using this approach, the thesis aims to understand the existing barriers to EHR acceptance in secondary care hospitals in Kuwait

2. To explore secondary care staff’s experiences and perceptions of EHR in their everyday roles

The literature review demonstrated that most research into EHR acceptance had been conducted using quantitative frameworks and survey type instruments to date. Whilst the studies help capture user attitudes for evaluative purposes, what is still lacking in the broader field of electronic health research is an insight into how users think about their own EHR experiences, how they reflect on their behaviour and attitudes and how they make meaning of their EHR use. This thesis aims to contribute to a more in-depth understanding of EHR user experiences in Kuwait by doing in-depth qualitative interviews with health care staff.

3. To understand perceived barriers to the EHR from the perspective of secondary care staff

An essential step in addressing the overall aim of the thesis was to gain a better and more specific understanding of the barriers to EHR acceptance and use in the specific context of this thesis, secondary care hospitals in Kuwait. Reviewing the existing literature revealed that whilst it has been established that technology acceptance often plays an essential role in the success or failure of EHR implementation projects, it is often less clear how to evaluate technology acceptance in a meaningful way.

Another knowledge gap identified in the literature relates to how research has tried to capture user attitudes. In EHR studies, attitudes have been mainly evaluated using large-scale quantitative models, such as the technology acceptance models. Whilst those models can provide good insight into the overall attitudes in a population and, to some extent, into the factors that influence attitudes, they are limited regarding predicting behaviour and providing a more in-depth understanding of how individual attitudes translate into behaviour.

4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait

In order to find solutions to increase EHR acceptance, there needs to be a greater understanding of how individual, cultural, social and organisational contexts influence engagement with EHR's. This thesis aims to find solutions to increase EHR acceptance derived from an understanding of local user attitudes combined with an in-depth exploration of how staff feel affected by using the EHR and what they would need to engage more fully with the EHR system.

2.7 Chapter summary

This chapter has presented the scoping literature review for this study. It has three main aims, to synthesise existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within the existing literature, to synthesise existing knowledge and research into the facilitators and barriers concerning the adoption and use of EHR's within Kuwait and to identify gaps in existing knowledge and research. First, the chapter has stated the specific aims of the literature review discussed the methods used to undertake the review, including study selection and eligibility, information sources and the search strategy. The key findings of the review have been summarised and presented thematically. Finally, the chapter has explained how gaps in knowledge and research were used to inform the aims of this study. The next chapter examines the theoretical models that have been designed and used to facilitate analysis of the usage and acceptance.

3 Chapter Three: User Acceptance and Technology Acceptance Model

3.1 Introduction

The previous chapter provided a scoping review of facilitators and barriers to EHR adoption and use. This chapter discusses the suitability of the model used to measure technology acceptance in this thesis, the TAM 2 (Venkatesh & Davis, 2000). The purpose of the review of TAM 2 in this chapter was to gain an understanding whether it was a suitable model to address some or all of the research aims of this thesis.

First, it provides an overview of the evolution of the TAM 2 (Venkatesh & Davis, 2000). The chapter describes how the TAM 2 (Venkatesh & Davis, 2000) evolved from the TAM (Davis, 1989) and discusses its purpose, use, benefits and limitations.

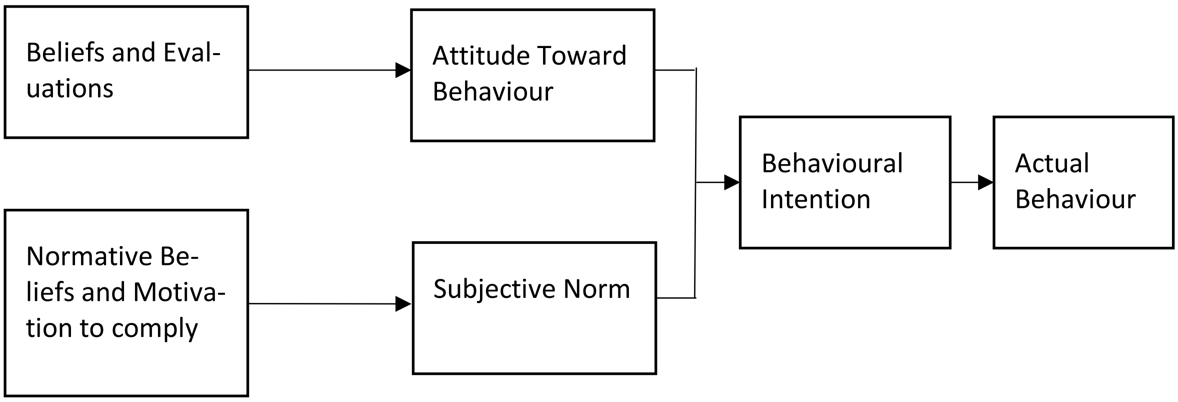
3.2 Genesis of Technology acceptance model 2 (TAM 2)

One of the underlying concerns when introducing and, eventually, adopting a new information system or technology of any kind is ensuring that there is buy-in from end-users – or in other words, they accept and use the new system. If end-users are unwilling to use the system, then the system's potential benefits cannot be maximized, and the resources used to implement the system will be wasted (Abdullah & Ward, 2016, p. 238). This concern has been well documented in health sciences, where the introduction of new health information technologies does not always integrate well with existing clinical work systems – which can often result in the information technologies being rejected by their end-users (Holden & Karsh, 2010, p.159). For this reason, scholars often make efforts to identify factors that may "affect the acceptance of any system" as a means of ensuring its successful implementation and adoption (Al-Emran et al., 2018, p. 389).

According to Momani and Jamous (2017), studying the adoption, acceptance and use of information technologies has become an essential part of computer sciences since the 1970s. Technology acceptance models and theories aim to explore how users understand and accept new technology and how they use it.

The TAM 2 reviewed in this chapter originated from the technology acceptance model (Davis, 1989), which in turn was influenced by Ajzen and Fishbein's (1980) theory of reasoned action (TRA). This psychological theory has been widely acknowledged for its theoretical foundation and explanatory power (Al-Suqri & Al-Kharusi, 2015). According to TRA, a person's behavioural intention affects their actual behaviour. Furthermore, the theory proposes that behavioural intention is influenced by attitude and subjective norms. Figure 3.1 provides and overview of TRA.

Figure 3.1 Framework of Theory of Reasoned Action (TRA) (Source: Ajzen and Fishbein (1980))

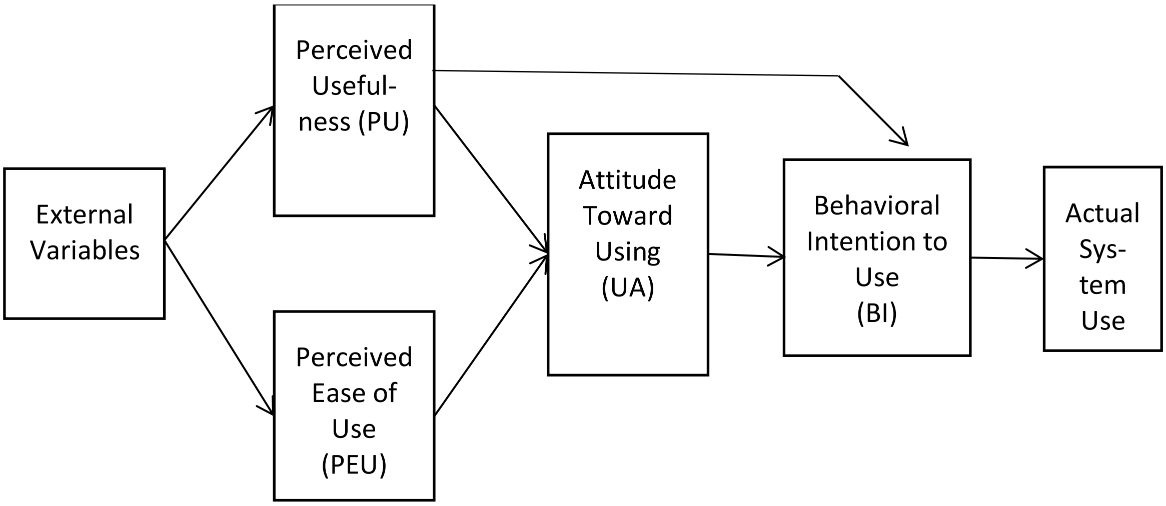


The original TAM was created by Davis (1989) and adopted TRA to the context of Technology Acceptance. Created in the 1980s to address growing concerns that workers were not adopting information technologies that were being made available to them, the TAM is the most widely used model that seeks to understand and assess factors that influence acceptance of such technologies (Venkatesh & Davis, 2000). Once those factors are known, organisations can work with those factors to promote acceptance and increase adoption and use (Holden & Karsh, 2010). Results from TAM studies found that the following factors help "explain, predict, and […] control acceptance" of information technologies (p.160):

- Behavioural intention (BI) to use the technology: determines an individual's willingness to use the technology.
- Attitude towards using the technology (ATT): measures the individual's judgement or evaluation of the technology.
- Perceived usefulness (PU) of the technology: assesses an individual's perception of the technology to enhance their job performance.
- Perceived ease of use (PEOU) of the technology: examines an individual's perception of the technology regarding the level of effort required to use said technology (Holden & Karsh, 2010, p.160).

According to TAM (Figure 3.2) an individual's intention to use new IT is determined by their perceptions of its usefulness and ease of use. These perceptions will often mediate external variables, such as design characteristics or social pressures, and inform the individual's attitudes towards the technology and intent to use it (Davis, 1989). In this respect, behavioural intention is often recognised or conceptualised in terms of an individual's level of acceptance of the information system or technology (Holden & Karsh, 2010, p.160).

Figure 3.2 TAM (Source: Davis, 1989)



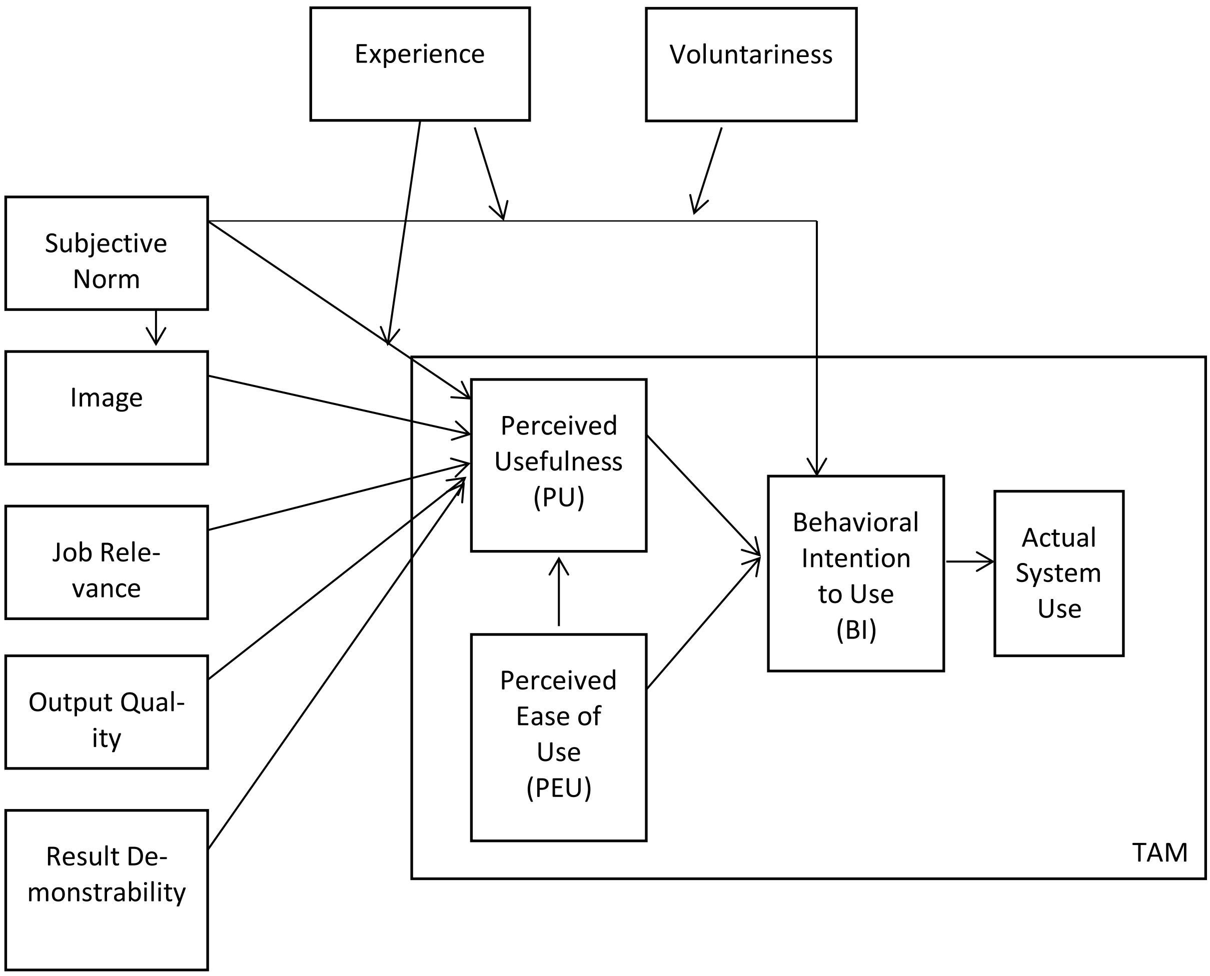
The TAM is a robust model to predict user acceptance that has been influential over several decades (Holden & Karsh, 2010; Martono et al., 2020; Venkatesh & Davis, 2000). The wide-spread use of the TAM is owed, in no small part, to the fact that it is relatively adaptable, simple, and sound compared to other models (Shachak et al., 2019).

In fact, since its inception, the TAM has been expanded and modified into new models – one widely used one is the TAM 2 (Venkatesh & Davis, 2000).

3.3 TAM 2 - expanded to capture social influence

The TAM 2 was proposed in 2000 by Venkatesh & Davis. It differs most notably from the original TAM in two ways. First, TAM 2 removes the attitude component from the TAM model and replaces it with new a variable to capture social influences – referred to as subjective norm (SN) (Holden & Karsh, 2010). Secondly, the TAM 2 introduces the variables of image, job relevance, output quality, and result demonstrability (see Figure 3.3).

Figure 3.3 TAM 2 (Source: Venkatesh & Davis (2000)



In this context, image refers to an individual's (perceived) status within the organisation; job relevance refers to the relative importance of the technology to the individual's job; output quality captures the perceived outputs of the technology system; and result demonstrability refers to the individual's ability to share the results (or benefits) of using the technology with others (Venkatesh & Davis, 2000). In this construct, subjective norms will also positively impact image. Subjective norms are influenced by a combination of experience and the degree to which individuals must adopt a new technology or information system (i.e. mandatory versus voluntary). The TAM 2 expands the original TAM by recognising how these different variables – subjective norms, image, job relevance, output quality, and result demonstrability – affect perceived usefulness (Holden & Karsh, 2010).

To date, the TAM 2 is the most widely used model to measure technology acceptance in the field of telemedicine (Harst et al., 2019). The TAM 2 has also been used widely across a range of disciplines. For example, Wang et al. (2022) used TAM 2 to analyse behavioural targeting advertising. The TAM 2 was later used as a basis for other models, for example the TAM 3 (Venkatesh & Bala, 2008).

3.4 Overall criticism and limitations of Technology Acceptance Models

Researchers using any TAM models sought to understand whether someone's intentions (to use the system or technology) would help predict, even if only modestly, their actual system usage. This link between intention to use and actual system usage is the core hypothesis of TAM 2, and it applies social psychology research on attitudes to the use of technology (Breckler, 1984; Manstead, 1999).

TAM 2, echoed Fishbein and Ajzen's (1980) TRA. This theory proposes that beliefs influence attitudes, which influence intentions, leading to behaviour. However, understanding the links between attitude and behaviour alone might not be as helpful in predicting behaviour as we previously thought. Empirical studies often find low to moderate correlational strength between attitudes and behaviour (e.g., Glasman, & Albarracin, 2006; Gollwitzer, 1999).

Furthermore, all PU and PEU models have been criticised for their inability to identify factors that might support and increase PU and PEU, and therefore those models are limited to identifying barriers to technology acceptance, but not facilitators to use and adoption (Lai, 2017).

Considering these limitations carefully, TAM 2 was deemed a suitable model to address some of the aims of the thesis, namely *aim 1: To evaluate secondary care staff's acceptance of EHR in their everyday role* and *aim 3: To understand perceived barriers to the EHR from the perspective of secondary care staff.* Furthermore, aim 4 was addressed taking into account the findings from the TAM 2 online survey and the qualitative study.

3.5 Summary

This chapter discussed how TAM 2 has been developed based on the TRA and TAM. TRA focussed on individual intention and behaviour. TRA and TAM have been criticised for their simplicity and focus on the individual. In response to the criticism and in an approach to support technology acceptance models in measuring the complexities of human decision making, TAM 2 and other models have also incorporated social factors influencing technology acceptance. The chapter concludes by outlining the significant advantages of using TAM 2, mainly how it combined the relative simplicity of the questionnaire with its highly predictive value of user attitudes. Whilst there are limitations as outlined in the previous section, the TAM 2 has been adapted as a suitable model to address aim one, three and four of the thesis;

see Chapter Five: Methods. Its simplicity and adaptability have contributed to its widespread use and continuous attempts at modifying and adapting the original model. Furthermore, it has continuously demonstrated high validity and reliability in previous studies (Cronbach alpha coefficients exceeding 0.80).

4 Chapter Four: Methodology

4.1 Introduction

This chapter outlines the philosophical, theoretical, conceptual and methodological approaches taken to address the research aims:

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals
2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in three government hospitals
3. To understand perceived barriers to the EHR from the perspective of secondary care staff
4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

This chapter first provides an overview of this research's epistemological and methodological perspectives. It then outlines the rationale for adopting a mixed-methods design drawing on qualitative and quantitative methods.

4.2 Philosophical Perspective

It is essential to understand how research philosophy influences our decisions about the methodology and methods. These influences are encapsulated in the form of a research paradigm. A research paradigm is "the set of common beliefs and agreements shared between scientists about how problems should be understood and addressed" (Kuhn, 1970). In other words, A paradigm describes our shared assumptions about the world and how those assumptions might influence our research methodologies (Oates, 2006). All paradigms provide a perspective on the nature of the world (ontology) and in our understanding of how we obtain knowledge about the world (epistemology) (Hesse-Biber et al., 2006). When choosing a research paradigm, it is crucially important to match how the researcher sees their role in conducting the research. It is the person's frame of reference' regarding theories, research methods, and what constitutes legitimate contributions and knowledge to the research field.

Two of the dominant paradigms, positivism and interpretivism, will now be discussed in more detail. Although the distinction is not always that clear, a positivist epistemology usually utilises a quantitative research design. Interpretivist epistemologies, however, are more aligned with qualitative methodologies.

4.2.1 Positivism and quantitative research methodologies and methods

The positivist paradigm is based on the idea that an objective reality can be measured and quantified (Gill et al., 2010). Research studies following a positivist paradigm usually focus on developing hypotheses and theories. For example, most evidence-based nursing research follows a positivist paradigm, gathering evidence to either support or reject theories about a phenomenon (Silvia, 2011). Positivist research believes in an objective reality that is measurable and independent from the researcher's perspectives and values (Oates, 2006). It aims to measure processes and trends in society. Positivism assumes that there are laws governing society as a whole that research can uncover, similar to the laws of physics that have been discovered by scientists (Creswell & Creswell, 2018).

The methods used in positivist research are usually quantitative, for example, surveys and structured questionnaires. It is also more common to research large datasets such as official statistics to make predictions for a population. Data analysis in a positivist paradigm is usually statistical analysis (Polit & Beck, 2009). According to Polit and Beck (2009), validity and reliability of the data are fundamental concepts in positivist research as they help identify the objectivity of what is being measured and to what extent this applies to a broader context. A quantitative study design usually aims to make predictions about a larger population (Creswell & Creswell, 2018). It tries to generalise findings from a smaller sample. Quantitative researchers try to understand how individual elements of a phenomenon influence each other. They assume that understanding the individual entities will help predict cause and effect when looking at a phenomenon.

A significant advantage of quantitative studies is that they usually aim for replicability (Hesse-Biber et al., 2006). This means that while they might not capture the dynamic, relational and multifaceted nature of many social phenomena, they can be a great asset in developing models to describe causal relationships (Silverman, 2016). Furthermore, quantitative designs are well suited for generalising and testing hypotheses. Therefore, it was decided that an essential factor for this thesis was how the current study would link in with the larger field of technology acceptance studies, mainly aiming to explore whether the TAM 2 is a reliable and valid instrument for testing technology acceptance and the influencing factors in the context of this research. A quantitative design will enable the researcher to understand, for example, the frequency or importance of an influencing factor (Salvador, 2006). Both qualitative and quantitative designs come with their strengths and weaknesses. A considerable strength of the quantitative design is that it is relatively less time-consuming because of the instruments, such as online surveys. Another significant advantage of the quantitative design is that it presents reliable and objective findings (Salvador, 2006). The major weakness of quantitative designs is that they do not allow for in-depth exploration, further questioning, elaboration and drilling down into the data. In a nutshell, the significant advantages of qualitative designs are the major weakness of quantitative designs and vice versa.

4.2.2 Interpretivism & Qualitative research methodologies and methods

According to Creswell and Creswell (2018), interpretivism is rooted in understanding the relationship between society and the individual that is quite different from positivism. The most substantial difference is that Interpretivism believes that individuals are conscious actors and not merely puppets reacting to external social forces. Interpretivism highlights the intricate and complex nature of human beings and social interaction. According to interpretivism, there is no objective, measurable reality, but different human beings respond to and interpret the social world they live in different ways (Hesse-Biber and Leavy, 2006).

Accordingly, the general focus of research conducted in the interpretivist paradigm is to gain an in-depth insight and understanding into the lives of research subjects (Polit & Beck, 2009). According to Oates (2006), the researcher's role is to gain an empathic understanding of their participants lived experience and meaning-making. Interpretive research is interested in human perceptions. It proposes that the way humans see the world and make meaning influences their reality. Interpretive research is often descriptive and provides rich detail rather than test theories or hypotheses.

Interpretive research believes that the researcher is part of the social world they study and will influence their study phenomena. Consequently, interpretive methodologies emphasise subjectivity, reflexivity and multiple meanings as the core of the work. The research aims not to generalise results but to understand better the context in which they occur (Ryan, 2006). Traditionally, the methodologies used in an interpretive paradigm are qualitative.

According to Creswell and Poth (2017), qualitative inquiry is often conducted as a narrative study, ethnographic design, phenomenological study, case study design or a grounded theory study. All these approaches have in common the goal to provide an in-depth understanding of a phenomenon (Yin, 2013). However, they differ with regards to some underlying assumptions and research goals, for example, a grounded theory study would focus on building theory from a particular experience in a particular group, whilst a phenomenological study would aim to capture the links between individual experiences and the study population as a whole (Creswell & Poth, 2017).

Qualitative research designs have been the preferred methodology in the interpretivist paradigm because they are often well suited to highlight the specificity of experiences of a particular sample and can give voice to the diversity of experiences within a sample (Creswell & Creswell, 2018). The methods used to capture the diversity of voices are often observation, focus groups or interviews (Polit & Beck, 2009).

A significant advantage of qualitative designs is that they allow unexpected and new meanings to emerge within the research process (Creswell & Poth, 2017). Creswell and Poth (2017) describe how qualitative designs help answer *how?* or *what?* Furthermore, qualitative studies are often an appropriate design to use when a topic needs exploring and when there is a need for a detailed view. However, qualitative studies capture an incredible amount of detail and ambiguity. They are a time-consuming and resource-consuming endeavour, a disadvantage of conducting qualitative studies (Creswell & Creswell, 2018).

4.3 Mixed-Methods Paradigm and methodologies

The different paradigms and accompanying research methodologies and methods used to be separate worldviews. However, there has been an increased belief that both paradigms have offered valuable insights and perspectives in recent years. The mixed-method research paradigm sees the different paradigms complement each other rather than competing (Creswell & Plano Clark, 2017). Accepting complementarity of paradigms rather than incommensurability is an important shift, making mixed-methods research grounded in epistemology possible. According to McChesney and Aldrige (2019), the common assumption used to be that there is a binary divide between positivist and interpretivist epistemology, going along with a split between quantitative and qualitative methods. Consequently, it was assumed that the qualitative and quantitative research paradigms are so different that mixed methods research would be philosophically impossible. However, more recent literature demonstrates that the binary between positivistic epistemology/quantitative methodology and Interpretivist epistemology/qualitative methodology is a simplistic and reductionist assumption (Creswell & Creswell, 2018).

Combining qualitative and quantitative research methods is either called mixed-methods or multi-method research (Barnes & Weller, 2017). The terms multi-methods and mixed-methods are often used interchangeably and different researchers disagree on the meaning of each term, depending on their field of study and the research tradition they come from.
This thesis draws on Creswell's (2015) differentiation of mixed methods from multi-methods:

“Mixed methods further is not simply the collection of multiple forms of qualitative data, nor the collection of multiple types of quantitative data. It involves the collection, analysis and integration of both quantitative and qualitative data. In this way, the value of the different approaches to research can contribute more to understanding a research problem that one form of data collection could on its own. When multiple forms of qualitative or quantitative data are collected, the term is ‘multimethod’ ” (pp. 2-3). Creswell therefore differentiates between multiple methods studies and mixed methods studies by the type of data collected. According to Creswell (2011), "Writers in mixed methods are also careful to distinguish 'multi-method studies' in which multiple types of qualitative or quantitative data are collected (see Creswell & Plano Clark, 2007) from 'mixed methods studies' that incorporate collecting both qualitative and quantitative data." (p. 273).
Lastly, Fetters and Molina-Azorin (2017) emphasise the same distinction between multiple and mixed methods research, namely that, “multi-methods research is a broader category that contains any two different methods, while mixed methods is a subset of that, where there are both qualitative and one quantitative methods.” (p. 39).

Navigating the assumptions of different paradigms make mixed methods research a challenging and potentially rewarding endeavour. The challenge lies in integrating different paradigms while not losing sight of the fundamental differences in epistemology and process. Mixed methods research can offer a bridge between the different paradigms. It encourages to embody multiple worldviews by offering the advantage of facilitating data integration (Creswell & Creswell, 2018; Fetters et al., 2013) and an aide to deal with the disadvantages of qualitative or quantitative approaches alone. Mixed methods research has been successfully utilised in EHR research, for example, in England (Robertson et al., 2010). However, a significant challenge in mixed-method research is approaching opposing research epistemologies. Adopting an approach where the researcher combines two paradigms in a mixed-methods approach brings challenges. A study where Positivism informs a quantitative component and a qualitative component informed by Interpretivism but has no dialogue or integration between these two components would not be considered a mixed-methods approach (Creswell & Creswell, 2018). However, a pragmatic view of establishing knowledge can be utilised (Creswell & Creswell, 2018). Pragmatism is a philosophy often utilised in mixed-methods research supporting the use of whichever method seems most applicable and appropriate to solve the problem at hand.

Now that the epistemological beliefs for this study have been discussed, the next section of this chapter discusses the methodological assumptions and decisions that have been made to address the aims of the thesis.

4.3.1 The case for a mixed-methods study design for this study

This thesis explores how to enhance the acceptance and use of EHRs amongst secondary care staff in Kuwait. As already discussed in Chapters 1 and 2, although Kuwait has invested heavily in the infrastructure to provide EHRs, existing research suggests a low level of acceptance and use of EHRs amongst secondary care staff. Chapter Two has highlighted that the existing research in Kuwait since 2011 has used a quantitative perspective to explore barriers and facilitators to EHR use in Kuwait. There was no study with a qualitative methodology, and only one of the studies conducted before 2011 utilized a mixed-methods design (Al-Hajerri, 2006). Therefore, the existing studies have not provided thorough insights into why the use and acceptance of EHR's in Kuwait are met with such resistance. The following discussions outline how a mixed methods approach was used to meet each of the research aims.

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals
2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in six government hospitals
3. To understand perceived barriers to the EHR from the perspective of secondary care staff
4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

Aim 1: To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals

Aim one was to evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals. This research phase drew on the TAM 2 as a model explaining EHR user acceptance due to someone's intention to use a system. Furthermore, after reviewing various models to measure technology acceptance in chapter three, it was decided to choose the TAM 2 survey design to explain perceived usefulness and intention to use considering social influences and cognitive determinants. TAM 2's emphasis on social influence and cognitive determinants seemed suitable to provide a quantitative perspective on some of the qualitative findings from other parts of this research, thus offering an opportunity to integrate findings in a mixed-methods paradigm.

Furthermore, the TAM 2 survey design was chosen as it has been widely used in research. However, the TAM 2, like other models, has been developed for a specific context with a particular, usually Anglo-American lens. The TAM 2 model has been used to research other contexts in Kuwait, for example, e-learning (Rabaa, 2016) or online shopping (Al-Shammari, 2014). However, the evidence of whether TAM 2 applies to the Kuwaiti context remains inconclusive. Helaiel Almutairi (2007) tested the applicability of the TAM to the usage of IS in Kuwaiti governmental organisations. The study did not find significant statistical evidence for the relationships between the TAM's core concepts, except in the case of the relationship between 'Perceived Ease of Use' (PEU) and 'Perceived Usefulness' (PU). Cultural differences and differences in the context of public organisations could account for these findings. Therefore, it was crucial not to assume the applicability of the TAM model to Kuwait's specific health care context but to carry out a TAM study to understand better what factors the model can and can not explain in this particular context. A mixed-methods design can hopefully contribute to the discussion around how western models map onto other settings and how they can best be adapted to a particular context.

In order to address aim one, a survey instrument, the TAM 2 2 questionnaire, was utilised to measure technology acceptance. Intention to use is explained by the perceived usefulness of a system and perceived ease of use. The main aim of the present study (see

Chapter Six: Quantitative Study) was to describe the attitudes of EHR users towards the system, as these have been described by Venkatesh and Davis (2000), including its use intentions, usefulness, ease of use, social norms, voluntariness, social image, job relevance, output quality and demonstrability. It further identified factors hindering or facilitating its use and evaluated the convergent validity of findings.

The researcher decided an online survey would potentially reach a larger and hopefully representative audience, could be easily shared, and, if administered correctly, promise time savings and resource efficiency to both participant and researcher (Lefever et al., 2007; Wright, 2005). Furthermore, online surveys are a convenient research instrument that can be completed at the participants' leisure, in the comfort of their own home (Sax et al., 2003). They are deemed particularly suitable if a large population is distributed across a wide geographic area (Lefever et al., 2007). It was considered to be the most appropriate tool to conduct the survey taking into account the resources available for this study, a single researcher, with considerable limitations in possible time for fieldwork outside the UK and the relatively large population of about 20.000 EHR users in six different Secondary Care Hospitals in Kuwait.

Of course, there are disadvantages to distributing online surveys. One primary argument is that they might be less accessible to less technologically educated populations. This disadvantage can be addressed by creating simple to complete surveys and requiring only a minimum of computer skills (Carbonaro & Bainbridge, 2000). I tried to counter this limitation by offering participants a paper version as an alternative format to access the survey. I made participants aware of this option in my recruitment email. If they were to take this option, they were instructed to leave the completed survey in a designated envelope in the head administrators office where I could collect it while ensuring their anonymity was guaranteed.

Studies tend to have higher response rates when a survey is administered face to face (Watt et al., 2002). However, there is an argument explaining that these higher response rates are better explained by the researcher when paper surveys are handed out rather than the format (Nulty, 2008). A lack of resources meant the researcher could not be present to hand out the surveys himself. Furthermore, this would have put pressure on participants to fill in the survey there and then and might have compromised their ability to provide informed consent.

Some limitations remained even after careful consideration of the advantages of utilising an online survey design. For example, a link can get shared with anyone in principle, which means there is a potential disadvantage in not controlling who has access and opportunity to complete the online survey. Furthermore, one person could theoretically complete the same survey several times on different computers and skew the study. All these limitations were considered when deciding to utilise an online survey. We know from other studies that relevance and interest in a topic can be one of the most important predictors and factors in enhancing engagement with an online survey (Lefever et al., 2007; Sax et al., 2003).

Aim 2: To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in six government hospitals

Aim two was to explore secondary care staff's experiences and perceptions of EHR in their everyday roles. A qualitative methodology and method would be the most suitable to explore perceptions and experiences of health care professionals. The qualitative component consisted of thirty semi-structured interviews with HCPs, analysed through a hermeneutic lens. The following section explores the philosophical underpinning of the qualitative study and outlines the role of reflexivity in the research process.

The qualitative study addressing aim two was situated within a phenomenological and hermeneutic tradition of qualitative research (Butler, 1998). Phenomenology is both a philosophical tradition and a research methodology. As a philosophy, phenomenology is concerned with human experience (Smith et al., 2009). Hermeneutics explores how hermeneutics can be used to unravel a historical authenticity of understanding (Dowling, 2004; Gadamer, 1976). In phenomenological research, the aim is to understand a phenomenon from the perspective of the research participants (Kaplan & Maxwell, 2005). This is why looking at the data quantitatively might lead to losing insight into the social and organisational context, shaping the participant's experience.

This approach means the research draws on an interpretative framework, understanding how participants' meaning-making leads to the phenomenon explored. In this case, the phenomenon is staff engagement with EHR. The qualitative study aimed to understand better how participants experienced and engaged with the EHR system. In interpretative research, it is crucial to make sense of the data as it emerges (Kaplan & Maxwell, 2005) and not enter the interpretation with pre-defined concepts and assumptions as those might negatively influence the consistency or accuracy of the research, hence reducing its quality. Consistency of a measure is also called reliability and in qualitative research reliability can be established by for example using comprehensive data and engaging in a process of continuously testing and comparing data reaching a point of deep saturation (Kirk et al., 1986).
Lincoln and Guba (1985) used the term 'trustworthiness' as the equivalent to what would be described as validity in quantitative studies. Trustworthiness describes the accuracy of the research tools, analysis and findings and relies, according to Lincoln and Guba (1985) on the

criteria of credibility, transferability, dependability and conformability. For qualitative research to be trustworthy, the data analysis needs to be precise, consistent and exhaustive (Nowell et al., 2017) for example by disclosing the method of analysis and by demonstrating the analysis was conducted in a systematic manner. Furthermore, reflexivity plays a vital role in keeping the researcher’s pre-defined concepts and assumptions at bay, hence enhancing the trustworthiness of qualitative research. Reflexivity in the hermeneutic tradition is different from, for example, the positivist paradigms. A positivist researcher conducting quantitative research would always aim to eliminate bias and conduct an objective research study. A researcher working in an interpretative paradigm using qualitative methods will bring different assumptions into the field. According to Dibley et al. (2020), researchers working in an interpretive paradigm would try to keep it in their consciousness that they bring their own beliefs, experiences and assumptions into their research.

An example of this would be the kinds of questions they find interesting at the start of the research, their ideas about causal relationships, and participants' experiences that resonate with them and are therefore easier to see. Those are the prejudices a qualitative researcher brings into the field. Different traditions within the interpretive paradigms have different ways of addressing this. For example, Gadamer's belief in the importance of pre-understanding or prejudice is a central premise to hermeneutics (Dowling, 2004). One way of addressing prejudice concerning a research project is to bracket assumptions (Koch & Harrington, 1998). Bracketing means noticing when biases or beliefs enter our perception and suspending our own beliefs and biases. It is a way of increasing the rigour of hermeneutic analysis.

Aim 3: To understand perceived barriers to the EHR from the perspective of secondary care staff

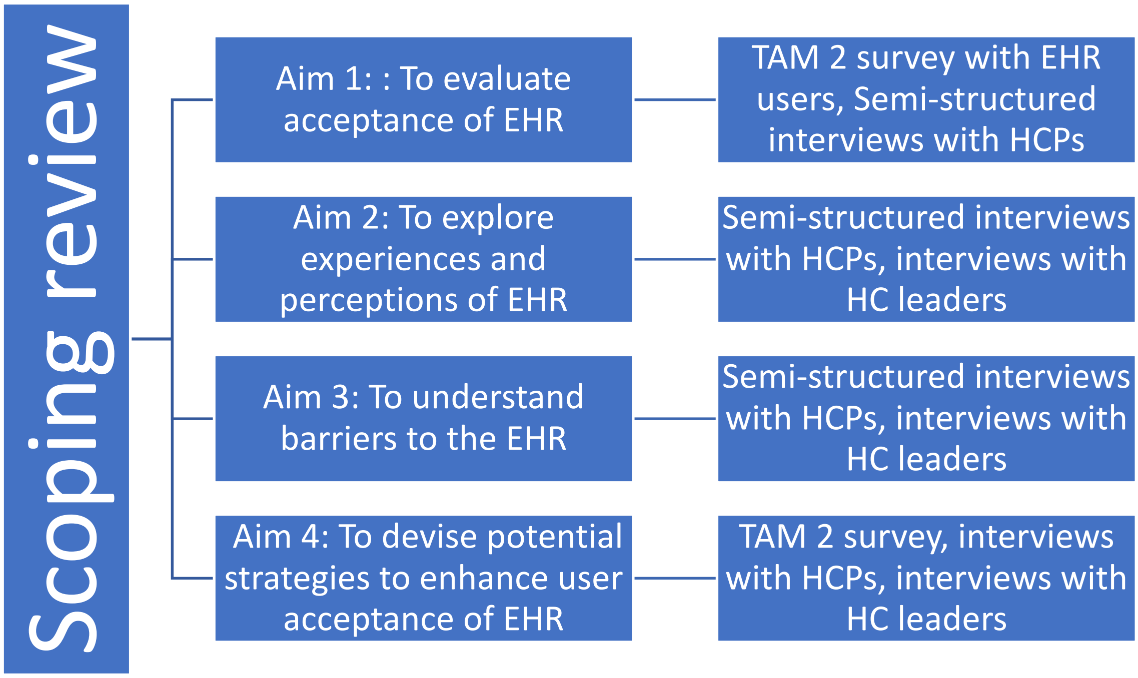
Aim three was to understand perceived barriers to adopting and using EHR from the perspective of secondary care staff. The scoping review of the literature has demonstrated that there are various barriers affecting HCPs in working with the EHR. This part of the thesis is interested in exploring HCPs perceptions of barriers in their everyday work and has therefore adopted a qualitative methodology to gain an in-depth understanding of individual perspectives and meaning-making. Aim three will be addressed by both phases of the qualitative study.

Aim 4: To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

Aim four was to devise potential strategies to enhance user acceptance of EHRs amongst secondary care staff in Kuwait. The scoping review of the literature demonstrated that user acceptance is still a barrier to EHR adoption in Kuwait (Alhuwail, 2020; Al-Jafar, 2013). Consequently, technology acceptance could play an essential role in successful EHR implementation. However, there was inconclusive research on evaluating technology acceptance in a meaningful way (Almutairi, 2007). An attempt to address this gap in knowledge needed to draw on the existing - primarily quantitative research - on technology acceptance whilst aiming to expand and elaborate on the findings in a qualitative way. However, understanding how cultural context and organisational culture would impact staff's experiences and attitudes with EHR seemed essential to complement this with an in-depth qualitative perspective. Another issue with technology acceptance studies is that whilst there is a solid research base confirming that technology acceptance models can measure attitudes, less research explores whether and how those attitudes translate into behaviours. It was hoped that the qualitative study could provide a more in-depth exploration of user experiences and meaning-making to understand users better. Aim four was addressed by synthesising the understanding gained from the quantitative TAM 2 study, the qualitative interviews with secondary care staff and by conducting an additional round of semi-structured interviews with Health Care leaders in three different facilities in Kuwait.

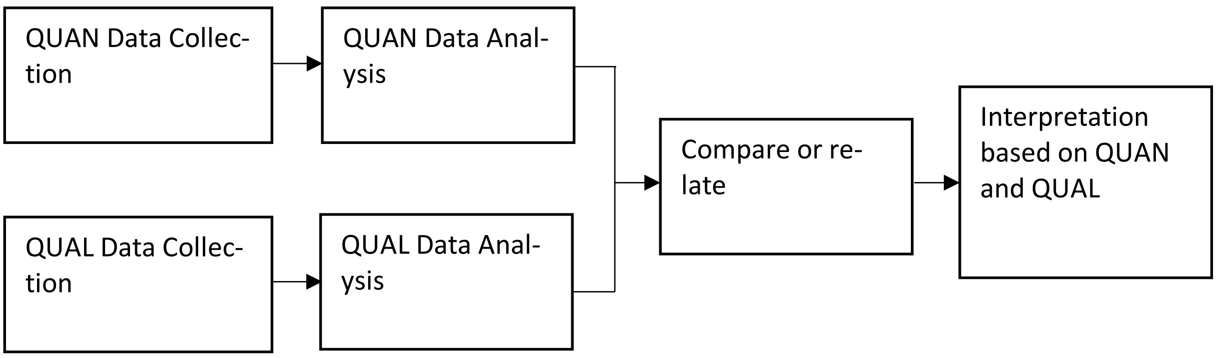
The gaps in the literature informed the research aims of this thesis and, subsequently, the research strategy. Figure 4.1 below provides an overview of how the individual components address the research aims.

Figure 4.1 Overview methodology and aims



The research aims indicated that it would be appropriate to adopt a convergent mixed methods design, see Figure 4.2

Figure 4.2 Convergent Mixed Methods Design (Source: Creswell & Plano Clark, 2017)



According to Morse (1991, p. 122), convergent mixed methods design intends “to obtain different but complementary data on the same topic” to understand the research problem. For this thesis, the research problem is how to enhance the acceptance and use of EHRs amongst secondary care staff in Kuwait. A convergent design enables the researcher to gain a complete understanding of the research problem by drawing on statistical data and analysis as well as qualitative findings (Patton, 2002). In order to achieve the aims of this thesis, there was a need to collect quantitative data to address aim one, qualitative data to address aim two and three. In addition, both qualitative and quantitative data were needed to address aim four. According to Creswell and Plano Clark (2017) a convergent design, i.e. a research design that obtains complementary data in a non-sequential way, allows to collect and analyze the qualitative and quantitative data separately whilst illustrating quantitative results with qualitative findings and vice versa. The authors pointed out how a convergent design should be chosen if the research intended to better understand the relationship between qualitative and qualitative findings by creating an interface where both separate datasets can be put in relationship and illuminate findings from the other paradigm. The procedures of how this interface was achieved are described in more detail in chapter 0

Mixed Methods Data Analysis and Interpretation.

4.4 Chapter summary

This chapter discussed the different philosophical perspectives of positivism and interpretivism and how they influence quantitative and qualitative methodologies. Next, it discussed how mixed methods approaches have attempted to bridge the paradigmatic gaps and how this study has adopted a pragmatic mixed-methods approach. The chapter then discusses how each research aim was addressed, providing a rationale for adopting qualitative and quantitative methodologies.

5 Chapter Five: Methods

5.1 Introduction

Chapter 4 has provided the methodological underpinnings of this study and justifies the approaches taken within this research. This chapter aims to provide a step-by-step account of the methods and procedures employed within this study. It discusses the methods for the qualitative and quantitative studies separately. It begins by presenting the data collection and analysis for the quantitative study. It then describes the data collection and analysis for phases one and two of the qualitative study. It then provides the step-by-step process of the mixed-methods data analysis and interpretation.

5.2 Study One: Quantitative online survey

As explained in

Chapter Four: Methodology, the first study was undertaken for this mixed-methods research was a quantitative online survey. This survey incorporated the revised technology acceptance model (TAM 2) by Venkatesh and Davis (2000) as a means to evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals (Aim 1). The main aim of the present study was to describe the attitudes of EHR users towards the system, as these have been described by Venkatesh and Davis (2000), including its use intentions, usefulness, ease of use, social norms, voluntariness, social image, job relevance, output quality and demonstrability. It further identified factors hindering or facilitating its use and evaluated the convergent validity of findings. Data collection took place in Kuwait during October 2019-December 2019. Approval for this study was obtained from the ethical committee of the Swansea University medical school, the Health and Medicine Research Committee of the MoH in Kuwait and the respective hospital management teams. Ethical approval was gained in September 2019 for the quantitative study, see Appendix F.

The following sections discuss the development of the data collection instrument, piloting, setting and population, the sampling strategy adopted, participant recruitment and the data analysis steps.

5.3 Data Collection

5.3.1 Development of the data collection instrument

The data collection survey used in the present investigation was a three-page online questionnaire distributed to staff using EHR via an EHR user email list in all six public hospitals in Kuwait. A three-part survey instrument was devised consisting of thirty-one questions in total. Five were general questions related to gender, age, job role, nationality and EHR use frequency. The remaining 26 questions were the original TAM 2 items mapped to a 7-point Likert scale.

5.3.1.1 Translating the survey

The survey was initially created in English, and the researcher did not plan to provide a translated version. The TAM 2 had not been validated in an Arabic version previously. Any changes to an existing survey design might potentially impact validity and reliability, and it was hoped this risk could be avoided. Furthermore, many healthcare professionals in Kuwait are proficient in English and use it daily. Therefore, it seemed appropriate to ask them in English, assuming they would understand. However, when the study was piloted with Kuwaiti colleagues and friends, the feedback suggested that it might be helpful to have an Arabic version. Their feedback indicated that the English wording of some of the items was not immediately meaningful to them. It can be problematic if the meaning of an item is even slightly open to interpretation because, as a result, different participants might understand the item differently, which will compromise the reliability of the study (Husni & Newman, 2015). I discussed this issue with my PhD supervisor, and we decided to provide an Arabic translation of the English question items.

Translating between English and Arabic can be challenging. English is an Indo-European language, whereas Arabic is a Semitic language. English and Arabic being from different language families mean they have significant differences in structure and content. As a result, translators are often faced with linguistic problems, including grammar, context and culture (Khalifa, 2013). Furthermore, translation needs to navigate the tension between equivalence, i.e. the mirroring of the source text and functional translation, i.e. the translation being faithful to the source, the reader and the context of the translated text (Baker, 2003). In addition to those general translation challenges, the Arabic language poses an additional challenge. It has two forms, a spoken and a written one. This is called diglossia and can pose significant translation challenges (Husni & Newman, 2015). These translation challenges mean that steps needed to be taken to ensure the translation is as close in meaning to the original text as possible. It could not be assumed that rephrasing the TAM 2 questions in Arabic would automatically translate the original meaning of the questionnaire.

According to Behling and Law (2000), the three most significant challenges in translating questionnaires into other languages are achieving semantic equivalence across languages, conceptual equivalence across cultures and normative equivalence across societies. They further explained that it is relatively easy to achieve semantic and conceptual equivalence of demographic questions. This is because demographic or general information words and ideas are more commonly used. However, they explain that normative equivalence is much harder to achieve because cultures differ significantly in their social norms. According to the authors, achieving all types of equivalence can become even more challenging when translating questions about attitudes since those are more abstract and culturally rooted. For example, some concepts might not be relevant in another culture, or there might be a social taboo in discussing certain attitudes. The authors suggest addressing those difficulties by using translators familiar with both cultures and by piloting the survey to ensure the most significant degree of equivalence.

Three steps in particular were undertaken to ensure the most significant degree of equivalence as suggested by Liamputtong (2010) and more extensively described in Chapter 5.4.1.5 Data Collection Procedure. Those steps were using translators familiar with both the English and Arabic language and the research context, establishing a structured process of discussing and checking the translation process and having another translator do a blind translation and assessing the level of agreement between both translated texts.

Following Behling and Law's (2000) suggestions, the researcher translated the questionnaire into Arabic himself as he was familiar with both cultural contexts. Then, he sent out the Arabic version of the questionnaire to three colleagues familiar with the English and Kuwaiti health context and who were also native Arabic speakers. Following their feedback, the researcher added further explanations to enhance understanding and clarity for one of the items (item seven): "My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job". This was translated literally into Arabic, and " i.e. I know how to use it in my job", which was not part of the original item, was added to enhance understanding. The translation process was checked in the same way as described later in this chapter for the qualitative study. The Arabic language version of the online survey can be found in Appendix K.

5.3.1.2 Piloting and amending the data collection instrument

A pilot study was carried out in the last week of September 2019 to determine the feasibility of the study. A pilot is a preliminary small-scale run of a study where researchers test the methods they plan to use for the research project (Ruel et al., 2015). The results from the pilot were used to guide the methodology of the larger-scale investigation.

According to Ruel et al. (2015), a pilot can be used to:

a) identify and address any practical problems

b) find out whether respondents understood the questions

c) check that the resulting data were meaningful

The link to the online survey was sent out to ten friends and colleagues on 26th September 2019 to pilot the study. Five of them were familiar with the Arabic and English language and the health context in Kuwait. It was essential to include those friends and colleagues in the pilot to provide feedback on potential intercultural challenges. The respondents were asked to provide verbal feedback on practical aspects of the survey process and whether they understood the questions. In addition to that, the data generated from the pilot was reviewed to evaluate whether the resulting data were meaningful. The feedback on practical aspects was positive. The respondents found the survey easy to access on desktop PCs and mobile devices. All ten needed less than 10 minutes to complete the survey. The respondents confirmed they found this was an appropriate amount of time to complete the survey without feeling fatigued or bored. The feedback with regards to whether they understood the questions was more mixed. Feedback indicated that some respondents were unsure what an EHR encompassed and what the questions were targeting. In response to this feedback, a general definition of EHR in the context of this study was added to the introduction of the online survey, see Appendix L and Appendix M. Other feedback suggested it might be helpful to have an Arabic language version of the questionnaire. The responses to all the pilot questionnaires were entered into SPSS to evaluate whether the data collected were meaningful, i.e. whether they could be analysed (Ruel et al., 2015). There were no concerns after the pilot about the meaningfulness of the data. The data were only entered into SPSS to test whether they would produce meaningful, analysable data, they did not form part of the quantitative online survey data set as not all of the pilot participants fit eligibility criteria, for example not all of them were current users of EHR or currently worked in secondary care.

5.3.1.3 Final version of online survey

At the beginning of part one of the survey, participants could fill in either the English or Arabic language version, see Appendix N and Appendix K. Part one included participant information (see Appendix I) and asked for consent. It explained the aim and purpose of the study and that it was carried out as PhD research. Furthermore, it explained why the participant had been invited to participate, that participation in the survey was voluntary and what would happen with the answers participants gave. It also provided information about completing the survey and how long it would take to complete. Furthermore, it explained that the survey would ask questions about the user experience of EHR, how useful they found EHR and how easy to use they found it. Finally, it clarified that participants could choose to participate in the study or not and leave the study at any time whilst completing the questionnaire.

Furthermore, the participant information sheet contains information about confidentiality, such as how participant anonymity would be ensured and how data would be stored safely. Before the survey started, participants had to read through the information carefully. They were prompted to contact the researcher via email and given the researcher's email contact details should they have any questions before or after answering the survey. The online survey was designed to allow people to stop and return at a later point without starting the whole survey anew. This was to ensure they could go away and come back later if they needed more time to think or any questions that needed answering. Participants were asked to complete the online consent form before starting parts two and three of the survey. A copy of the consent form can be found in Appendix J. Participants had to confirm that they had read the participant information sheet, that their participation was voluntary and that they could withdraw without giving any reason. They also had to confirm that they agreed to participate in the study.

Part two of the online survey consisted of five general questions and included information on EHR use frequency and demographic information, namely age, gender, nationality, job title. Gender, age, EHR use frequency and experience had been found to influence user attitudes in previous studies (Cheung et al., 2013) and have therefore been added to this part of the online survey. Furthermore, Venkatesh et al. (2003) added gender, age and experience to the UTAUT because they found those to be moderating variables determining an individual's behavioural intentions and, consequently, the use of technology. While this study has not adopted UTAUT as a model, it was still interested in whether those variables would moderate behavioural intent. Furthermore, nationality and staff groups (doctor, nurse, administrator, technician, other) were additional variables to analyse whether there were any significant differences between either staff groups or nationality.

As for age, Age groups, as originally assessed, showed the categories: 'Less than 30'; '31-40 years-old'; '41-50' years-old; '51 – 60' years-old; and '60 and above'. However unfortunately an error occurred in how the categories were set up initially. Therefore, there was an overlap of the boundaries of offered options, with 60 representing both the upper limit, and the lower limit of two options. Participants with sixty years old might have picker either of these options. Additionally, the first option read 'less than 30', and the second option '31- 40'. Thus, people with exactly 30 years-old had no category to choose from.

The scoping review of the literature had demonstrated that there were significant variations in the barriers and facilitators perceived by different staff groups. See, for example, Alasmary et al. (2014b). Therefore, nationality was added to explore whether there were significant differences in EHR attitudes between Kuwaiti and foreign national users. It is documented that there are significant educational differences between the Kuwaiti and migrant workforce. For example, 51% of all migrant workers are illiterate or have only received primary education (Salama, 2020). Therefore, it was decided that it might be helpful to differentiate between the different groups of EHR users based on nationality to analyse whether there were significant differences. Part two of the survey allowed for "no response "or "prefer not to respond" as an option for every question so that participants had an option not to answer a question but still to continue with the survey.

Part three of the online survey included Venkatesh and Davis' (2000) original TAM 2 EHR attitude items, all of which were mapped to a 7-point Likert scale ranging from one (strongly disagree) to seven (strongly agree), and with level four as the neutral position (neither agree nor disagree). The table below provides an overview of the TAM 2 constructs measured by each of the 26 survey items.

Table 5.1 TAM 2 constructs measured by survey item

Survey Item	TAM 2 Construct
1. I have access to the EHR system and I intend to use it.	Access and Intention to Use
2. I have access to the EHR system and I will use it.	Access and Intention to Use
3. Using the EHR system improves my performance in my job.	Perceived Usefulness
4. Using the EHR system in my job increases my productivity.	Perceived Usefulness
5. Using the EHR system enhances the effectiveness in my job.	Perceived Usefulness
6. I find the EHR system to be useful in my job.	Perceived Usefulness
7. My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job.	Perceived Ease of Use
8. Interacting with the EHR system does not require a lot of mental effort.	Perceived Ease of Use
9. I find the EHR system to be easy to use.	Perceived Ease of Use
10. I find it easy to get the EHR system to do what I want I to do.	Perceived Ease of Use
11. People who influence my behaviour think that I should use the EHR system.	Subjective Social Norm
12. People who are important to me think that I should use the EHR system.	Subjective Social Norm
13. My use of the EHR system is voluntary.	Voluntariness
14. My supervisor does not require me to use the EHR system.	Voluntariness
15. Although it might be helpful, using the EHR system is certainly not compulsory in my job.	Voluntariness
16. People in my organisation who use the EHR system have more prestige than those who do not.	Social Image
17. People in my organisation who use the EHR system have a high profile.	Social Image
18. Having the EHR system is a status symbol in my organisation.	Social Image
19. In my job, the usage of the EHR system is important.	Job Relevance
20. In my job, the usage of the EHR system is relevant.	Job Relevance
21. The quality of output I get from the EHR system is high.	Output Quality
22. I have no problem with the quality of the system's output.	Output Quality
23. I have no difficulty telling others about the result of using the EHR system.	Result Demonstrability
24. I believe I could communicate to others the consequences of using the EHR system	Result Demonstrability
25. The results of using the EHR system are apparent to me.	Result Demonstrability
26. I would have difficulty explaining why using the EHR system may or may not be beneficial.	Result Demonstrability

The tool used to create the online survey was *Lime survey* (https://www.limesurvey.org/). It is a self-serve survey platform assisting researchers in designing, deploying and analysing surveys through an online interface. It has been successfully used by Swansea University Researchers before and is safe and compliant with British and Kuwaiti Data protection laws.

5.3.2 Setting and population

The whole population of users of EHR in Kuwait consists of about 20.000 HCPs (Ministry of health statistics, version 38, 2017) in six different public hospitals. However, not all of them will be active users or have ever used the EHR system. This is because the introduction of EHR's into secondary care has been a staged process in Kuwait, and not all hospitals are at the same level of adaptation and expertise (Alhuwail, 2020).

5.3.3 Sampling strategy

The sampling strategy was convenience sampling, a non-probabilistic sampling method (Ruel et al., 2015). According to Ruel et al. (2015), convenience sampling means selecting elements into the sample because they are easy to include more readily available. Naturally, this means convenience samples are often the least resource-intensive and cost-effective sampling method (Houser, 2016). However, convenience sampling is often not representative of the population because of the selection bias. For example, only people already interested in the topic answer the survey (Fink, 2003). Therefore, this bias needs to be considered when analysing the data. One approach to minimise bias is to maximise randomness in convenience sampling (Fink, 2003). One way this was addressed in this study was to utilise existing email lists of EHR users to distribute the survey to avoid the bias of people participating because they knew the researcher.

Another way to increase the validity of a convenience sample is to increase the population validity (Houser, 2016). A higher population validity would be achieved if the study was conducted on a sample with characteristics similar to the overall population. According to Houser (2016), one way of achieving higher population validity is to aim for a diverse sample regarding age and gender. This study aimed to achieve population validity by offering a paper version of the online survey for respondents who might not have felt comfortable completing it online. This offer was aimed at the older workforce, in particular, who might not be as familiar as younger staff members with online surveys.

5.3.4 Identifying Participants and Recruitment procedures

Eligible participants were identified via hospital staff email lists. Respondents were eligible to participate if they were subscribed to the email list of current EHR users in at least one of the six government hospitals. The total number of emails sent out via email lists across hospitals was 3000. Using an email list of EHR users increased the likelihood that participants were currently using or at least had been using the EHR in the past, hence ensuring they were able to complete a survey asking about their current user experiences.

HCPs were excluded if they were not a current user of EHR, for example, if they were on the respective email list but not actively using EHR. This exclusion criterion relied on respondents' honesty in replying to the survey. The email introducing the survey asked them only to participate if they were meant to be using the EHR in their everyday role.

The researcher obtained ethical approval for their research from the Kuwait Ministry of health on 27th March 2018. The ethical approval provided permission to contact the administration of each of the six government hospitals and asked them if they were willing to send out an email to staff using EHR in their hospital. All six government hospitals agreed to support the research and distribute the researcher's email, including the online survey link via their staff email distribution list. The email can be found in Appendix H. The first email was sent out on 15th October 2019. Sue and Ritter (2012) have shown that a reminder email can enhance the response rates to an online survey. Therefore, a reminder email was sent out two weeks later, on 31st October 2019, asking participants to complete the survey if they had not done it yet and still wanted to participate. The reminder email can be found in Appendix O. The survey was kept open until 15th December 2019 for two months.

The researcher encouraged participants to get in touch via email if they preferred to complete the survey in a paper version rather than an online survey. They could then choose to complete a paper copy of the survey and leave it anonymously in an envelope in the administrator's office. The administrator would then enter the paper-based survey responses into the online survey platform so that the replies would remain anonymous.

5.3.5 Data Analysis

At the end of data collection, participants' replies were entered into IBM SPSS Statistics Subscription version 25, as string variables. This represented the raw data set. It was never changed, or analysed, to prevent data loss. Nominal and ordinal variables cannot be entered directly into multiple regression analysis such as the linear stepwise regression analysis utilised in this study. Therefore, as it is summarized in Table 5.2, below, raw data were transformed into numerical, analysable information, by creating numerical variables from raw data.

It was this set of dummy variables that was subjected to data analysis.

The steps involved in the data analysis process are summarized in Table Table 5.2, below, and described in briefly the following sections.

Table 5.2 Summary of data analysis process

Step	**Main actions**
1. Creating numerical variables from raw data	Creating numerical variables from raw data. Computing variables for assessing the constructs of TAM and TAM 2, as presented in **Error! Reference source not found.**, Table 12.1 and Table 12.2. Classifying variables for type (nominal, ordinal, or discrete quantitative) and role (Target, Input, Both), and the meaning of values, as presented in **Error! Reference source not found.**, Table 12.1 and Table 12.2.
2. Sampling, Missing Values, and Case Selection Rules	Minimizing the number of missing values by excluding from the sample everyone who had not reached the last page of the survey; provided their consent; and answered the first and last items of the EHR Attitude Scale. Applying for this purpose the following case selection rule in SPSS: lastpage.Lastpage = 3 & Consent = 1 & Q6AccessIntent >= 1 & Q31DifficultyExplainingBenefits >= 1.
3. Establishing hypotheses	Establishing the hypotheses associated with TAM 2, i.e. TAM 2 equates the causal positive impact of Ease of Use on Perceived Usefulness, then on Intention to Use, and then finally on Actual System Use. Then, it was tested if an increase of Ease is associated with an increase of Usefulness. Lastly the new TAM 2 variables such as subjective norm, image and job relevance were hypothesized to affect, positively and directly, Usefulness.
4. Normality testing	Testing the normality of discrete quantitative variables.

5. Test choice	Choosing suitable measures of central tendency, in accordance with variables' classification. Choosing tests for inspecting interrelationships between variables, and hypothesis testing.

Creating numerical variables from raw data

In the first step, numeric variables were created from the raw data, and classified through standard statistical specifications (Cowan, 1998; Fagerland et al., 2011). The result is presented in Table 12.1, in Appendix Y, and will be summarized in the following paragraphs.

In this data set, nominal variables were: Language (‘Arabic’, or ‘English’); Consent (‘Yes’, or ‘No’); Gender (‘Male’, or ‘Female’); Nationality (‘Kuwaiti’, or ‘Non-Kuwaiti’); and Job title (‘Doctor’, ‘Nurse’, ‘Technician’, ‘Administrator’, or ‘Other’).

Ordinal variables were: Age (‘Less than 30’, ‘31-40’, ‘41-50’, ‘51-60’, and ‘60 and above’); Above Forty (’40 or less’, ’41 or more’); EHR Use frequency (‘Every Day, ‘2-3 times per week’, ‘Once per week’, ‘2-3 times per month’, ‘Less than three times per month’, and ‘Never’); Weekly Use (‘More than once a week’; ‘Once a week’); and Daily Use (‘Daily’; ‘Not Daily’); and the 25 survey items, labelled Q6 to Q31. Replies to the latter were offered in a Likert-like scale, varying from one, for ‘strongly disagree’, to seven, for ‘strongly agree’.

Discrete quantitative variables consisted of TAM and TAM 2 constructs. The way these were computed from respondents’ answers to the survey are depicted in Table 12.1 and Table 12.2 in **Error! Reference source not found.**. These variables were coined following Venkatesh and Davi’s (2000) TAM 2 model. They are: Intent, Usefulness, Ease, Social Norm, Voluntariness, Social Image, Job relevance, Output Quality, and Result Demonstrability.

Finally, the variable ‘InteractionNormIntent’ was created by standardizing the variables Voluntariness and Social Norm, and then multiplying these results by respondent, as specified in ***Error! Reference source not found.***.

Sampling, Missing Values, and Case Selection Rules

The second step of data analysis related to missing values. There were many missing values in the 900 initiated surveys. These are known to lower the trustworthiness of data analysis, and must be dealt with on a study-by-study manner.

In this study, inspecting patterns of missing values suggested that most of those were questionnaires where a participant would have answered the demographic questions but completed none or only a few of the TAM 2 questions. In order not to lower the trustworthiness of the study, it was decided those missing values would be eliminated by using a sample selection rule in SPSS. It was defined as follows: lastpage.Lastpage = 3 & Consent = 1 & Q6Access-Intent >= 1 & Q31DifficultyExplainingBenefits >= 1.

Inspecting the reasons for why people might not have completed the survey revealed that some participants started answering the first set of questions about consent and their demographic information but did not proceed to answer the majority of the EHR use related questions. Their pattern of engagement suggested that this behaviour was due to a lack of interest or relevance of the questions to them, rather than some questions being too challenging to answer.

The other sources of missing values were not so easy to identify, being apparently scattered across variables. Their impact on data analysis was dealt with by the automated options of SPSS, on a case-by-case manner. Finally, there were several outliers. These also tend to be recommended for the deletion of the case from the database. In this study, these outliers were not eliminated from the sample. There was an interest in exploring normal and extreme reactions alike.

At the end, from the 900 initiated surveys by following the link, only 419 had seen the survey presented in page three, among which 12 had not given their consent, and eight had not answered to the first and last question of the survey. The final sample, subjected to data analysis, had 399 respondents for most questions. It represents a response rate of 13.3% of participants.

Establishing hypotheses

The present study aimed at testing the TAM 2, as described by Venkatesh, and Davis, 2000. The hypotheses associated with TAM 2 are:

0a. Intent affects Use behaviour directly and positively.

0b. Usefulness affects Intent directly and positively.

0c. Ease affects Intent directly and positively.

0.d Ease affects Usefulness directly and positively.

1c. Voluntariness will moderate the effect of subjective norm on intention to use. (...)

2. Subjective norm will have a positive direct effect on perceived usefulness. (...)

3a. Subjective norm will have a positive effect on image. (...)

3b. Image will have a positive effect on perceived usefulness. (…)

5. Job relevance will have a positive effect on perceived usefulness. (…)

6. Output quality will have a positive effect on perceived usefulness. (…)

7. Result demonstrability will have a positive effect on perceived usefulness. (…)

8. Perceived ease of use will have a positive effect on perceived usefulness.

The hypotheses above also describe how Intention to use is expected to increase as Usefulness and Ease of use scales' results increase. These hypotheses were tested here, as in Venkatesh, and Davis' (2000) study, via linear stepwise regression analysis. Additionally TAM 2 equates the causal positive impact of Ease, then on Usefulness, then on Intent, and then finally on use behaviour. Then, it should also be tested if an increase on Ease is associated with an increase on Usefulness.

TAM 2 expanded TAM in terms of number of variables and equated relationships. For the most part, the new variables are hypothesized to affect, positively and directly, Usefulness, as established by hypothesis 2, and 3b to 8. Exceptions involved the variable Social norm, which was expected to also affect directly Social Image (3a), and have an effect on Intention, though as moderated by Voluntariness (1c). There further were additional hypotheses involving Voluntariness. These were excluded from testing procedures in the present study for none gathered empirical support.

Normality Testing

Normality testing is done to determine whether a sample is drawn from a normally distributed population. The normal distribution is a continuous probability distribution that is symmetrical around its mean with most values near the central peak. Normality of the distribution can never be assumed for nominal and ordinal variables, but it must be tested for discrete quantitative variables before studying variables separately, via descriptive statistics, and jointly, for hypotheses testing.

Kolmogorov-Smirnoff tests was used for this purpose. Results showed no variable followed a normal distribution. Specifically, test results were: Intent ($D(391)=0.24$; $p \leq 0.001$), Usefulness ($D(391)=0.2$; $p \leq 0.001$), Ease ($D(391)=0.12$; $p \leq 0.001$), Social Norm ($D(391)=0.15$; $p \leq 0.001$), Voluntariness ($D(391)=0.73$; $p \leq 0.001$), Social Image ($D(391)=0.09$; $p \leq 0.001$), Job relevance ($D(391)=0.18$; $p \leq 0.001$), Output Quality ($D(391)=0.15$; $p \leq 0.001$), and Result Demonstrability ($D(391)=0.09$; $p \leq 0.001$). These result showed that there was not a single variable following a normal distribution.

Test Choices

As measures of central tendency, frequencies, medians and quartiles were used to describe nominal and ordinal variables. For quantitative discrete variables, means, medians and standard-deviations were determined. The mean is the numerical average of a data set. When all the numbers in a data set are ordered from least to greatest, the median is the number in the middle. The standard deviation measures the dispersion of data, i.e the greater the value of the standard deviation, the more the data tends to be dispersed from the mean. Those values were calculated to explain variations in the data. Standard deviation tells how spread out the data are from the mean, regardless of whether the data is normally distributed.

As for inspecting interrelationships between variables, and for hypothesis testing, nonparametric tests, or tests not requiring normality assumptions were chosen for data analysis. These detect statistically significant differences in the distribution of data, rather than simply describing how spread out the data are from the mean like calculating standard deviation does. Detecting differences in the distribution of data is important to determine which statistical tests to use to detect interrelationships between the data. Every test was two tailed, to help to deal with the uneven size of the groups, and was identified and reported upon where appropriate. Moreover, TAM and TAM 2 constructs were created by summing up ratings for an uneven number of survey items. The process used to do this was using weighted means, which is similar to calculating an ordinary mean, i.e the average of a data set. Weighted mean was calculated by calculating the average with some data points contributing more than others. Therefore, means weighted by the number of items, named 'weighted means', consisting of an average weighted by the number of items within each scale.

For any of these approaches, the nonadditivity of variables needs to be tested, which are, in this case, the scales assessing each construct. Non-additivity tests the role of variables in an estimated model. If a variable was additive then it could simply added to the other variables in a model to determine which effect it has on the independent variables. Additivity then means that the predictor variable is independent of any other influencing variables. Non-additivity testing can be achieved through multicollinearity tests, based on patterns of correlations, or Tukey's test of Nonadditivity. Strongly correlated, and significantly nonadditive variables, should either be deleted from models, or entered exclusively as interacting variables. This interaction role helps to test moderating effects, for example.

Finally, the causal pathway established by the whole model were inspected. This once, analytical procedures included the variables Voluntariness and Experience, in their moderating roles between Social Norm and Intent or Usefulness.

Overall, the tests more commonly employed in the present study were:

- Cronbach's α, for testing the reliability of composite scores. Cronbach's α measures internal consistency, i.e. how closely related a set of items are as a group;
- Chi-Squares, for inspecting the association between variables with two levels and frequency above five (e.g., gender and nationality). Chi-Square tests are being used to compare expected results with observed results, i.e Chi-Square determines whether the difference between observed data and expected data is due to chance or due to a relationship between the variables;
- Cramer's V, used to understand the strength of the relationship between two variables. In this study Cramer's V was used for inspecting associations between variables where at least one has more than two levels (e.g., Job title and Use Frequency);
- Spearman's Rank correlation coefficients, used to summarise the strength and direction (positive or negative) between two variables. It is suitable for inspecting relationships between at least ordinal variables in large and non-normally distributed populations (e.g., Use Frequency and Age);
- Mann Whitney's U, compares whether there is a difference in the dependent variable for two independent groups. It can be used for comparing the distribution of at least ordinal variables across two groups;
- the Kruskal-Wallis's H, used to test whether samples are originated from the same distribution. Kruskal-Wallis H is used to compare three or more groups on a dependent variable;
- Dunn's pairwise, is used when a Kruskal Wallis H is rejected. Dunn's test performs pairwise comparisons between each independent group and tells which groups are statistically significantly different.
- Bonferroni corrected comparisons, used to reduce the chances of obtaining a false positive; for comparing at least ordinal variables across more than two groups;
- Multicollinearity tests, to determine which TAM and TAM 2 constructs showed high, significant correlations, and should be entered, in multiple regression tests, as two-way interactions.
- Multiple, linear, stepwise regression analyses for predicting Intent and Usefulness, stepwise regression examines the statistical significance of each independent variable in a linear regression model

5.4 Study Two: Qualitative Study

As previously explained, the second component of this mixed-methods research was a qualitative study that sought to explore secondary care staff's experiences and perceptions of EHR in their everyday roles and understand perceived barriers to the EHR from their perspective. This section outlines the two qualitative phases of the research and the followed methods and procedures.

5.4.1 Phase One

The qualitative design enabled the researcher to capture various voices and approaches (Creswell & Poth, 2017). This research design aimed to address mainly the *second and third aim* of this thesis *to explore secondary care staff's experiences and perceptions of EHR in their everyday roles in six government hospitals* and *to understand perceived barriers to the EHR from the perspective of secondary care staff.* A quantitative research design alone would not have provided an opportunity to capture the multiplicity and complexity of voices. However, a qualitative design enabled the researcher to gather a richly descriptive account of how the participants made meaning of their experience with EHR implementation (Creswell & Creswell, 2018).

It was decided to collect the data in the form of semi-structured interviews to cover various areas of interest stemming from previous research and literature. Furthermore, to give participants enough flexibility to bring in the critical experiences (Galletta & Cross, 2013). This method had the advantage of providing some structure in the form of themes that the researcher wanted to touch on while at the same time ensuring that participants could bring in whatever seemed important to them. A questionnaire style interview, for example, would not have been appropriate as predetermined questions would have made too many assumptions about staffs' experiences with EHR (Leavy, 2014).

For example, other qualitative methods, such as participant observation, were deemed unsuitable for the research aim. Participant observation means that the researcher goes into the field and spends, for example, several days or weeks following the research subjects observing the interactions and use of the technology. This approach would have revealed interesting insights about the actual use of the EHR. However, it would have potentially lacked a better understanding of how the healthcare professionals were making meaning of the use (Leavy, 2014). It was, therefore, decided to adopt an interview methodology.

5.4.1.1 Development and piloting of Data Collection Instrument

According to Drever (1995), a semi-structured interview guide can be used to set up a general structure for the interview. It can be helpful to decide in advance what aspects the interviewer wants to cover and determine the main questions to be asked during the interview. The most important purpose of the interviews was to address Aim 2, i.e exploring participants' felt experience and how they made meaning of their engagement with EHR. The semi-structured interview guide was informed by some of the themes that the scoping review of the literature had identified as influencing acceptance and use of EHR. The interview guide can be found in Appendix U.

Guest et al. (2013) recommend piloting semi-structured interview guides with the target population to test whether the interview questions were interpreted in the way the researcher had intended, test whether the estimated time for interviews was appropriate, and allow the interviewer to practice their interviewing skills. Accordingly, the researcher asked two colleagues who were Kuwaiti HCPs working with EHRs whether they would be willing to take part in a round of pilot interviews. The pilot interviews were carried out in the last week of November 2018. The researchers own reflections and feedback from the interviewees were incorporated into an improved version of the semi-structured interview guide which can be found in Appendix U. Changes that were made after piloting were for example changes to the order of questions, adding further questions to elicit more elaborate answers and deleting questions that could be interpreted as influencing participants. The pre-pilot interview guide can be found in Appendix T.

5.4.1.2 Sampling Strategy

It was decided to use a convenience sampling strategy, a non-probabilistic sampling method (Emmel, 2013). According to Emmel (2013), convenience sampling, i.e. choosing participants based on their availability and willingness to participate, is often the most cost-effective and least resource-consuming sampling method in qualitative research. Furthermore, convenience samples are usually not representative of the population (Fink, 2003), which is less of a problem in qualitative research than in quantitative research as this type of research does not aim for generalisability of the findings (Creswell & Creswell, 2018).

The sampling strategy aimed to include a broad range of different user experiences. This was achieved by focussing the sampling strategy on recruiting participants from different health care roles. The range of HCPs was made up of doctors, nurses, management, including monitoring and evaluation officers and assistant directors, as well as technical staff like medical laboratory technicians, radiologists, and other allied health workers or administrators who deal mainly with data input, for example, staff members who are situated in the medical records department.

The fieldwork was carried out in three public hospitals in Kuwait from December 2018 and March 2019. Kuwait has six public hospitals, and due to logistics and resources, it would not have been possible to do interviews in person with staff from all six hospitals. The work for this thesis was undertaken in collaboration with the Ministry of Health. The Ministry funded the research as they wanted to improve EHR use in public hospitals in Kuwait. With this aim in mind, it was agreed with the Ministry that the present study should focus on the three hospitals which eventually participated in the qualitative study. Therefore, this study limited its sample to three hospitals. The hospitals were chosen to encompass a range of different stages of EHR implementation and thus to increase variation in the sample to illuminate some primary dimensions and themes in the user experiences across hospital sites. According to Patton (2002), this is one of the advantages of qualitative sampling to maximise heterogeneity. Heterogeneity and variation of the sample were achieved by including hospitals located in different areas of Kuwait and at different stages of EHR implementation. For example, one hospital had implemented EHR as one of the first in the country and had been using it for almost ten years, another one had just recently started the implementation process, and the third hospital had implemented some basic functionality. However, it had not yet achieved a complete utilisation of the EHR system. Unfortunately, no official data outlines the different implementation stages of secondary care hospitals in Kuwait (Alhuwail, 2021). Hence the participating hospitals were selected based on anecdotal evidence.

5.4.1.3 Inclusion and exclusion criteria

Respondents were eligible to participate if they were:

a) a member of management, doctor, nurse, technical or administrative staff in one of the three selected government hospitals

b) subscribed to the email list of current EHR users in one of the hospitals

c) were currently using EHR in their work

5.4.1.4 Participant recruitment

The researcher obtained permission from the MoH on 26th March 2018 to contact hospital leadership in each of the three hospitals, see Appendix E. Ethical approval from Swansea University to begin the study was obtained on 3rd of May 2018, see ethics applications and approvals in Appendix F and Appendix G.

Hospital leadership then agreed to send out an email to all staff subscribed to each hospital's EHR email user list inviting them to take part in the study. The researcher did not obtain the email addresses himself following data protection laws but asked the leadership of each hospital if they were willing to support the research by distributing a research invittaion email to each hospital's list of EHR users on behalf of the researcher. The email can be found in Appendix P. The total number of emails sent out was 1400. The initial email invitation was sent between 5th and 18th of November 2018. Potential participants were advised to contact the researcher directly via his Swansea email address provided in the recruitment email. There was initial interest from 85 HCPs. A second email was sent out to those interested, containing the participant information sheet, consent form and the eligibility criteria, see Appendix Q, appendix R and appendix S.. Participants were encouraged to read through the participant information sheet and sign and return the consent form (if they met the eligibility criteria. Out of the initial 85 HCPs interested, 45 people met the eligibility criteria, agreed to be interviewed and returned a signed consent form. The remaining forty potential interviewees either did not meet eligibility criteria, did not respond after the initial contact or did not return the consent form after being contacted repeatedly by the interviewer. The researcher had scheduled two weeklong in-person visits to each hospital between December 2018 and March 2019. Participants were booked in for an interview during these times. Out of the 45 potential participants, 30 were scheduled and completed the interview. Unfortunately, fifteen participants had initially signalled interest but could not participate due to busy schedules and scheduling conflicts.

The researcher decided to carry out a round of interviews with thirty participants to gauge whether data saturation would be reached or if it would be necessary to do another round of participant recruitment. Data saturation refers to the point in qualitative research where interviewing more participants would not bring up new themes or patterns (Creswell & Creswell, 2018)

5.4.1.5 Data collection procedure

The researcher then visited each hospital for two weeks and scheduled in-person interviews with the participants before the visit. The interviews took place in a private office space in each hospital. The researcher took care to agree on a location that was convenient and safe for both himself and the participants. He offered to meet in a more private space, such as the participants' homes, if they said they would feel more comfortable not being interviewed in their workplace. They were being audio recorded with the participant's permission. The interviewer used an audio recording device for this purpose as they are a small, light, and dependable recording (Guest et al., 2013). Guest et al. (2013) recommended familiarising oneself with the recording device before the interview, and the researcher did this during the pilot interviews. The authors further recommend taking an extra set of batteries on the day of the interview and for the researcher to take notes during the interview in case of data getting lost. The researcher followed this advice and ensured the recording device was fully charged or plugged in, did a test recording in each new space to check sound quality in advance.

Building rapport with interviewees is a very important component of the data collection process. Its purpose is to make the interviewee, who volunteers their time and energy to support the research process, as comfortable as they can be with the research process. Good rapport between interviewer and interviewee also supports the quality of data collected as the interviewee will be more likely to feel able to speak freely about the topics discussed. The researcher supported rapport building with interviewees by displaying genuine interest in their research participants, for example not only asking them about the topics relevant to the research but also making them feel comfortable by asking them if they arrived safely at the interview site, if they had a good day and by offering them refreshments if they wished. Furthermore, the researcher subtly matched their own verbal and non-verbal expressions, for example body language to the expressions of their interview partners to increase rapport building as suggested by Youell and Youell (2013).

The researcher was also taking hand-written notes to support the interviewing process. The semi-structured interview questionnaire was used as guidance for the interviewer and adapted depending on interviewees replies (Drever, 1995). For example, if a participant mentioned one of the themes in the semi-structured interview questionnaire without needing a prompt, then the interviewer would follow this thread and ask follow-up questions allowing the interviewee to elaborate on the topic that was brought up. If, however, an area of exploration was not mentioned by the interviewee on their initiative, then the interviewer would prompt using some of the questions that can be found on the semi-structured interview guide in Appendix U. All interviews had initially been conducted in the Arabic language as it was the mother tongue of interviewer and interviewees. Conducting the interviewees in Arabic removed potential barriers to a nuanced expression caused by searching for and finding words in a second language, mainly if the language structures are as different as English and Arabic (Khalifa, 2013).

After each interview, the audio recordings were transferred to an encrypted hard drive as soon as possible, usually within a few hours to minimise the risk of losing data (Guest et al., 2013). The following data analysis step involved transcribing the audio recordings using a word processor. Each transcript was saved as a password protected word document. It was decided to transcribe the Arabic recordings first before translating them into English. This was done to reduce the difficulties associated with translating and transcribing verbatim data, such as minimising interpreter bias and preserving as much meaning and nuance from the original interviews (Liamputtong, 2010). While transcribing can be a time-consuming and demanding process, it is also invaluable for the researcher to get familiar with the data (Seidman, 2015).

Furthermore, Seidman (2015) recommends transcribing interviews as a whole not to invite premature judgements regarding which aspects of an interview are essential and which are not. Therefore, the audio recordings were transcribed as a whole. It took between three and five hours to transcribe each interview. The researcher also included pauses, laughs, coughs, and other non-verbal signals recorded on the tape to reflect the interview as fully as possible, as Seidman (2015) suggested.

It was decided to translate them into English as a first step for the researcher to immerse himself in the hermeneutic cycle and as an opportunity to get familiar with the small, word by word meaning-making of the participants as suggested by Liamputtong (2010). One of the Arabic language complexities is that it has two forms, a spoken and a written form. In addition, spoken Arabic varies from region to region. Another complexity of the Arabic language is that the same word can capture different meanings, depending on the context (Al-Amer et al., 2016). It was, therefore, decided not to use a professional translator because they might not be familiar with the health care context and therefore not be able to capture the meaning and the interviews appropriately, add relevant information or lose the meaning (Aranguri et al., 2006). The researcher did the initial Arabic to English translation of the interviews. Being a Kuwaiti researcher at a UK university, he often has to navigate cultural and language barriers.

Furthermore, he has a background in nursing and is, therefore, familiar with the language used in the Kuwaiti health care context. Adopting a process of checking and discussing the translation process as suggested by Liamputtong (2010), he asked a second colleague who was also a native Arabic speaker doing PhD research in the UK to blindly translate a sample of the interview to assess the level of agreement between two translations. The primary researcher would continue translating the whole interview if both versions agreed. If there was a disagreement between the translators, it was planned to ask another colleague proficient in English and a native Arabic speaker to guide the final decision about appropriate terms to use in the translation. This checking procedure seemed important, particularly as the literature has shown that including an independent reviewer can increase the credibility of the translation (Squires et al., 2013).

The researcher also aimed to transcribe and translate each interview relatively soon after conducting it before the following interview was conducted. The reason for doing this was so that each interview could add to the researcher steps of knowledge and understanding about participants experiences with EHR, even before the formal process of analysis began when all the interviews were completed. In practice transcribing and translating each interview before the next one was conducted was not always possible. This was due to time constraints and scheduling issues. However, most of the interviews could start the first step of hermeneutic exploration and identify the most pertinent themes in the participants' experiences and meaning-making.

5.4.1.6 Data Analysis

This study has adopted hermeneutics as a method of analysis. Hermeneutics can be the philosophy that underpins an interpretative framework and a way of analysing data (Bleicher, 2017). The leading question for hermeneutic analysis is “what is the meaning of this text?” (Radnitzky, 1970, p. 20). Hermeneutics aims to make clear what is confused or contradictory. It tries, through interpretation, to understand how the participant’s meaning-making leads to an underlying sense of coherence and meaning. Another central principle of hermeneutics is the hermeneutic circle (Gadamer, 1976). The hermeneutic circle describes how hermeneutics aims to show the connection between the whole of the text and its parts. The idea is that meaning will be conveyed through the whole text interpreted and reflected in its parts. Hermeneutics is underpinned by the understanding that we construct knowledge as a dialogue between the researcher and the text (Gadamer, 1976). This means the researcher has to engage with the text repeatedly. Each iteration will increase his understanding and enable a complete interpretation of participants' meaning-making.

The hermeneutic analysis follows these principles by acknowledging that the analysis of the text has already started with the construction of research questions and the way the interview questions are put together. The dialogue started when the researcher started engaging with knowledge around the subject (Gadamer, 1976). This means there needs to be much careful interpretation which might also unravel the researcher’s assumptions about the topic, for example, guided by the Technology acceptance model, which is a very particular way of making sense of EHR adoption. The data analysis was carried out in a hermeneutic circle, adopting the following seven steps to hermeneutic analysis as suggested by Diekelmann et al.(1989).

Step 1: Reading all interviews or texts for an overall understanding

The first step was to read through all interviews individually to have first ideas about meaning-making and contradictions and confusion. Furthermore, to gain an idea about how individual interviews were situated within the context of all interviews conducted.

Step 2: Preparing interpretative summaries of each interview

This step involved noting the basic information about individual interviewees anonymously, including their job role and the hospital they worked in. This step involved creating short summaries of essential points conveyed in each interview. Furthermore, poignant quotes that seemed meaningful were noted down.

Step 3: In-depth analysis of individual interviews

The next step was to analyse individual interviews guided by the questions asked in the semi-structured interview guide. Ambiguities, emerging questions, and fragments of interpretation were noted for each interview. There were some emerging contradictions during the interviews, for example, between a great appreciation of the EHR systems as useful and enhancing staff's engagement with their work. At the same time, staff also reported that the system was only used partial and incomplete. Hermeneutics provided a way of analysis, bridging the gap between these contradictions. The hermeneutic analysis is a method particularly suitable for exploring contradictions and ambiguities by offering an opportunity to move between individual statements and the larger text (or interview) produced (Diekelmann et al., 1989).

Step 4: Resolving any disagreements on interpretation by going back to the text

To achieve this step, a separate word document was created, collating statements made across individual interviews, including any upcoming contradictions, ambiguities or fragments identified in individual interviews. Those were grouped thematically. **Error! Reference source not found.**

Step 5: Identifying recurring themes that reflect common meanings and understandings

Step 5 involved colour coding all interviews to gain an initial idea of upcoming themes and meanings. The researcher started the coding process by reading through transcripts. After some time of doing this process, similar themes emerged across transcripts. Those themes were then assigned the same code.

Step 6: Identifying emergent relationships among themes

The initial themes were used to guide another reading of the whole text. This process helped to identify themes, subthemes and the relationships between them more clearly. The themes were then grouped together and analysed individually, followed by a round of re-reading each section identified as part of a theme within the larger context of the whole interview.

Step 7: Presenting a draft of the themes along with examples and quotes from the transcripts

This step involved presenting each theme and the associated subthemes, reflecting on their relationships, and providing examples and quotes from the transcripts.

5.4.2 Phase Two

This qualitative research phase was much smaller in scope than phase one. It was an exploratory which was used to better understand what can be learned from previous implementation successes in different settings. The purpose of this qualitative research phase was to address aims two, three and four of the thesis. Phase one of the qualitative research focused on user experiences and meaning-making. However, this study adopted a broader and more strategic interest aiming to learn from previous EHR implementation experiences in Kuwait.

5.4.2.1 Development of the data collection instrument

It was decided to collect data in the form of semi-structured interviews. The semi-structured interview guide can be found in Appendix X. Focus of the questions was on how participants experienced the EHR implementation process in their organisation and the benefits and lessons. A semi-structured interview guide ensured the researcher could cover all areas of interest he had defined before the research (Drever, 1995). The questions were based on literature research, the researcher's own experience and discussion with the thesis supervisors. The first section of the semi-structured interview guide was interested in why EHR was initially introduced in these settings. In addition, questions were aiming to elicit the decision-making process around implementation, for example, if EHR was mandated or if it was a voluntary decision.

Furthermore, the participants were asked which factors influenced their decision making if they introduced the EHR system voluntarily. Finally, this section also discussed the benefits and limitations participants found in the systems once they were implemented. The next part of the interview explored the implementation process, such as whether the interviewees had to adjust or make any changes to their original plans, whether they learned something during implementation that helped them improve the use of the system or its functionality. The participants were also asked if they had any advice for someone who was starting the journey of EHR implementation, and any lessons learned that they found worth sharing.

5.4.2.2 Sampling Strategy

A non-probability sampling method, convenience sampling, was used to collect the data. Emmel (2013) states that convenience sampling is often the most resource and cost-saving research strategy. It is a sampling strategy that chooses participants based on their availability and willingness to participate. The researcher used their professional networks to identify three staff members who held leadership positions in different settings that successfully implemented EHR. One participant was the director of a primary care centre in Kuwait; another was a private hospital director. The third participant was leading a tertiary care centre and was also involved in the decision making around EHR implementation in their specific setting. They were chosen because they had significant knowledge around the decision making involved in acquiring EHR systems and had experienced the whole cycle of implementing EHRs in their specific contexts.

5.4.2.3 Data collection procedure

These interviews were brief and lasted around half an hour each. They were conducted in person in the interviewee's offices during a visit to Kuwait by the primary researcher between July and August 2019. The researcher had sent the questions in advance to the participants via email to enable them to make an informed decision whether they felt they were a) willing to participate and b) the right person to help the researcher gain a better understanding of some of the strategic decision making involved in implementing EHR systems. All three hospital leaders that were approached initially agreed to be interviewed were sent a participant information sheet (Appendix V) and had read and signed the consent form, see Appendix W. The interviews were recorded using a digital recorder as suggested by Guest et al. (2013) as a safe and convenient way to record interviews. The semi-structured interview guide was used to guide the interviews. However, the participants were free to talk about whatever seemed most relevant to them so the researcher could remain open to emerging themes and variations in emphasis and importance.

The audio-recorded interviews were transferred to a password protected hard-drive immediately after (Guest et al., 2013). They have been conducted in Arabic and were first transcribed verbatim in Arabic to preserve as much meaning and nuance as possible (Liamputtong, 2010). The interviews were then translated into English by the researcher. The exact process for phase one of the qualitative research was applied to the translation. A detailed description of the translation process can be found in Chapter 5.4.1.6 Data Analysis.

5.4.2.4 Data analysis procedure

The interview transcripts were analysed using the six-phase guide to performing thematic analysis proposed by Braun & Clarke (2006). Each step is outlined below:

Step 1: Familiarise yourself with the data

Step one started with transcribing the data in Arabic and continued through the translation process. This step allowed the researcher to immerse himself into the data (Seidman, 2015). While reading each transcript several times, the researcher noted some initial ideas on a separate word document.

Step 2: Generating initial codes

Step Two was to generate initial codes. The coding systematically went through each transcript, top to bottom and sentence by sentence, and coded interesting data features. According to Braun & Clarke (2006), coding can be done with specific questions in mind to code around. In this case, the questions guiding the coding were derived from the research aim 4: To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait. The questions derived from this aim were: How did participants experience EHR implementation in their setting? What lessons did they learn from their implementation experience?

The coding was done in a word document using a word processor and assigning different colours to each code. The codes were then extracted to a separate word document and matched with the data extracts demonstrating that code, as suggested by Braun & Clarke (2006).

Step 3: Searching for themes

The following data analysis step involved collating the codes identified in step two into themes. Step 2 had generated a long list of codes. The purpose of step three was to re-focus the analysis on the broader level of themes by sorting the codes into potential themes and collating the relevant data extracts under each theme. This step was accomplished by creating a mind-map of the relationship between codes and emerging themes. The repeated visual mapping of codes and themes eventually led to emergent relationships between codes and themes, between themes and revealed the hierarchy between different levels of themes.

Step 4: Reviewing themes

This step involves refining themes and checking whether the data extracts support the themes identified. First, step four was done by reading all the collated extracts for each theme to consider whether they form a coherent pattern, as suggested by Braun & Clarke (2006). If data extracts did not fit, this meant they belonged to a different theme and needed moving, or the theme needed to be refined to capture the meaning of the data extract better. Following this process for individual data extracts was applied to the whole data set. Finally, the researcher re-read the whole data set to check whether the "thematic map" (Braun & Clarke, 2006, p. 91) reflected the meaning evident in the whole data set.

Step 5: Defining and naming themes

Once the researcher was satisfied that the themes worked and accurately represented both the data set as a whole and individual data extracts, he moved to step five of data analysis, defining and naming themes. This step involved identifying the scope and content of each theme.

Identifying the scope was done by defining each theme's interest and why. Furthermore, in this step, it becomes clear the essence of each theme and how it relates to the other themes identified.

Step 6: Producing the report

This step involved using the themes as guidance to produce a narrative of the themes found and their relationships. Step six also involved evidencing this analytic narrative with data extracts to tell a compelling story and illustrate the analytic narrative (Braun & Clarke, 2006).

5.5 Mixed Methods Data Analysis and Interpretation

This thesis's data collection and analysis have been conducted following Creswell and Plano Clark's (2017) four-step process in convergent research design.

Step 1 and Step 2 -Data Collection and Data Analysis

The first step was to collect qualitative and quantitative data. Then those distinct data sets were analysed separately and independently, following the methods described previously in this chapter. Data analysis for the quantitative study can be found in Chapter Six and for both qualitative studies in Chapter Seven.

Step 3 Compare and relate

The third step involved comparing and relating the findings and results from both studies. Step three involved looking for common concepts across both sets of findings as suggested by Creswell and Plano Clark's (2017). This step was done by entering the quantitative results and qualitative findings side by side. xsssfsSide.All the results and findings were then mapped on a whiteboard to identify shared concepts as suggested by Creswell and Plano Clark's (2017). Once the common concepts were identified by mapping the results and findings from the quantitative and qualitative studies, the concepts were used to develop a mind map displaying the results together as suggested by Creswell and Plano Clark's (2017).

Step 4 Interpretation

Finally, the fourth step was the researcher's interpretation with regards to how the two data sets converge or diverge from each other and how they combine to create a better understanding in response to the study's overall purpose, to enhance the acceptance and use of EHRs amongst secondary care staff in Kuwait. The fourth and final step of mixed-methods analysis and interpretation involved what Tashakkori and Teddlie (2009) called inferences and meta-inferences, i.e. drawing interpretations from the qualitative and quantitative strands of the research as well as from across the different strands. This was done by comparing the results in the table under each concept to determine whether in what ways they confirmed, disconfirmed, or expanded on each other. The analysis and interpretation of step three and four can be found in Chapter 9.

6 Chapter Six: Quantitative Study Results

6.1 Introduction

The objective of the present Chapter is to describe the findings collected through the online survey in six governmental hospitals in Kuwait. These help to describe the demographic characteristics of their health professionals, and their opinions about Electronic Health Record (EHR) system being implemented there.

The present study tests TAM 2. TAM 2 uses the nine subscales to predict, theoretically and empirically, future technology use behaviour. Their theoretical relationships were detailed in Chapter Five: Methods.

The chapter is divided into eight parts. The first is this brief introduction. The second is concerned with measuring reliability. The third section inspects respondents' demographic information. The next section tests use frequency patterns. Section five tests TAM 2's hypothesis. The next section offers the causal pathway. Section seven covers overall conclusions, and the final section discusses more evident methodological limitations.

6.2 Reliability

Reliability studies establish, as rule of the thumb, Cronbach's α coefficients above 0.8 as satisfactory. Appendix Z, describes the reliability of the scales used to assess every construct. Most scales had satisfactory reliability, or at least above 0.7, as for the case of Social Image, Job relevance, and Output Quality. The only scale with remarkably low reliability was Result Demonstrability, with a reliability of 0.52. Yet, its reliability would increase visibly, and to satisfactory levels of approximately 0.82, by deleting Q31.

The inter-item correlations included in Appendix AA support this decision. Correlations can be very strong, when above 0.8, strong, when between 0.6 and 0.8, moderate, when between 0.4 and 0.6, and weak, when below 0.4. Even if there were several inter-item correlations across scales with moderate levels of strength, Q31 was the only item showing weak correlations, with a strength close to zero, with the other items within its scale, namely. Therefore, Q31 is recommended for deletion in future studies.

Table 12.4 in Appendix Z compared the reliability of construct scales in this study with those published by Venkatesh, and Davis (2000, p.201). As it can be observed, Social Image, Job relevance, and Output Quality showed slightly lower, and lower than satisfactory reliability in this study. This discrepancy did not seem alarming. For the remainder, there was some apparent equivalence for every construct across studies, providing convergent validity to both. The exception was Result Demonstrability, which showed a particularly low reliability, and markedly lower than the one found in the original study. The reliability would only be equivalent by deleting Q31. This reinforced the recommendation of deleting this item.

6.3 Participants' demographic characteristics

A total of 399 surveys was analysed. It represents 13.3% of what was, at the time of data collection, the overall population of health care professionals in secondary care hospitals in Kuwait. The nonresponse rate regarding those who did receive the survey was 55.67%. Nonresponse, i.e. not obtaining a useful response to all survey items from the entire sample can be an issue if the nonresponse rate leads to biased results. The risk of nonresponse bias is discussed subsequently, in the limitations section.

A summary of the frequencies of the categories of gathered demographic traits is presented in Table 6.1, below.

Table 6.1 Frequencies of demographic attributes

Attribute	Valid N[1] (Missing)[2]	Value	Percentage
Language	399 (0)	Arabic	63.4%
		English	36.6%
Nationality	398 (1)	Kuwaiti	72.9%
		Non-Kuwaiti	26.8%
Gender	396 (3)	Male	29.3%
		Female	69.9%
Above Forty Groups	398 (1)	Forty, and less	67.4%
		Above Forty	32.3%
Job Title	386 (13)	Doctor	16.8%
		Nurse	22.6%
		Technician	19.8%
		Administrator	19%
		Other	18.5%

1. N stands for sample size.
2. Number of study participants who did not answer to the question, and thereby represent a missing value.

The variable Language registered automatically the language chosen by health professionals to answer to their surveys. Table 6.1, above, shows the majority replied in Arabic (N=253;

63.4%). Nevertheless, a yet remarkably large group answered to their surveys in English (N=146; 36.6%).

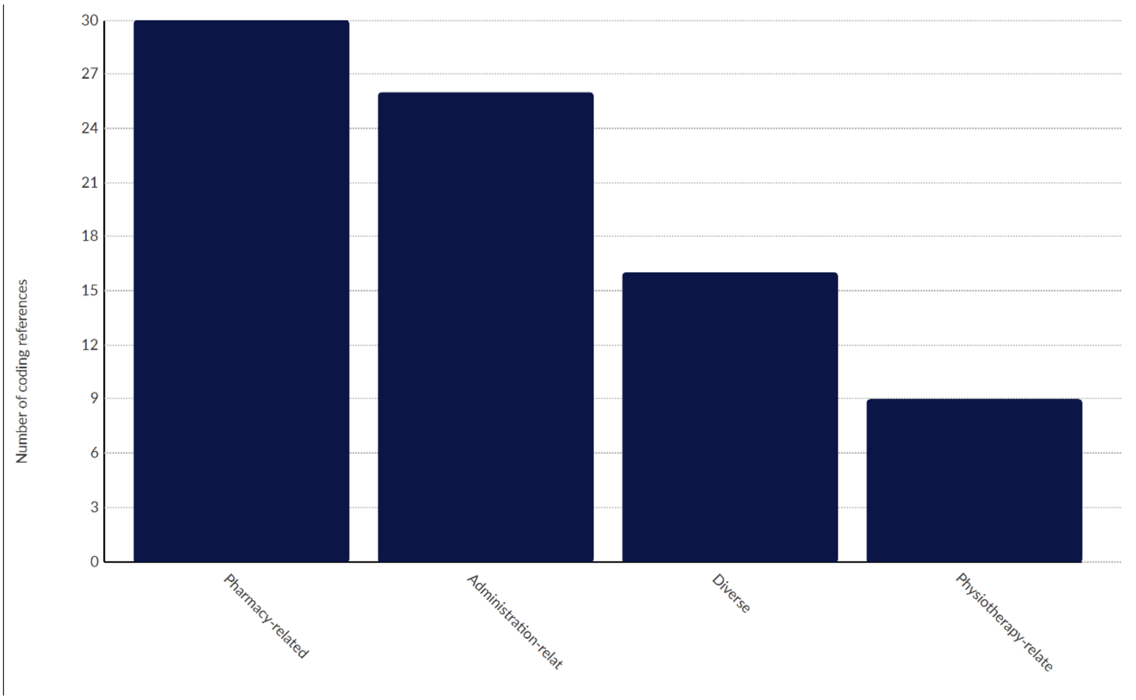
As for Nationality, the majority of participants further had a Kuwaiti nationality (N=291; 73.1%), rather than any other nationality (N=107; 26.9%). Regarding Gender, there were approximately three times more individuals from the female gender (N=279; 70.5%) than from the masculine gender (N=117; 28.5%).

Due to an error in setting up the age category, it was decided to create a new Age variable. It was the variable ‘Above forty’, which was chosen as it divided participants into two groups, those with forty or less, and those above forty. This new variable did not solve the 30 years-old void, but enabled the researcher to do group comparisons between the two age groups. As included in Table 6.1, about two thirds of participants had forty or less years of age (N=269, 67.4%), and one third had more than forty years old (N=129; 32.3%).

Finally, in terms of Job title, as adjusted to the 13 missing answers, there apparently were approximately one fourth of participants per Job title category. In decreasing order, their frequencies were: Nurses (N=90; 23.3%); Technicians (N=79; 20.5%); Administrators (N=76; 19.7%); Other (N=74; 19.2%); and Doctors (N=67; 17.4%). Then, job titles seem to be fairly equally distributed in this sample.

Additionally, those answering ‘Other’ were asked to identify their professional roles. A Table listing their replies, and counting their frequency, is included in Appendix BB. Results are illustrated in Figure 6.1. As it can be observed, staff who felt improperly accounted for by the categories offered by the survey described performing pharmacy-related roles, then administration-related roles, from EHR administrators to quality nurses and heads of department, then physiotherapy-related roles, and, finally, diverse specialized roles in departments, from nuclear medicine to occupational therapy, and dietetics.

Figure 6.1 Number of coding references for 'Other' categories



The roles described in the 'Others', illustrated in Appendix BB, represent almost 20% of Job titles. Moreover, these roles could well be accounted for by the offered categories offered by the survey, were these to have included examples. This observation raised doubts about the analytical value of the variable Job Titles, principally when involving distinctions between the category 'Others', and its alternatives.

In sum, the majority of participants answered to the survey in Arabic, were from the female gender, had a Kuwaiti nationality, and were less than 41 years-old. In terms of Job titles, participants were fairly equally distributed across available categories, and the most common non-listed Job titles included roles related to pharmacy, physiotherapy, and leading positions.

6.3.1 Independence of demographic attributes

This section assessed the independence of demographic attributes. Findings are summarized in Table 6.2, below, and detailed in Appendix CC. For both tests, the null hypothesis establishes independence between variables.

Table 6.2 Independence tests for demographic attributes

Association	**Valid N[1] (Missing)[2]**	**Pearson $\chi2$ / Cramer's V**	**Significance[3]**	**Likely relationship**
Gender*Language	399 (0)	$\chi2(2)=13.666$	$p=0.01$	Dependent
Gender*Nationality	398 (1)	$\chi2(2)=19.395$	$p<0.01$	Dependent
Gender*AboveForty	398 (1)	$\chi2(2)=4.204$	$p=0.122$	Independent

Language*Nationality	398 (1)	$\chi2(1)=17.336$	$p<0.01$	Dependent
Language*AboveForty	398 (1)	$\chi2(1)=2.647$	$p=104$	Independent
Nationality*AboveForty	398 (1)	$\chi2(1)=2.33$	$p=0.127$	Independent
Job title*Gender	384 (15)	V=0.38	$p<0.01$	Dependent
Job title*Language	386 (13)	V=0.336	$p<0.01$	Dependent
Job title*Nationality	386 (13)	V=0.38	$p<0.01$	Dependent
Job title*AboveForty	386 (13)	V=0.148	$p=0.075$	Independent

1. N stands for sample size.
2. Number of study participants who did not answer to the question, and thereby represent a missing value.
3. The adopted significance cut point was p=0.001.

As shown in Table 6.2, Pearson $\chi2$ results suggested that the only apparently independent associations were between the variables Above Forty, and every other variable (Gender, Language, and Nationality). Cramer's V results also suggested the variable Above Forty was independent from the variable Job Title. These independence tests were done to ascertain whether the actual data was close enough to the expected counts that would occur if two variables are independent.

Therefore, Age was the only variable which was seemingly independent not dependent on every other variable. It could easily be entered into predictive models. The remainder variables showed apparently dependent relationships. This means that, for example, the language participants chose seemed statistically related to their Nationality, which is not surprising, but also to their Gender and Job title.

The tests of association summarized in Table 6.2 also help to understand the direction of dependent relationships, by comparing observed and theoretically expected frequencies cell by cell. Appendix CC details these findings.

As there substantiated, non-Kuwaitis were more commonly than expected males, rather than females, and chose English, rather than Arabic, more commonly than expected. Nationality and Job title were also apparently dependent. Specifically, non-Kuwaitis dominated more than expected the nurse profession, and less than expected the 'administrator' and 'other' job titles. In sum, non-Kuwaitis more frequently chose English, were males, and had a nursing role.

Regarding the relationship between Job title and Gender, there apparently were more males than expected exercising the profession of doctors and nurses. For every other job title, there were slightly more females (and consequently less males) than expected. As for the relationship between Language and Job Title, Arabic was less frequently than expected chosen particularly by Doctors, and Nurses. On the other hand, Arabic was more frequently chosen particularly by Technicians, Administrators, and slightly more by Other.

In sum, age was the only variable which was apparently independent from every other variable. As here found, non-Kuwaitis apparently more often opted for English, were males, and nurses. Doctors were also more frequently male, and chose English, but were not more frequently non-Kuwaiti than expected. Finally, in any other job title, there were more females than males than expected, and Arabic was the preferred language.

6.4 Frequencies of Use Patterns

Participants were asked to describe the frequency with which they used the EHR. The frequencies of its categories were, in decreasing order: Daily (N=231, 58%), 'Never' (N=92; 23.1%), '2-3 times per week' (N=41; 10.3%), 'less than three times per month' (N=13; 3.3%), '2-3 times per month' (N=11; 2.8%) and 'once per week' (N=10; 2.5%). Then, the majority used the EHR daily, and about a fourth of respondents never used it. It is important to note that the participants who said they 'never' used the system would have been using it at some point during their work as they were subscribed to the list of current users, i.e. the list of people who had received access to the EHR system. Those 'never' using the EHR were therefore included in the analysis as it was safe to assume that despite them not using the system regularly at the point of completing the survey, they would have a working knowledge on how it was working in their hospital, how easy they found it to use and how useable it was.

These replies were used to create two groups, one of daily users and other of non-daily users, for the same trustworthiness reasons mentioned for the creation of new age groups. Consistently with the frequencies reported in the previous paragraph, the majority used the EHR Daily (N=231, 58%), whereas the remainder did not (N=167, 41.9%). A summary of these frequencies is presented in Table 6.3 below.

Table 6.3 Frequencies for Use Frequency groups

Attribute	Valid N[1] (Missing)[2]	Value	Percentage
Use Frequency Groups	398 (1)	Daily	57.9%
		2-3 times a week	10.3%
		Once a week	2.5%
		2-3 times per month	2.8%
		Less than three times per month	3.3%
		Never	23.1%
Daily Use Frequency	398 (1)	Daily	57.9%

	Not Daily	41.9%
1. N stands for sample size. **2. Number of study participants who did not answer to the question, and thereby represent a missing value.**		

EHR Use Frequency, and Daily use Frequency, amount to measures of self-reported technology use behaviour. These can be regarded as that which TAM and TAM 2 ultimately seek to predict, as established by hypothesis 0a in Chapter 5.3.5 Data Analysis, **Error! Reference source not found.**. Nevertheless, Intent tends to be targeted more frequently than use behaviour through TAM 2 predictive models. The present study embraced the latter choice.

6.4.1 Demographic characteristics of patterns of EHR use

Differences in EHR use frequencies regarding demographic attributes were investigated. These results are summarized in Table 6.4, below.

Table 6.4 Use frequency differences across binomial demographic attributes

Attributes	Valid N[1] (Missing)[2]	Mann Whitney's U	Significance[2]	MeR(Group 1)[4]	MeR(Group 2)[4]
Gender	395 (4)	U=17159.5	p=0.564	MeR (Males)=190.34	MeR (Females)=201.22
Nationality	397 (2)	U=12799.5	p=0.003	MeR (Kuwaiti)=208.36	MeR (non-Kuwaiti)=173.62
Language	398 (1)	U=16519	p=0.056	MeR (Arabic)=206.95	MeR (English)=186.64
Above Forty	397 (2)	U=20492.5	p<0.001	MeR (40, or less)=186.82	MeR (Above 40)=224.6

1. N stands for sample size.
2. Number of study participants who did not answer to the question, and thereby represent a missing value.
3. The adopted significance cut point was p=0.001.
4. Median rank values for groups 1 and 2 of each variable, each of which identified verbally between brackets per row.

In the significance column of Table 6.4, above, it can be observed which variable yielded significant differences in the medians of compared groups. These were: Nationality, and Age. The direction of detected differences can also be determined. In accordance with the specifications offered in Appendix Y the column 'MeR (Group 1)' identifies the median rank of the group classified with the value 1, and 'MeR (Group 2)' those classified with the value. The comparison of these values clarifies which group shows more frequent use of EHR. As it can be observed, Kuwaitis, and those Above forty had higher median ranks, than, respectively, non-Kuwaitis, and those aged forty years old or less. The higher median ranks of Kuwaitis and older persons illustrated how they tended to use the EHR less frequently than their comparison groups.

In sum, the variables Language, Gender and Job title did not seem associated with distinctive EHR use frequency patterns. On the other hand, Nationality and Age were. Specifically, older and Kuwaiti health care professionals tended to use the EHR less frequently than their comparison groups.

6.5 TAM 2's constructs

In the following sections, descriptive statistics for TAM 2's subscales will be described. Additionally, the inter-relationships between these scales will be explored. Finally, the relationship between the subscales and demographic attributes will be scrutinized.

6.5.1 Descriptive statistics for subscales

Descriptive statistics for TAM's 2 constructs are shown in Table 6.5, below. Means and Standard-Deviations (SDs) were weighted by the number of items within each scale.

Table 6.5 Descriptive statistics for subscales

Attitude Scale	Valid N[1] (Missing)[2]	N. Items[3]	Range[4]	Mean (SD)	Subscale weighted mean (SD)[5]
Intent	399	2	12	4.97 (3.45)	2.49 (1.73)
Usefulness	399	4	25	8.17 (4.95)	2.04 (1.24)
Ease	399	4	24	10.3 (4.72)	2.56 (1.18)
Social Norm	399	2	12	5.65 (2.76)	2.83 (1.4)
Voluntariness	399	3	18	12.51 (5.21)	4.17 (1.74)
Social Image	399	3	18	8.68 (4.21)	2.89 (1.4)
Job Relevance	398 (1)	2	12	4.24 (2.37)	2.12 (1.19)
Output Quality	397 (2)	2	12	5.41(2.69)	2.71 (1.35)
Result Demonstrability	399	4	24	11.54 (3.8)	2.89 (0.95)

1. N stands for sample size.
2. Number of study participants who did not answer to the question, and thereby represent a missing value.
3. N. stands for number. The column identifies the number of items in each scale.
4. Range stands for the difference between the found maximum and the minimum value of the distribution.
5. Mean ratings for the scale, and their Standard-Deviation (SD) between brackets.
6. Weighted item means were calculated by dividing arithmetically the mean and the Standard-Deviation (SD), detailed between brackets, by the number of items within this scale.

In accordance with the findings in Table 6.5, above, there was not a single subscale with a weighted mean in the positive spectrum of five or above. This reinforced the conclusion that the trend was one of dissatisfaction, with participants' opinions being generally moderately negative. Moreover, the aspects of EHR which were criticized the less, and thereby showed higher means, were, in decreasing order: Voluntariness; Result Demonstrability, in exaequo with Social Image; Social Norm; Output Quality; Ease; Intent; Job Relevance; and Usefulness.

Furthermore, Voluntariness had a weighted mean of 4.17. It was the subscale with a weighted item above every other weighted mean, including those in in **Error! Reference source not found.**, and the only with a weighted mean in the neutral spectrum. Its weighted mean even reached the positive spectrum when taking into account its SD of 1.74. However, since Voluntariness was, as noted, conceived as more of an organizational characteristic than an attribute of the system, this finding does not necessarily express any particularly good attribute of EHR.

In summary, participants expressed mild disagreement, and, thereby, mild dissatisfaction in every subscale. The exception was Voluntariness, which showed weighted mean ratings in the neutral spectrum.

Relationships between subscales and EHR Use Frequency

EHR Use Frequency was embraced in this study as an indicator of use behaviour. This was that which TAM 2 ultimately sought to predict, as established by the hypothesis 0a, in *Chapter 5*, section 5.3.6, Table 5.3. The theorized expectation was that the greater the Intent was, the more frequent the use was. This is revealed by positive correlation coefficients.

Two-tailed Spearman correlations between EHR Use Frequency and subscales were detailed in Appendix DD. These findings showed that the strongest EHR Use frequency relationship was with Intent (r_s=0.584; p≤0.01). However, whilst there was a positive relationship between Use Frequency and Intent it was an unexpected one. The positive correlation was that the less frequent the use of the EHR, the higher the rating for intent was. This is because, as detailed in Appendix Y, the EHR Use Frequency scale varied between ‘Daily’, for the value one, to ‘Never’, for the value six.

Additionally, EHR use frequency showed positive correlations with almost every scale. These findings illustrated the more satisfied participants were, the less frequent their use was. The exception was Voluntariness, which showed negative, and moderately strong correlations with EHR Use frequency (r_s=-0.478**). Therefore, the more voluntary the use of EHR was seen to be, the more frequent the use was.

Overall, findings clarified that health practitioners with greater intent were those who used the EHR less frequently. Therefore, hypothesis 0a was not supported at the level of correlations. Finally, results suggested that the more Voluntary the use of EHR was seen to be, the more frequent the use was.

In the following section regression analysis is used to estimate the effect of explanatory variables on the dependent variable, for example in the case of TAM2 whether a higher intention to use affects use behaviour positively.

6.5.2 Correlations between Intention to Use, Ease of Use and Perceived Usefulness

TAM 2 posited that Usefulness and Ease were related and together helped to predict (and as such were related to) individuals' Intent to use technology. These hypotheses were specified in *Chapter 5*, section 5.3.6, Table 5.3 and are described below:

0a. Intent affects Use behaviour directly and positively.

0b. Usefulness affects Intent directly and positively.

0c. Ease affects Intent directly and positively.

0.d Ease affects Usefulness directly and positively.

The hypotheses illustrate direct, positive effects. These effects were inspected at the level of correlations and linear regressions, and linear regression. Results will be presented in the following subsections.

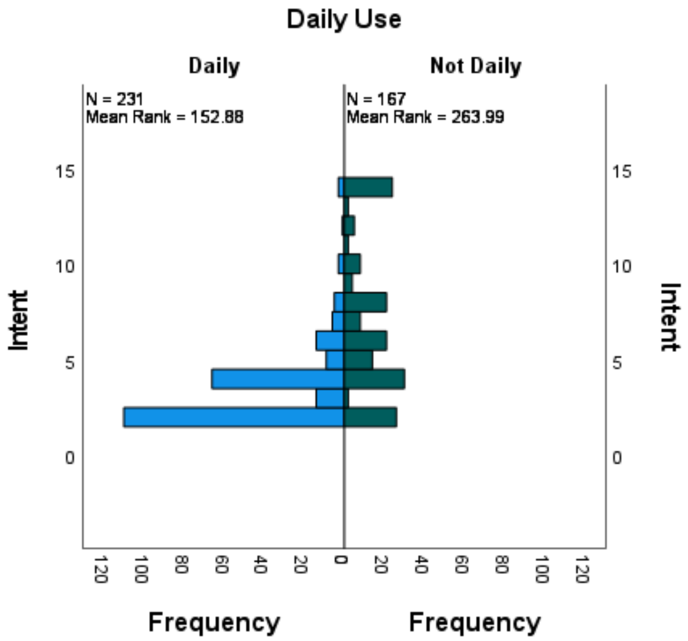
At a correlational level, as discussed in section 6.5.2, substantiated in Appendix DD and summarized in Table 6.6 below, two-tailed Spearman correlation coefficients between Intent, Usefulness, and Ease were positive, moderate, and extremely significant. These findings support hypotheses 0b to 0d.

Table 6.6 Correlations across TAM's constructs

Subscales' Pair	Spearman's correlation coefficient
Intent*Usefulness	r_s=0.521**
Intent*Ease	r_s=0.559**
Ease*Usefulness	r_s=0.594**
Intent* EHR Use Frequency	r_s=0.551**
** Extremely significant correlations ($p \leq 0.001$).	

Nevertheless, as discussed in the previous section, support was not gathered for the hypothesis 0a. This was because those using EHR less frequently manifested greater Intent to use it. A Mann Whitney's U test, comparing results for groups of Daily and Not Daily users, corroborates this conclusion. Results clearly showed that Use Frequency groups differed significantly in their Intent to use EHR (U=30058; $p \leq 0.001$). As illustrated in Figure 6.2, the mean ranks of Daily users (MeR(Daily)=152.88) were lower than those of Not Daily users (MeR(Daily)=263.9). Therefore, non-daily users of EHR manifested greater intent to use the system.

Figure 6.2 Mann Whitney's U comparison of Intent per Daily, and Not daily Use frequency



6.5.3 Predicting Intention to use, Perceived Usefulness, and Use behaviour

According to TAM 2 a person's intention to use a system is predicted by their perception of its usefulness and ease of use. TAM 2 posits that these perceptions will mediate external variables such as system design or social context.

Multiple linear regression models were utilized to test the hypotheses 0a to 0d.

0a. Intent affects Use behaviour directly and positively.

0b. Usefulness affects Intent directly and positively.

0c. Ease affects Intent directly and positively.

0.d Ease affects Usefulness directly and positively.

Results are summarized in Table 6.7, Below, and were detailed in Appendix EE. Given the reduced number of predictors in each model, the adopted method was 'enter', i.e. all variables were entered as a single step, not in the form of stepwise regression. Across tests, diagnostic of lack of multicollinearity was confirmed. This means that the independent variables, i.e. Perceived Usefulness and Perceived Ease of Use, were not highly correlated with each other. This assumption was tested using Variance Inflation Factor (VIF) values. VIF values were below 10. To illustrate the causal pathway put forward by these results, standardized coefficients in Table 6.7 were added do Figure 6.2, alongside their error estimates. Standardised coefficients allowed the researcher to compare the relative magnitude of the effects of the different explanatory variables in the path model, i.e. they helped to illustrate the causal pathway established by TAM 2.

Table 6.7 Summary of linear regression results for TAM's hypotheses

Target	**Adjusted R^2**	**Predictors**	**Standardized Beta coefficients**	**Standard Error**	**F**
Hypothesis 0a ***Intent affects Use behaviour directly and positively***					
EHR	34%	Constant Intent	0.748[a] 0.584**	0.151 0.025	F(1, 396)= 205.13**
Hypothesis 0d ***Ease affects Usefulness directly and positively***					
Usefulness	40.7%	Constant Ease	1.263[a] 0.639**	0.459 0.041	F(1, 396)= 273.96**
Hypotheses 0b and 0c ***Usefulness affects Intent directly and positively and Ease affects Intent directly and positively.***					
Intent	29.1%	Constant Ease Usefulness	0.94[b] 0.26** 0.339**	0.353 0.038 0.04	F(2, 396)=82.69**
a. p=0.06 **** Significance of p≤0.001** **b. p=0.08**					

Table 6.8 presents a summary of the results of linear regression models testing the hypotheses 0a to 0d. R^2 shows the proportion of the variance of the dependent variable that is explained by the independent variables in the regression model. Adjusted R^2 results, in the first column in Table 6.7, above, indicate how well TAM 2's hypotheses were supported by data. For the first model, it can be observed that the independent variable, EHR Use Frequency, explained 34% of the variance of the dependent variable, Intent. In the second, Usefulness explained 40.7% of the variance of Usefulness. In the third, Usefulness and Ease explained 29.5% of the variance of *Intention to Use*. Each one of these values was below 60%, which is rule of the thumb for the good enough fit of linear regression models.

In sum, in the light of present results, TAM 2's models did not offer sufficiently good explanations for target variables. Findings also did not support Venkatesh, and Davis' (2000, p.187) observation of how "*usefulness has consistently been a strong determinant of usage intentions, with standardized regression coefficients typically around 0.6.*"

6.5.4 Correlations between TAM 2's constructs

As described in section 5.3.6, in Chapter 5, TAM 2 added eight hypothetical relationships to the model. These are described below:

1c. Voluntariness will moderate the effect of Social norm on Intent.

2. Social norm will have a positive direct effect on perceived Usefulness.

3a. Social norm will have a positive effect on Image.

3b. Image will have a positive effect on Usefulness.

5. Job relevance will have a positive effect on Usefulness.

6. Output quality will have a positive effect on Usefulness.

7. Result demonstrability will have a positive effect on Usefulness.

8. Ease will have a positive effect on Usefulness.

As it can be observed, most input variables above are expected to have a positive, direct effect on their targets. The exception was hypothesis 1c, which proposes that voluntariness has a moderator role. This specific type of relationship must be tested through its effect on its target. In the following subsections, the above hypotheses were tested separately, at the level of correlations, linear regression, and linear regression with interactions.

Table 6.8, below, summarizes observed two-tailed Spearman correlation coefficients for the pairs of constructs identified in each one of TAM 2's hypotheses. These are further substantiated in Appendix DD.

Table 6.8 Spearman correlation coefficients for TAM 2's hypothetical relationships

Hypothesis	Subscales' Pair	Correlation coefficient[1]
1c	Voluntariness*Intent	r_s=-.272**
1c	Social Norm*Voluntariness	r_s=0.06
2	Social Norm*Usefulness	r_s=0.462**
3a	Social Norm*Image	r_s=0.389**
3b	Image*Usefulness	r_s=0.379**
5	Job relevance*Usefulness	r_s=0.561**
6	Output quality*Usefulness	r_s=0.538**
7	Result demonstrability*Usefulness	r_s=0.396**
8	Ease* Usefulness	r_s=0.594**
****Extremely significant (p≤0.001).**		

As systematised in Table 6.8, Usefulness was the target of every hypothesis except 1c, and 3a. Each one of these hypotheses proposed that the influence on Usefulness was direct and positive. This type of relationship would be supported by positive and significant correlation coefficients.

Correlation coefficients were all moderate, positive and significant, meaning there was a direct and positive influence on Perceived Usefulness by the other variables. In decreasing order of strength, these variables were: Ease (r_s=0.59; p≤0.001), as found when testing TAM 2's hypotheses, in section 6.6.2; Job relevance (r_s=0.56; p≤0.001); Output quality (r_s=0.54; p≤0.001); Social Norm (r_s=0.46; p≤0.001); Demonstrability (r_s=0.4; p≤0.001); and Social image (r_s=0.38; p≤0.001). These findings thus supported hypotheses 2, 3b, and 5 to 8. Additionally, hypothesis 3a suggested that Social Image could be predicted by Social Norm (r_s=0.389; p≤0.001). The found positive correlation coefficient supported this hypothesis.

Finally, there is hypothesis 1c. It was the only hypothesis which, as discussed, involved a moderating role. Namely, Voluntariness was expected to moderate the relationship between Social Norm and Intent. The relationship between Voluntariness and Social Norm is insignificant, weak, and negative (r_s=0.06; p=0.234). The relationship between Voluntariness and Intent (r_s=-0.272; p≤0.001) was rather significant, but weak and negative. These findings suggested the more health professionals viewed the use of the EHR as voluntary, the less they intended to use it. Overall, these findings do not seem to support hypothesis 1c.

In conclusion, correlations seemed to support TAM 2's hypothesis. The exception was perhaps the relationships involving Voluntariness, established by hypothesis 1c.

6.5.5 Predicting Perceived Usefulness in TAM 2

Hypotheses 2, 3b, and 5 to 8 proposed that PU could be predicted based on the following six variables: Ease, Social Norm, Social Image, Job Relevance, Output quality and Result Demonstrability. These variables were entered as predictors in a stepwise, linear, regression model targeting the variable Usefulness. None showed collinearity, as measures via VIF statistics.

Stepwise methods go over predictors one by one, and exclude from the model those which are not predictively useful. Its results are illustrated in Table 6.9**Error! Reference source not found.**, below, and detailed in Appendix FF. As it can be observed, the resulting model had only four variables (R^2=56%; F(4,396)=22.368; p≤0.001; SE=3.31), as opposed the six expected predictors. These variables were: Ease, Job Relevance, Output Quality, and Social Norm. Therefore, results supported hypotheses 2, 5, 6 and 8. It did not find support for hypotheses 3b, and 7.

Table 6.9 Predicting Usefulness in TAM 2: Summary of Linear Regression Results

Target	Adjusted R^2	Predictors	Standardized Beta Coefficients	Standard Error (SE)	F
Hypotheses 2, 3b, 5-8					
Perceived Usefulness	55.5%	Constant Ease Job Relevance Output quality Social Norm	-1.239[a] 0.322 0.617 0.362 0.270	0.461[a] 0.047** 0.086** 0.078** 0.075**	F(4,392)=124.676**
a. p=0.007 **** Significance of p≤0.001**					

Table 6.9 further illustrated that the fitness of this model was almost sufficiently good. The four variables explained 55% of the variance of Usefulness. The most explanative variable was that Ease. As Appendix FF, and summarized here, it explained 40.7% of the variance of Usefulness ratings. It followed Job Relevance, which explained more 10.2% of variance. Thereafter, there was Output quality, which explained an additional 3.6% of variance. Finally, the least and still significant explanative construct was Social Norm, which explained a total of 1.5% of variance.

In conclusion, Usefulness seems almost sufficiently well explained by Ease, Job Relevance, Output Quality, and Social Norm. Therefore, as Venkatesh, and Davis (2000) had predicted but failed to support, Output quality seemed a useful predictor in present findings. Nevertheless, unlike Venkatesh, and Davis (2000), this study could not find empirical evidence to support the predictive power of Social image and Result demonstrability.

6.5.6 Predicting Behavioural Intention to use in TAM 2

As frequently mentioned in this study, TAM 2 simply expanded TAM, inclusively in terms of hypotheses. According to both models, Behavioural Intention to Use is predicted by Perceived Usefulness and Perceived Ease of Use. TAM 2 expanded the predictors of Intetion to Use by adding mediting variables. TAM 2 actually offers, as predictors of Intent: Ease of Use (0b); Perceived Usefulness (0c); and Subjective norm, as moderated by Voluntariness (1c). This model was tested here as a two-block, stepwise, linear regression model. The first block assessed the impact of Ease (0b); Usefulness (0c), whereas the second block tested the role of the mediators voluntariness and subjective norm. Table 6.10, below, summarizes findings, and Appendix DD offers detailed model statistics.

Table 6.10 Predicting Intent in TAM 2: Summary of Stepwise, Linear Regression Results

Model	Target	Adjusted R^2	Predictors	Standardized Beta coefficients	SE	F
	Hypotheses 0b, 0c, and 1c					
2	Intent	29.1%	Constant Ease Usefulness	0.940[a] 0.339** 0.26**	0.353 0.040 0.038	F(2,396)= 82.692**
3	Intent	29.1%	Constant Ease Usefulness Interaction-NormVoluntariness	0.948[a] 0.335** 0.264** -0.037[b]	0.353 0.040 0.038 0.124	F(3,395)= 55.349[b]
a. p=0.08 **** Significance of p≤0.001** **b. p=0.383**						

Table 6.10, above, describes two linear stepwise regression models, the second one including an interaction term. A interaction term is two or more variables interacting to have an effect that is bigger than the sum of their parts, i.e. affecting a third variable in a non-additive manner. In this case the interaction term was the mediating variables voluntariness and subjective norm.

In model "*2*", the interaction term had not yet been introduced. As specified in the Adjusted R^2, this model explained 29.1% of the variance of Intent. This unsurprisingly replicates the findings obtained when testing TAM 2's hypotheses earlier, detailed in section 6.6.3. The model did not show a sufficiently good fit. The independent variables Perceived Usefulness and Perceived Ease of Use did not predict Intention to Use sufficiently.

Model "3" added the mediating variables voluntariness and subjective norm to the linear stepwise regression. Nevertheless, most importantly, model "*3*", which introduced the interaction term, did not help to explain more variance than model "*2*", i.e. it was not a better fit to predict Intention to use via Perceived Usefulness and Perceived Ease of Use. This term was even deemed insignificant (p=0.383), and not included in the final model. This means that hypothesis 1c *Voluntariness will moderate the effect of subjective norm on intention to use* did not gather empirical support in the present study, only 0b *Usefulness affects Use behaviour directly and positively* and 0c *Ease affectes Intention to Use directly and positively* did.

In conclusion, Voluntariness did not seemingly mediate the impact of Social Norms on Intention to Use. Instead, the only variables seemingly useful for predicting Intention to Use were Perceived Ease of Use and Perceived Usefulness. Additionally, these two variables together explained less than 30% of the variance of Intent. The model was not, therefore, sufficiently explanatory.

6.5.7 Predicting Social Image in TAM 2

The last remaining hypothesis, put forward by TAM 2 which has not been tested, refers to the prediction of Social Image (3a) via the predictor Social Norm. As summarized in Table 6.11 below, and detailed in Appendix FF, this hypothesis was supported by present findings. Yet, the fit of this model is very limited, with Social Norm explaining merely 14.6% of the variance of Social Image.

Table 6.11 Predicting Social Image in TAM 2: Summary of Stepwise, Linear Regression Results

Target	Adjusted R^2	Predictors	Standardized Beta coefficients	SE	F
Hypothesis 3a					
Social Image	14.6%	Constant Social Norm	5.350[a] 0.385	0.445 0.071	F(1,396)=69.068**
[a] **Non-standardized** **** Significance of $p \leq 0.001$**					

6.6 Causal Pathway

The previous sections summarized the results of linear regression models testing the hypotheses set forth by TAM 2, detailed in *Appendices AE and AF*. Support was obtained for hypotheses: 0b, 0c, 2, 3a, 5, 6 and 8.

0b. Usefulness affects Intent directly and positively.

0c. Ease affects Intent directly and positively.

2. Subjective norm will have a positive direct effect on perceived usefulness. (...)

3a. Subjective norm will have a positive effect on image. (...)

5. Job relevance will have a positive effect on perceived usefulness. (...)

6. Output quality will have a positive effect on perceived usefulness. (...)

8. Perceived ease of use will have a positive effect on perceived usefulness.

Support was not found for hypotheses 1c, 3b, and 7. Results are illustrated in Figure 6.3, below. For the simplicity of the image, error terms were not included but can be consulted for each predictive term in preceding tables, in the column coined Standard Error, and in the Appendices.

Figure 6.3 Linear regression results for TAM 2's hypotheses (Venkatesh & Davis (2000))

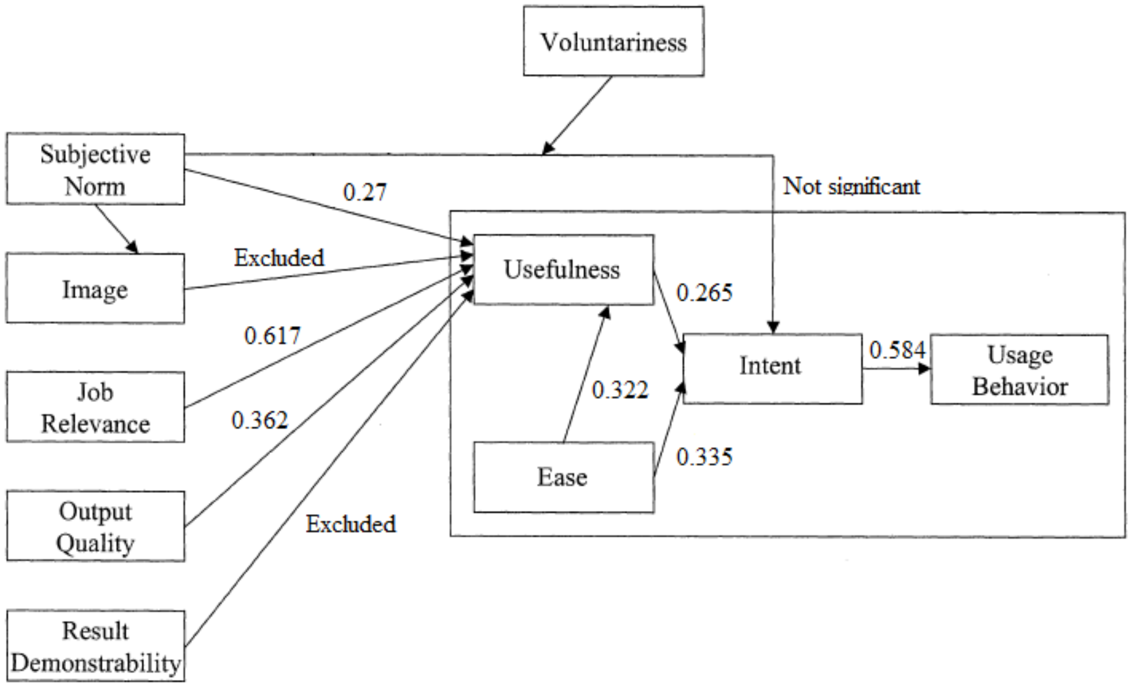


Figure 6.3 shows the proportion of the variance for each dependent variable, i.e. Perceived Usefulness, Intention to Use and Usage Behaviour, that is explained by the independent variables. The linear regression model shows how much of the variance for Perceived Usefulness is explained by the independent or predictor variables Subjective Norm ($R^{2=}$ 0.27), Job Relevance ($R^{2=}$0.617) and Output Quality ($R^{2=}$0.362). Furthermore it shows how much of the variance of Intention to Use is explained by Perceived Usefulness ($R^{2=}$0.265), Ease of Use ($R^{2=}$0.335) and how much of the variance of usage behaviour is explained by Intention to Use ($R^{2=}$0.584).

The R-squared value can oscilliate between o and 1. It shows the percentage of the dependent variable variation that a linear model explains.

6.7 Conclusion

The present study achieved the aim of testing whether TAM 2 was applicable to the specific context of public health in the Kuwait. The responses to an online survey of 399 health care professionals in six public hospitals illustrated how the majority of respondents answered to the survey in Arabic, were from the female gender, had a Kuwaiti nationality, and were less than 41 years old. These were the Health practitioners who answered to most of survey questions.

In terms of Job titles, participants were fairly equally distributed across available categories. However, the Job title question and its answering options might not have been clear enough. There were about 1/5 of participants choosing the ‘Other’ category. As illustrated in Figure 6.1, and detailed in Appendix BB, many of the types of jobs listed when specifying the ‘Other’ job title could easily have been classified under the offered alternative categories. This meant that the Job title frequencies described in this chapter were not necessarily accurately descriptive of the sample. It also means that group differences involving this variable might lack trustworthiness. For these reasons, results involving tis variable will not be greatly valued here.

Additionally, Age, as measured in terms of age groups or the Above forty variable, was the only demographic attribute which was apparently independent from every other demographic variable. This lack of independence raises further doubts about the validity of study claims involving demographic variables.

Having said this, as here found, non-Kuwaitis apparently, and unsurprisingly, more often opted for English, were males, and held a nurse Job title. Doctors were also more frequently male, and chose English, but were not more frequently non-Kuwaiti than expected. Finally, in any other job title, there were more females than males than expected, and Arabic was the preferred language.

Moreover, this study found that the majority of respondents used the EHR Daily, though an almost equally large amount of participants did not. The variables Language, Gender and Job title did not seem associated with distinctive EHR use frequency patterns. On the other hand, Nationality and Age apparently were. Specifically, older and Kuwaiti health care professionals tended to use the EHR less frequently than their comparison groups.

This study further clarified that health professionals were generally displeased with the EHR, as measured via TAM 2. Consistent with this observation, participants expressed, on average, mild disagreement, and, as such, mild dissatisfaction in every subscale. The exception was Voluntariness, which showed weighted mean ratings in the neutral spectrum.

It was further observed in this research that most subscales showed positive, significant and weak to moderate correlations. Moreover, subscales also correlated positively and significantly EHR Use frequency. This suggested that the less frequent participants’ use of EHR was, the greater respondents' satisfaction with EHR was. The exception was once more Voluntariness. This scale showed sometimes insignificant and sometimes negative correlations with other subscales. Voluntariness showed negative correlations with Intent, Usefulness, and Job Relevance. Importantly, the more Voluntary the use of EHR was seen to be, the more frequent the use was.

Regarding TAM 2's hypotheses, support was found for 0b, 0c, 2, 3a, 5, 6 and 8.

0a. Intent affects Use behaviour directly and positively.

0b. Usefulness affects Intent directly and positively.

0c. Ease affects Intent directly and positively.

2. Subjective norm will have a positive direct effect on perceived usefulness. (…)

3a. Subjective norm will have a positive effect on image. (…)

5. Job relevance will have a positive effect on perceived usefulness. (…)

6. Output quality will have a positive effect on perceived usefulness. (…)

8. Perceived ease of use will have a positive effect on perceived usefulness.

The other hypotheses were not supported. Additionally, the resulting predictive models showed generally low goodness of fit, i.e., the observed data did not closely mirror the expected data. Indeed, the model with highest fit, was concerned with the prediction of Perceived Usefulness through Ease of Use, Job Relevance, Output Quality, and Social Norm.

This implies that, unlike Venkatesh, and Davis (2000), this study could not find empirical evidence to support the predictive power of Social image and Result demonstrability on Perceived Usefulness. Voluntariness also did not seemingly mediate the impact of Social Norms on Intent. Instead, the only variables seemingly useful for predicting Intent were Ease of Use and Usefulness.

6.8 Limitations

In previous sections, aspects linked to the trustworthiness of present conclusions have been mentioned. One was consequent of the observed lack of independence of demographic attribute, with the exception of the age variables. Then, the found associations between Gender, Language, Nationality, and Job title may lack validity. Caution must be held when seeking to generalize findings linked to these variables. Furthermore, conclusions regarding Age should also not be taken to heart. As discussed, the age options offered to participants in the data collection instrument were inaccurate measures.

In the conclusions section, it was also remarked that the Job title question might be unreliable, and thereby lack validity. Namely, the question soliciting respondents to specify, when opting for the option 'Other', their supposedly non-listed Job Title showed some of those option for the Other category might easily have chosen an alternative reply, Figure 6.1 and particularly Table 12.14 in Appendix BB, which listed replies one by one, illustrated this possibility. A very obvious example was the respondent describing the 'Other' position as "*senior administrator assistant*", which yields the Administrator option, as opposed to the chosen 'Other' option.

Together, the aspects mentioned in the preceding paragraphs were the main the reasons for refraining from looking into the impact of demographic variables more closely in the present study. Conclusions related with these attributes represented great validity and reliability threats.

In the present study, from the 3000 distributed surveys covering the population of health professionals, only 900 were initiated, and 399 were answered to more fully. Relatively to initiated surveys, this represents a 55.67%. Relatively to distributed surveys, it represents a 13.3% response. Even if only initiated surveys are taken into account, this subsample still represents the fraction of the population with access to technology. One has to be careful in interpreting data from a small sample, particularly when collected using a convenience sampling strategy (Emmel, 2013), as the data collected will not represent the whole population, and the findings might not be generalisable beyond the participants. Moreover, there is still a nonresponse rate bias risk. Those who actually replied might possess special reasons for filling in fully the survey, such as more available time, or special personality traits. This is another clear red flag for generalizing present findings. The present sample might not be representative of the population, and one should refrain

Regardless of the above contentions, the present study represents a great endeavour. It managed to gather the participation of a large amount of participants. After all, the study is based on what represents a, statistically speaking, a large sample. In future studies, the revision of the variable age, as presented to participants is recommended. Additionally, alternative, face-to-face data collection methods might be used, in an attempt to reduce nonresponse rates.

7 Chapter Seven: Qualitative Study

7.1 Introduction

This chapter will present the findings from both qualitative studies, one study interviewing three hospital directors and one more extensive hermeneutic analysis of 30 interviews with HCPs from three public hospitals in Kuwait.

7.2 Phase One: Hermeneutic Analysis of interviews with thirty Health Care Professionals

This phase of the qualitative study consisted of thirty interviews with HCPs from three different hospitals. In order to protect confidentiality and anonymity, the participants have been assigned numbers, i.e. Participant 1, 2, 3 and so on. The hospitals are referred to as hospital A, hospital B and hospital C.

Whilst EHR use has been made mandatory in all secondary Care hospitals in Kuwait, to date, there is no evaluation as to what extent EHRs have been fully implemented (Alhuwail, 2021). Therefore, the following summary of EHR use in hospitals A, B, and C are directly taken from the interviewees' accounts and may be subjective.

Hospital A

The EHR system in hospital A is not totally activated. Participants said there were using between 60 to 90% of the total system capacity. The EHR is currently used to enter patient health status, previous diseases and medication used, admission and discharge, and write medications, laboratory tests, and radiography. In addition, HCPs in hospital A report using paper files and EHR simultaneously for most aspects of their work, for example, to document patient notes paper files and EHR are being used.

Hospital B

Hospital B started using an electronic programme in 1992, HIS since 2005 and started implementing EHR around six years ago. Implementation of EHR started with medical records, entry and discharge papers, and patient history and was then extended to laboratory results, ordering medications, radiology. Hospital B has recently started using barcodes as part of the EHR system. Now almost the whole hospital is using EHR but not every department. Hospital B is using paper files and EHR simultaneously.

Hospital C

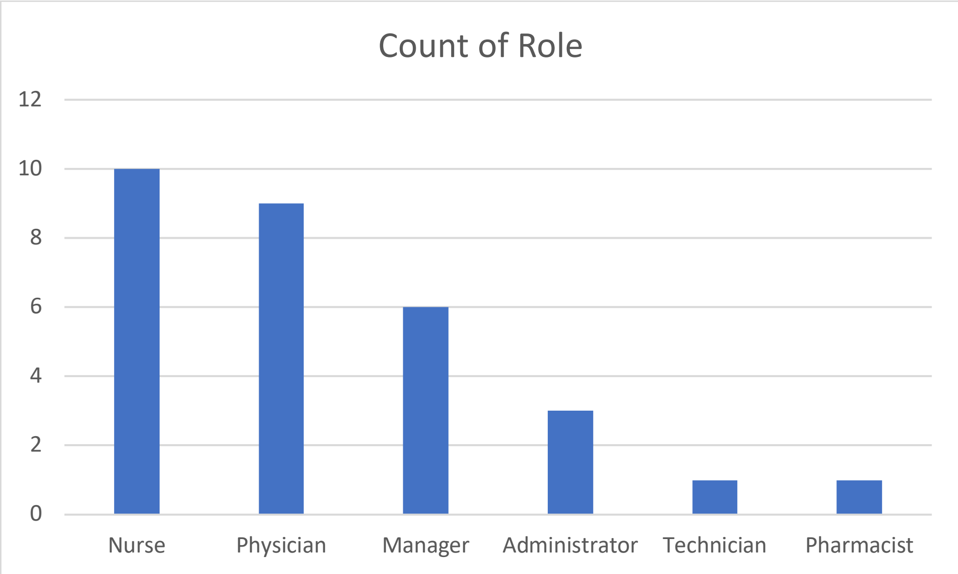
Hospital C started EHR implementation two years ago to link their hospital with the primary care centres in the area. Now, hospital C is using the EHR for discharge notes and medication ordering. Laboratory and pharmacy are integrated, and radiology is not. Hospital C uses both paper files and EHR, for example, to complete patient records and treatment documentation. Table 7.1 provides an overview of the participants who agreed to be interviewed for this study.

Table 7.1 Overview Age, Gender, Role, Hospital Interviewees Phase one

Participant ID	Hos-pital	Age	Gender	Role
Participant 1	B	38	Male	Nurse
Participant 2	B	49	Female	Manager
Participant 3	B	29	Male	Physician
Participant 4	B	31	Male	Nurse
Participant 5	B	26	Male	Nurse
Participant 6	B	29	Female	Manager
Participant 7	B	28	Male	Nurse
Participant 8	B	35	Male	Physician
Participant 9	B	43	Male	Nurse
Participant 10	B	31	Male	Physician
Participant 11	B	65	Male	Physician
Participant 12	C	26	Female	Nurse
Participant 13	C	64	Male	Physician
Participant 14	C	38	Female	Physician
Participant 15	C	25	Female	Administrator
Participant 16	C	36	Male	Pharmacy
Participant 17	C	26	Female	Nurse
Participant 18	C	36	Male	Physician
Participant 19	C	28	Female	Manager
Participant 20	C	37	Male	Manager
Participant 21	A	30	Male	Physician
Participant 22	A	32	Male	Physician
Participant 23	A	35	Female	Administrator
Participant 24	A	31	Female	Administrator
Participant 25	A	30	Female	Nursing
Participant 26	A	37	Male	Technician
Participant 27	A	44	Female	Nurse
Participant 28	A	38	Female	Manager
Participant 29	A	49	Female	Nurse
Participant 30	A	30	Female	Manager

Thirty interviews were conducted until the point of data saturation was reached and no new themes emerged during the interviews. The researcher aimed to have sufficient diversity amongst the interviewees regarding the hospital they worked in and their job role to capture their different experiences. Overall it was ten interviews in hospital A, eleven in hospital B and nine in hospital C. Sixteen of the participants were male, and fourteen were female. The youngest participant was twenty-five years old, and the oldest was sixty-five years old. Figure 7.1 below shows the distribution of job roles among the interviewees.

Figure 7.1 Role Count Interviewees Phase one



Hermeneutic analysis of these interviews identified six themes with accompanying subthemes, as shown in

Table 7.2 below.

Table 7.2 QUALI1 Themes and Subthemes

Theme	Subthemes
Trust in usefulness of EHR implementation	Overall contentment with EHR Praise for EHR as time-saving care improvement tool Pride in how EHR supports error reduction
Need to integrate knowledge	Desire for enhanced functionality and integration Training needs Desire for better information flow
Ambiguity	Conflicting views on EHR literacy Ambivalence towards EHR's benefits Role of managerial support
Experience of powerlessness	Frustration with IT issues and lack of resources Frustration with lack of EHR Interoperability and partial use of functionality 7.2.1.1 Conflicts among HCPs
EHR as a threat	Fear of clinical error due to disjointed information Fear of losing data Fear of security breaches and misconduct
Resistance grounded in fear	Ambivalence and resistance towards implementation of IT systems Data collection supports managerial control Resistance towards growing importance of EHR

Each theme is divided into several subthemes, which will be presented in the sections. Each section concludes with a summary and brief discussion of the themes. The discussion of the themes concerning the wider research literature can be found in the discussion section of this thesis.

7.2.2 Trust in the usefulness of EHR implementation

This theme explores staff trust in the usefulness of EHR implementation and consists of three different sub-themes: Overall contentment with EHR, Praise for EHR as a time-saving care improvement tool, Pride in how EHR supported staff in accomplishing error reduction.

7.2.2.1 Overall contentment with EHR

All participants agreed that EHR was essential to their work. They could name many different examples of how EHR improved clinical work, administrative tasks and the general workflow. Overall, participants expressed contentment with the EHR, for example:

> *"The system is easy. We use it much for now than we used it before. Paper is sometimes not available or lost so HIS should replace the paper-based files. It is important for medicolegal issues as everything is written down and reported" (Participant 9, nurse, hospital B)*

> *"EHR is very important in our work because it saved time and reduces mistakes" (Participant 13, physician, hospital C)*

> "*With EHR we much avoided prescription errors and much controlled medication custodies. It's more timesaving and more precise. The system reduces the error by 80%" (Participant 16, pharmacist, hospital C)*

> *It is very important because [currently] we lose patients' paper files, and this data can be used in many different clinics and other hospitals with the consent of the patient. It also preserves patient information from damage over time even after the patient dies. It protects the right of the patient privacy of his data. It is difficult to change the data or tamper with it. It also helps the doctor and the researchers conduct research, especially research that requires retrospective information as a cohort study. They can depend on electronic files more than paper ones which are subjected to damage, and this could help epidemiologists and doctors of other departments". (Participant 23, administrator, hospital A)*

> *"We enter the patient's entire information on the computer to know his health status, his previous diseases and the medications he used. This helps to know the patient's condition with a comprehensive vision. This makes it easier for the doctor to make a lot of decisions and give him a picture of the patient's condition before dealing with him". (Participant 22, physician, hospital A)*

The comprehensive vision of the patient's information and background was praised for supporting immediate and long-term decisions by several participants, often by physicians. Nurses were equally hopeful that EHR would enable them to be more prepared when interacting with patients as they would be able to access relevant information in advance of meeting the patient. The nurses interviewed for this study seemed to like functionalities around improved appointment management, particularly using barcodes to identify patients and general improvements around automating recurring processes better. It was also mentioned that EHR was of great support for making referrals from primary to secondary care. Nurses did not express any concerns about the EHR. Participants hoped that EHR would make their work easier to carry out and more efficient, even though their actual experiences using EHR had not always been positive.

7.2.2.2 Praise for EHR as time-saving care improvement tool

Staff expressed great appreciation for the support they received through using EHR to improve their efforts to provide good care. They embraced the functionality of EHR that helps staff look at the patient's past to plan their treatment in the future. They believed that the more fully EHR would be used in the future, the better they could carry out planning and evaluation aspects of their work.

Time seemed to be an essential aspect of how EHR can work as a care improvement tool. Apart from linking past and present, there was much more timely and immediate communication between different care providers.

> *"EHR is especially important in the radiology department as we want the results to be quickly available for the patient without paper files and without worrying getting the results. We use it in about 50-60% paperless in our department. It is making the work follow up very fast and there is no need to show papers to the doctor. The x-rays and images show directly in the doctor's screen" (Participant 26, technician, hospital A)*

> *"The EHR is more time saving and more precise. It helped reduce the error in the pharmacy by eighty percent" (Participant 16, pharmacist, hospital C)*

> *The whole world is directed to the electronic system, as the paper system has become a primitive time-consuming method that does not preserve the privacy of the patient". (Participant 23, administrator, hospital A)*

As the quotes above demonstrate, participants saw time-saving and error reduction as some of the most apparent benefits of EHR. Another aspect that linked care improvement through EHR and time was mentioned concerning patients. The main advantages that were embraced by participants here were speedy service delivery and reduction of waiting time for patients. In addition, the participants showed great care and concern for patients and repeatedly emphasised how EHR would save time in their work and patients.

"EHR is important as it saves much time for the patient as we get the results immediately with no need for waiting". (Participant 27, nurse, hospital A)

Furthermore, several participants emphasised another aspect of timesaving: it was much easier to establish fast and multidisciplinary communication between different departments, for example, when it came to referrals.

7.2.2.3 Pride in how EHR supported staff in accomplishing error reduction

Many staff members expressed a sense of pride about how EHR had helped them reduce errors and hoped this would lead to further error reduction. They named this one of the most critical changes that EHR had brought to their work.

"Previously we had many issues with files being lost. Since we have the electronic system in place there is less legal issues and we are dealing less with lost patient files". (Participant 29, physician, hospital B)

"Yes, it is so important as it reduces errors of paper records such as missing files and its damage which can be avoided upon using EHR, also to reduce errors, especially in the medicines of patients as well as to compare the laboratory test of the patient old and new one and choose the most appropriate plan to treat the patient". (Participant 21, physician, hospital A)

Several participants mentioned the damage missing files had historically caused to their reputation. Problems previously encountered were not only that files went missing, but that some of them were lost completely. One hospital had lost up to twenty files every day and was now expressing hope that with the EHR, a significantly smaller number of files would be lost.

"Yes, it is very important for our work. Part of our team is responsible for statistical analysis. Every day, we search for about 20 lost files. Upon using the electronic files, data will less likely to be lost". (Participant 30, manager, hospital A)

In this theme, what generally came across was a hope that the technology could counterbalance the likelihood of human error. Participants frequently mentioned prescription errors occurring because humans are not as precise as technological systems. Particularly administrators and nurses expressed frustration with having to decipher illegible handwriting.

"Yes, it is important and clear as no difficult handwriting we try to understand. It saves space, also the information is not lost as paper". (Participant 19, manager, hospital C)

They explained that this common cause of prescription error could be avoided using the EHR system. This function made EHR very important in their work because it was perceived as helping to speed up the process and avoid error. Another common cause of error avoided by using the EHR system was sharing patient data in real-time between different departments.

7.2.2.4 Overall interpretation of the theme "trust"

What was conveyed in this theme was that staff were trusting and wanted to trust in the usefulness of EHR in the clinical work and also for improving their work processes. Overall, the participants seemed to have embraced EHR as a tool to improve care. However, after reading and listening to the transcripts several times, it was noticeable that there seemed to be a lack of variation in how staff described the advantages of EHR. What stood out was that participants seemed truly and overwhelmingly relieved by having a tool for error reduction and tracing mistakes within the system. However, while nearly everyone seemed to agree that it was an excellent tool for saving time with regards to various aspects of the work, for example, patient care, workflow, admin time, what stood out was that time saving seemed to be the only point that was mentioned about improving the quality of care.

The question that was opened up here then was much more concerned with what was not said, for example, which other aspects of the quality of care were affected by EHR but maybe not in such a positive way. Following on from that, the question emerged, to what extent staff were aware of not so positive effects but not quite able to define what those were and how they were affected in providing their work. This is entirely speculative at this stage, but I almost had the feeling that because EHR makes the work more accessible and more time-saving, staff might have felt that they need to be complicit in not mentioning the more negative aspects of using EHR because they would not like to lose the benefits of using it.

7.2.3 Need to integrate knowledge

The second theme consists of three subthemes: *Desire for enhanced functionality and integration between paper and electronic files*, *Desire to formalise training* and *Desire for better information flow.* Overall, this theme *need to integrate knowledge* is centred around what staff perceived as crucial support and facilitators that would need to happen and what they wished for the EHR to have better functionality and integration with their work.

7.2.3.1 A desire for enhanced functionality and integration between paper and electronic files

Despite EHR being implemented for several years in some hospitals, interviewees across hospitals reported that paper files were being used every day, usually parallel to EHR or complementing EHR functionality. This dual-use posed questions to the researcher: What motivates staff to use both systems? How, if at all, do paper and EHR integrate? My initial reaction to hearing numerous staff accounts of using paper files was one of discouragement. I had heard much anecdotal evidence when I was still working in a health care setting about paper files getting lost, being duplicated, putting the burden of record-keeping on the patient and generally felt that paper files were a step backwards when it came to ensuring good quality care. However, to understand why and how participants were using paper records, I needed to bracket those assumptions and explore phenomenologically what it meant for participants to use paper records and EHR simultaneously. The first question I tried to explore was whether paper files were used out of the participant's own initiative or if their work required them to record data on paper. This inquiry line helped to better understand whether it was a question of a personal choice, organisational demands, or possibly a mix of both.

It seemed in some departments recording everything on the EHR was not an option:

> *"I have been using electronic records in laboratory and radiological investigations and writing notes. In ICU department, we write notes in both electronic and paper-based records as full investigations, IV lines and transfer paper sheets need to be documented in papers". (Participant 17, nurse, hospital C)*

This quote and other statements from interviewees document how often the use of both electronic and manual systems was dictated by the current work processes and systems available. For example, participant 22 (physician, hospital A) highlighted how the use of paper files was at times needed because it fit better into the current workflows: "I think paper files are faster to use and easier to modify medications and laboratory tests". Another participant (Participant 26, technician, hospital A) highlighted how currently there was a need for paper-records as some core work depended on its use:

> *"Here in the radiology, we are much depending on images which are provided by RIS and not present in the paper records. Paper records are still used because some of them need to be stamped".*

The need for stamping papers also extends to other areas of work:

"EHRs are important but sometimes we [need to] use papers especially in legal matters that need to be stamped, signed and submitted to the legal entities" (Participant 29, nurse, hospital A).

Participants saw many benefits in using EHR; for example, paper-based records could never guarantee sufficient regulation of prescriptions. With EHR, patients could never repeatedly ask for the same medication on the same prescription without this being detected. They also perceived a lack of privacy with paper records. They also expressed a desire to transform the bits that still needed papers, such as legal matters, into electronic versions.

Overall, participants expressed a desire to make better use of the system functions and integrate it more:

"The electronic system is very important, but the paper system is still used in the legal matters and papers sent outside the hospital. We want this paper part to be sent via e-mail in Arabic and English". (Participant 29, nurse, hospital A)

"I have been using it since I came here three years ago. When I came, we used the electronic system only for ordering investigations, and the results were in paper format. Now, the results of laboratory and radiological investigations are present on the system. This can help us make a record for the patient, but the notes can't be made or maybe we can't use this option. If this note option is present, it would be present to be able to add data if needed. Currently I use both the electronic record and the paper one. The paper record I used for the notes and documentation". (Participant 18, physician ,hospital C)

The desire to use more EHR integrated functionality seems to be accompanied by frustration about not knowing why some functions seem to be visible in the system but not activated. This tension between desire and frustration raises the question as to what extent staff are able, encouraged and willing to make contributions and suggestions to improve the system and make workflows more efficient.

7.2.3.2 Training needs

The vast majority of participants explained that they learned how to use the EHR from their peers despite having received some basic training, usually from the company which initially installed the EHR. While many participants were content with learning from their peers, they expressed a desire to formalise those aspects of training. This wish for more formal training was mentioned repeatedly concerning training new staff where it was found that it was beneficial for new staff to shadow a more experienced colleague and observe them using the EHR system.

> *"I didn't receive any trainings, but I know the basic computer skills. Our senior colleagues tell us how to use it". (Participant 1, nurse, hospital B)*

> *"The company responsible for installing the electronic system conducts basic sessions for system users to know how to use the system. There should be a training for the doctors to know where they should enter the data and use the system. There should be a regular repeated training each other day in a different department to check their work and remind them how to use it". (Participant 30, manager, hospital A)*

> *"At first, seniors of each department were gathered to introduce them to the system. Then, all members were given a detailed lecture about the importance of the system. Later, different companies offered their electronic programs, and we chose the most suitable one. When we applied the system, our work was regularly checked to better improve it. The clinical instructor checked the doctors' problems with the system. The newcomers didn't receive a training which was a problem. They depended on their colleagues to learn about the system". (Participant 11, physician, hospital B)*

Participants expressed a desire to have those arrangements formalised, for example, into a written training plan, which would enable tracking and evaluating who had done training.

> *"The training could be improved through ensuring there is a work plan consisting of several stages to ensure that the training was done correctly at all stages and that each unit staff, decision-makers, and health care professionals were trained. It must be extensively used by the system users with IT and HR experts being part of it. This plan must be written, published and in a systematic fashion". (Participant 23, administrator, hospital A)*

This desire might indicate that there might be a lack of monitoring of training. Consequently, it depends on individual managers and staff whether training takes place and whether the quality of this training is good.

It seems that although most participants said they learnt through peer support and from their seniors, some of them did receive some form of formal training. However, the majority expressed irritation with the training content and frequency. Some of the participants described how their training only addressed the fundamental functionalities of the software or was not were user-friendly:

> *"It was just a very simple training on how to open the program and enter the user name" (Participant 29, nurse, hospital A)*

> *"There were training lectures every month without a practical application. It should be a practical training on real computers, so we can learn from our mistakes". (Participant 6, manager, hospital B)*

Several other participants described their training as just being shown how to open the system but then being left alone to discover how they can use the system in the context of their clinical work. The participants who did receive formal training perceived a lack of connection between the clinical work and the provided training. This means they received the training but, in the end, had to discover many of the functionalities and their application to their clinical work, for example:

> *"Yes, we received about 8 to 10 days training. It helped me a lot, but some information was acquired only from my clinical work, for example, where the barcode is present in the system". (Participant 17, nurse, hospital C)*

This quote shows that the length of training provided does not necessarily translate into the applicability of the training contents to a participant's clinical work.

Furthermore, participants were irritated that there was no more training provided. When the system functionalities were updated and complexity increased. For example, when electronic accessibility of different departments was merged:

> *"We received just a small training not much. We need more trainings to know how to connect the radiology department and other departments". (Participant 27, nurse, hospital A)*

> *"We need more regular trainings more than one time a year to know the system updates". (Participant 1, nurse, hospital B)*

> *"New doctors should receive a simple training to the system to save time. Sometimes, the system gets updated. It's better to be informed about these updates so we can make use of it." (Participant 3, physician, hospital B)*

Overall, the staff seemed to be much more content when they had received longer and more frequent training. There was an ambiguity about training content. Participants in more managerial positions expressed a need for more theoretical introductions to EHR, for example, awareness campaigns. However, the doctors, nurses, administrators, and other management staff emphasised how important it was to conduct the training more practically. Many of them mentioned the training was conducted in the form of, for example, a lecture, or the EHR system was introduced in the morning meeting. However, participants were concerned that those formats were not making it easy to talk about the actual usage of the system but focused much more on the concept of EHR, for example, its more comprehensive benefits.

The more lengthy and intensive training programs seemed to focus more on heads of departments and decision-makers, whilst many other staff members solely relied on peer learning. The following quote shows what seems to be a typical approach in a nutshell:

> *"At first, seniors of each department were gathered to introduce them to the system. Then, all members were given a detailed lecture about the importance of the system. Later, different companies offered their electronic programs, and we chose the most suitable one. When we applied the system, our work was regularly checked to better improve it. The clinical instructor checked the doctors' problems with the system. The newcomers didn't receive a training which was a problem. They depended on their colleagues to learn about the system". (Participant 11, physician, hospital B)*

Some staff expressed that if the training was conducted more practically, attendance rates at training events might be higher than they are now.

> *"It needs to be practical and computer-based rather than theoretical. Where I was attending a number of lectures and were not useful because of the lack of practical training". (Participant 19, manager, hospital C)*

It was also suggested that it might be easier to conduct the training online as it had been found difficult to find meeting slots that most staff members could attend at the same time.

When asked about the training experience of EHR, most participants reported that they had not received formal training but that they had been trained by their peers or senior colleagues on the job. There was ambiguity around whether this was a helpful way of conducting training or not. Many participants expressed gratefulness to their colleagues for taking the time and training them on the system. On the other hand, some of them expressed that they felt lost in how to use the system, particularly when it came to using functions that were a bit more than just basic, but they still believed that it was not necessary to provide more formal ongoing training. This finding is an interesting contradiction, for example, expressed here:

> *"No one trained us, but the staff who came from Kuwait and had already used it helped us with. We didn't get the information where to go or what to do. There is an IT team here in the hospital. Once we have a problem, we tell them, and they help us". (Participant 25, nurse, hospital A)*

This participant seems to be ambiguous about what not getting the information meant for them, because on the one hand, they seem to be aware that they did not have information available, but on the other hand, they downplay the importance of this because "*once we have a problem we tell them, and they help us".* This ambiguity was found in many more of the accounts in the interviews. One interpretation is that once the participant mastered the system with the help of their peers, they too became experts in using and explaining the system. This increase in knowledge provides them with a sense of pride that would potentially diminish if they expressed how lost they felt with the system initially. Hence, they downplay the importance of training.

> *"We don't need a training for it. It doesn't require an effort to learn about the system or its updates". (Participant 14, physician, hospital C)*

In support of this interpretation, participants' emphasis on having basic computer skills and how basic computer skills were enough preparation to use the EHR is discussed further in the next subtheme. Of course, there is also a positive side to learning through peer training that participants expressed. They emphasised how important it was to use the EHR on the job and learn from other colleagues by observation and practice.

IT support was perceived as a crucial aspect that could improve EHR use and training. Participants said that increasing IT support could help solve technical problems as soon as they happened. Regarding training, increasing the capacity of IT staff to support was perceived as crucial in helping to teach other staff essential elements of knowledge. What was described was that individual staff members often did not know how to use a function of finding a particular function.

> *"The doctor faces difficulty in accessing the desired page. We hope that the IT unit will help facilitate the system. Sometimes, the doctor may complain that there are no options in the program for what they need .The IT technician will show the*

> *doctors these options. Doctors were invited to attend the training in the theatre hall, but most of them didn't attend". (Participant 29, nurse, hospital A)*

IT staff were perceived as crucial in helping other staff locate these functions.

7.2.3.3 A desire for better information flow

Participants expressed a desire for better information flow, for example, through regular meetings. When a participant asked for more regular meetings, this was mainly to ensure that people could know about system updates and how those were likely to work. The healthcare professionals expressed a lack of opportunity to share information with colleagues on system updates and other changes that affected the work.

> *"We should receive a training to avoid mistakes entering data especially if there is a new update. For example, when we use the barcode system many of my colleagues faces mistakes because we didn't get a training". (Participant 7, nurse, hospital B)*

> *"We should get regular trainings every six months to know about the new updates of the system and how to use them" (Participant 26, technician, hospital A)*

> *"The doctors working on HIS should be grouped on a group like WhatsApp to share information with each other". (Participant 3, physician, hospital B)*

> *"Distance learning either direct or by e-mail can improve this training as we are not included in the Ministry of Health. We can send them our recommendation via e-mail or pamphlets. Pamphlets are already present, but they need to be more user-friendly. Also, group learning can improve the training to make use of the other members' suggestions to improve the system or their questions about something new we don't know yet. The individual learning can be improved if one of the IT specialists takes a rotation in the doctors' offices to check their work on the system and know their barriers of using it." (Participant 20, manager, hospital B)*

Interestingly, what initially seemed to be a request for more regular training turned out upon several more readings and comparisons to be a desire for better information flow and connection between different staff members inside and outside the hospital. Staff spoke about being connected via pamphlets, emails, online learning, and staff communication forums, such as WhatsApp groups. The participants wished to get a better connection among EHR users, faster information flow, and an ability to share how they made the best use of the system.

7.2.3.4 Overall interpretation of the theme "Need to integrate knowledge"

Initially, this theme seemed to be about eliminating paper files and ensuring more regular and more formalised training, leading to better integration of knowledge. This is undoubtedly true and crucial to streamline workflows and ensure knowledge is transmitted, particularly to new staff. However, many participants also emphasised how vital more informal aspects of training and sharing knowledge were. It became clear that the role of IT support was not only one of quickly fixing technical problems but that the IT department also had a crucial role in the on-the-job problem-focused teaching of the functionality of the EHR system. Participants seem to desire more informally and quickly sharing their problems and possible solutions whilst working on a particular challenge.

7.2.4 Ambiguity

The third theme tried to capture what staff felt ambiguous about. It is divided into three sub-themes, *Disagreement about role of IT literacy*, *Ambivalence towards EHR benefits* and *Role of managerial support*.

7.2.4.1 Conflicting views on EHR literacy

When participants were asked whether the computer knowledge was related to EHR use, the resulting answers were ambiguous and needed some interpretation. The vast majority of participants expressed that either no computer knowledge or only very basic computer knowledge was needed to operate the system. However, it became clear that this assumption depended mainly on what participants defined as basic computer knowledge. How participants defined basic knowledge varied greatly as described below:

> *"Just basic knowledge of computer and English language". (Participant 12, nurse, hospital C)*

> *"The doctor needs advanced skills to use the electronic system such as Office and English language, not just basic skills". (Participant 8, physician, hospital B)*

> *"Yes, it is good to have some knowledge about computers, because without these knowledges we cannot work efficiently with EHR, so we computer knowledge is recommended" (Participant 27, nurse, hospital A)*

> "*The health worker should have a simple [basic] background on the computer. I think no higher skills are required" (Participant 28, manager, hospital A)*

"You need to know basic computer skills like Word and Excel". (Participant 1, nurse, hospital B)

Consequently, it seemed more important to look at what this knowledge was rather than what level of computer literacy it represented. With this new perspective on the data, it became clear that what staff needed to be able to use as basic skills was the Microsoft Word application, and they also needed to have a basic command of the English language.

7.2.4.2 Ambivalence towards EHR benefits

Whilst many participants expressed they believed the EHR would bring many advantages to their work, a closer reading of individual interviews also revealed that participants felt ambivalent towards whether EHR had the potential to improve their work.

"It doesn't much hang now, but previously, the system was hanging for hours. There are technical issues like the absence of autosave option which can cause the data to be lost in minutes. Paper and ink are not enough in the hospital, so we can't sufficiently communicate with the other departments. Also, the system is not efficient in consultation matters, ordering laboratory tests or drugs as they must be printed before being sent to the other departments". (Participant 3, physician, hospital B)

"I have been working here for six months, but it's the best place here. The EHR we are using here is better [than in previous hospital participant worked in] but not all data is present on it. We do not use it completely, and doctors don't always enter all data. Laboratory tests, entry paper and discharge paper are present on it" (Participant 6, manager, hospital B)

"The electronic system is much better as all the patient's data is documented, and it is fast. And there is a link between the system and number of departments such as laboratory and radiology, which facilitates the work. I started using it four years ago, since I began working in the wards here for nursing notes and care plan. But when I moved to diabetic clinic, there was no user and password for the nurses. Just the doctors were doing all things in the system and we are helping them. Most of work done by the system and we face many problems". (Participant 12, nurse, hospital C)

There seemed to be a focus on reporting functions that were used previously but could now be centralised and sped up through the use of EHR. The participants implicitly expressed they were making use of these functions in particular, but they felt more ambivalent about the usefulness of other EHR components:

> *"The system is [designed to be] user-friendly, fast and accurate and multidisciplinary...but there is no multidisciplinary follow-up of systems" (Participant 2, manager, hospital B)*

> *"I have trained to use EHR in A hospital in internal word. The system wasn't totally activated. We cared about writing medications, laboratory tests and radiography" (Participant 21, physician, hospital A)*

This quote seems to answer the question that came up during interview analysis as to why participants seemed very satisfied with the potential use of EHR systems whilst, in their actual work, still heavily relying on paper-based records. Furthermore, the functions they ***cared*** for, i.e. the functionality they had been using in the past but were now more streamlined, more accessible and faster, seemed to be the ones that were the easiest to integrate into their everyday workflow. The hermeneutic stance was used to explore the tension between interview partners expressing great satisfaction with the EHR whilst simultaneously expressing how in their actual day-to-day work, they were still heavily relying on paper-based records. There was a contradiction between expectation and actual use. However, reading the quote side-by-side with the whole interview explained that the functions HCPs ***cared*** for, i.e. the functionality they had been using in the past but were now more streamlined, more accessible, and faster, seemed to be the easiest ones to integrate into their already existing workflows.

7.2.4.3 Role of managerial support

Participants expressed they felt management was investing in adapting the system to their needs, for example, ensuring frequent updates enabled the system to adapt to changes. The users were keen to unify the system to make it easier to use. The participants in senior managerial positions agreed they intended to eliminate paper files slowly. Participants in those roles in mainly expressed frustration with the resistance from doctors and nurses:

"We began to adjust the system until 90% of the system became fully electronic. Paper files are still present, but they need to be filtered so we can eliminate them. We face difficulties with doctors and nurses in their response to information entry. In the last meeting with the main medical record department in the ministry of health we discus to start with scan the inactive files and this idea is under discussion." (Participant 28, manager, hospital A)

There seems to be a small amount of staff representation in decision-making around EHR, for example, through committee representation or though complaints processes, according to Participant 13 (physician, hospital C): Staff members are involved [in EHR decision making] because we deliver our complaints, and they listen”. However, most staff agree that they were not involved in decision-making. It seems that managerial staff were more likely to believe that staff were involved sufficiently:

> *“The administrators regularly check the system and update it to make it easier to use. They didn’t ask for our opinion on the required changes”. (Participant 14, physician, hospital C)*
>
> *“Yes, staff are involved in EHR related decisions. I receive any feedback from the doctors and workers. Then, I send them to the IT unit to solve these issues. The IT unit is very cooperative with us”. (Participant 28, manager, hospital A)*
>
> *“They consult only with the seniors and subsequently, they tell us. But, no one of the administration asks us about our opinions”. (Participant 3, physician, hospital B)*
>
> *“They take our opinions. But the opinion must be supported by statistics and studies, not just a mere opinion”. (Participant 15, administrator, hospital C)*
>
> *Staff are not involved at all in decisions about using the electronic system” (Participant 17, nurse, hospital C)*

It seems that in the sample presented here, there was a general lack of asking stakeholders. If those were asked about the input, they were in senior management positions.

7.2.4.4 Overall interpretation of the theme “ambiguity”

This section demonstrates where specifically there is a need for more clarification of aims and goals, as expressed in staffs’ ambiguous attitudes. Not only were there disagreements amongst different participants, but there was also felt sense that some of the disciplines had not found clarity with regards to the points inside themselves. Training seems to be a significant issue with staff not sure if they should receive more formalised training or learn on-the-job. Furthermore, when defining what kind of knowledge was needed to operate the system, participants seem to differ significantly in their perceptions and interpretations about what adequate IT knowledge was. There was not only disagreement about the format of training if it would be conducted by peers, by specialist trainers, online or face-to-face, but there was also disagreement about the training content. Historically the training had focused more on the importance of EHR in general, rather than on the everyday use of the system. Some participants queried this practice and its usefulness.

Many participants agreed that making EHR fully supportive of care processes was a long process requiring commitment from all staff. The management seemed to recognise this and explained how they held cross-departmental meetings to get the doctors on board. They also perceived the IT department as a crucial partner supporting this transition and found them cooperative. However, it was interesting that staff in managerial positions are more concerned with resistance. In contrast, staff and non-managerial positions usually did not mention how management supported them using the EHR. When they were prompted to think about managerial support in their work, the overwhelming majority of participants replied by explaining how management was supporting EHR implementation from an administrative and IT perspective. This gives reason to believe that there is room for improvement regarding management better understanding of how staff could use the system. This issue came up as a subtext in other themes as well.

7.2.5 Experience of powerlessness

This theme discusses the staff's experience of powerlessness regarding different aspects of their work with EHR. It is grouped into the following subthemes: *Frustration with IT issues and lack of resources, Frustration with EHR interoperability and partial use of functionality* and *Conflicts amongst HCPs.*

7.2.5.1 Frustration with IT issues and lack of resources

Whilst most participants seem to be very content with the support they received through the respective IT departments, they all mentioned frustration with frequently re-occurring IT issues. Those were, for example, the system hanging, the system being slow, particularly at peak times when many people are using it, network connection breakdown, no autosave option which leads to data loss, people forgetting passwords and getting locked out, a mismatch between electronic and actual data.

> *"Sometimes, the internet connection is absent. There is no autosave option which causes some data to be deleted. There are not enough computers. There are only three computers for nurses and doctors in our department". (Participant 17, nurse, hospital C)*

> *It [The EHR] hangs sometimes. There is no autosave option, there are more one program in the system, all of them are integrated together, but the interface was*

different which causes obstacle to the user. Also, information is sometime stored in the wrong places. (Participant 19, manager, hospital C)

"The system is slow. The number of computers is not enough to meet the needs.The computer system crashes frequently which delays the patient flow. Also, the computer "PC" is heavy unlike a laptop, so it is not easily movable, and doctors in other places can't view the patient files. The printer is also a problem, and usually there is no enough ink or sheets. I don't think that management focus is enough. We can wait for many hours if there is a problem with the printer as there isn't an IT clerk in the hospital. Generally, there is no [leaderrship] focus on the system". (Participant 21, physician, hospital A).

"The administration is not much focussing on EHR and as a consequence, we are experiencing many issues, for example, there is a lack of enough computers and often a lack of resources for example printing ink". (Participant 2, manager, hospital B)

What stood particularly out was how long it can often take to solve an issue and how interruptive this is for the work:

"Sometimes, the system hangs, but we call the IT team in our department to check the problem. The IT team is cooperative with us, but sometimes it takes time until the problem is solved. Internet connection is especially important in RIS. When the internet hangs, it becomes a problem. Sometimes, the computer hangs when retrieving the data for more than half an hour for a single patient which is completely nonpractical. Now, they are updating the system, but this is a real problem". (Participant 11, physician, hospital B)

Staff saw as one of the main barriers for them using the electronic medical record system was the perceived lack of resources. They were concerned that the number of computers was not enough to meet their needs. Moreover, they found that often the existing computers were too heavy and not easily movable. They expressed a desire to have laptops that they can carry around. They were also concerned about a lack of printers and other equipment, for example, ink and paper.

This lack of resources is particularly significant when thinking about the lack of interoperability between different departments. For example, for security reasons, physical files often have to be printed to share with other departments rather than looked at on the screen.

Staff also felt that another barrier to making better use of the EHR system was that it took a long time to make any changes to enhance system functionality. Therefore, they asked for more system developers.

7.2.5.2 Frustration with EHR Interoperability and partial use of functionality

Many participants identified design flaws as significant barriers to EHR use. They were frustrated with the design of the EHR as they found that often, for example, entering patient data required too many steps for their taste. The lack of interconnectivity was also another major problem.

> *"Also, we don't know all the patient's data as we only enter the patient's reports like radiological reports. The rest of what happens during the day is not known for us." (Participant 25, nurse, hospital A)*

> *"The options are limited, and it is not connected to the other hospitals. There should be a complete electronic record for each patient as in private hospital". (Participant 6, nurse, hospital B)*

> *"Just the interdisciplinary communication of the system [is an issue]. It can't be sent to another department for fear of violating the patient's data security". (Participant 8, physician, hospital B)*

> *"There is no unified system across all hospitals to connect with each other to enable the patient to retrieve his data if he moved from one hospital to another. If the doctor moves from one hospital to another, the ordering difference leads to difficulties in adapting the doctor to the new system". (Participant 22, physician, hospital A)*

Although technologically possible, data security concerns meant that different departments using the same system are not connected. This lack of connection means that patient data cannot be sent electronically to another department but must be printed and sent via internal mail. The current situation is complicated and means that there is no multidisciplinary follow-up.

Participants elaborated on how some of the patients' records were on the EHR, but other essential patient files were not recorded on the system.

> *"I used the electronic system when I was in the intensive care unit. We used it a little, for example, in the patients' admission and discharge and nurses' notes. When*

I moved to the quality unit, we only used the system to enter the patients' laboratory tests and reports from radiology department, so we used the system but not in fully." (Participant 29, nurse, hospital A)

The participants giving the statement sounded frustrated. This frustration came out in particular when participants had changed roles and moved between different hospitals. For example, one participant had used EHR in Hospital B to organise follow-ups. However, in hospital A where she was employed at the time of the interview, the follow-up function was not utilised at all. This experience was frustrating for the interviewee as she felt the follow-up function saved time and reduced human error. In addition, in her experience, this function led to an overall better workflow and more ability to focus on other tasks. However, this functionality was not utilised in hospital A, and she found this frustrating.

7.2.5.3 Conflicts among HCPs

The managers in hospital B experienced staff as compliant with using EHR. However, this was not the case across hospitals. Another frequently expressed contradiction was that despite all staff being encouraged to use the system, some groups of staff, doctors, in particular, were often mentioned not to be using the system at all or not always entering all data.

"Currently the electronic medical record and paper record are used simultaneously and also the IT department is cooperative. All the employees use the system, and they are very co-operative. Only when there is a system error, they have to wait. All staff and the physicians are cooperative with us". (Participant 2, manager, hospital B)

"We suffer from the lack of cooperation of physicians, especially the actual doctors treating the patients". (Participant 19, manager, hospital C)

"Other departments do not cooperate with us as some doctors do not adhere to the dates in the system". (Participant 28, manager, hospital A)

"There are a number of employees are very helpful in the use of electronic medical file and the other hand there is a large number of employees is not cooperating in the use of electronic medical file, especially doctors. They are encouraged by trainings about how to use the system. In every meeting, they focus on instructing doctors to use it, but some doctors are not responsive". (Participant 30, manager hospital A)

On the one hand, this lack of cooperation was described to cause more workload for other staff groups who had to manually enter doctors' handwritten notes onto the EHR system. Particularly nurses and administrators expressed irritability about this. On the other hand, they were also the group of participants who mentioned they used EHR a lot, and it sometimes was used for up to 80% of their daily tasks. On the other hand, EHR was not necessarily perceived as reflecting all critical information on a patient as it was not possible to tell whether all the relevant information had been entered or not. This observation explains why so many participants believed in the importance of paper backups whilst hoping they could be abolished over time. Many different members of staff experienced a perceived lack of support. Interestingly, the different staff groups seemed to blame each other. It was, for example, perceived as the management duty to get rid of paper files and enforce doctors to cooperate more.

> *"Yes, there are obstacles to EHR use. The first is management. There is no good understanding of the project. The HR may also be a hindrance. Health care professionals fear change, lack awareness of minimising errors. They don't realise the benefit of this new system. There is not enough encouragement to sustain and apply the system". (Participant 23, administrator, hospital A.)*

At the same time, management emphasised that it was challenging to make the EHR efficient whilst there was a continuous lack of cooperation from the doctors and perceived resistance to change from other staff.

> *"Yes, the lack of cooperation of doctors in the insertion of all information, as well as training. It took time, effort and money when we had to enter the data in the paper files onto the electronic system. Some doctors were not patient to do so". (Participant 30, manager, hospital A)*

Participants agreed that there had been quite a lot of management focus on EHR use in the hospitals, for example, through having it as a standing agenda item in meetings. They partly explained this because EHR is part of Kuwait's accreditation requirements. However, they found that management often lacked the required resources to fully implement and support the system. Moreover, there was no program in place that would enable management to monitor and evaluate the use of the system. This inability to monitor and evaluate EHR use effectively was seen as a problem and potentially as a lack of interest by some participants:

> *"They encourage us but not much. For example, I use the system without having access to my personal ID, I use my colleagues ID, and nobody cares". (Participant 7, nurse, hospital B)*

This quote shows how concerned some participants were about the possible consequences of a lack of monitoring and evaluation. The example above actually points towards an issue of potential security concern.

7.2.5.4 Overall interpretation of the theme "powerlessness"

Many participants expressed how they wanted to make the EHR better and support the work more adequately, for example, by suggesting improvements to training content and frequency. However, many of them expressed challenging barriers to overcome and made them feel powerless. One of them was the frequent occurrence of IT issues and the delays this caused. They also expressed frustration with the partial use of EHR functionality and the lack of essential features. Moreover, there was also a human element to the experience of frustration and powerlessness which resulted in some individuals feeling burdened as they perceived different staff members were free to engage or not engage with the EHR without any disciplinary consequences. This perceived lack of disciplinary action led to blaming each other for not reaching the full potential of EHR. While management was very keen on supporting EHR, they often lacked the power and resources to facilitate this through better monitoring and evaluation.

7.2.6 EHR as a threat

This theme explores how participants perceived EHR as a potential threat to completing their work to a good standard. It is divided into three subthemes: *Fear of clinical error due to disjointed information, Fear of losing data* and *Fear of security breaches and misconduct.*

7.2.6.1 Fear of clinical error due to disjointed information

The participants who had used the EHR in different roles expressed frustration with the disjointed use of the system in different departments.

> *"I use it [the EHR] for entering patient's past history, laboratory results, and all the patients' data. You can use it for ordering medications, consultations, radiological or laboratory tests. There is also a system for follow up, but we don't use it. Regarding operations, the surgery department use the electronic system to upload the operation data, but in urology department, we don't use it". (Participant 3, physician, hospital B)*

> *"In C hospital, we began to use only one year ago. It's not very good. There is not enough integration between the departments. We are trying to figure out how the departments communicate. Not all departments work on it. We get the laboratory*

results using it, and the figures of the radiological tests can be obtained easily on our own computers (through Packs not HIS)". (Participant 13, physician, hospital C)

The first read of this quote seemed to indicate the participant was quite content with the EHR, despite its limited interdepartmental integration. However, when read in light of some of the contradictions that came up while analysing the transcripts, it might be possible to conclude that the interviewee experienced the same fear of making errors, lack of integration and loss of data as shown in the quote above. Therefore, the quote shows how employees in some hospitals need to find multiple workarounds to have all the necessary information available to them, despite having an EHR. In addition to that, some other participants mentioned issues around one patient having multiple files in different departments, potentially leading to clinical error. In order to avoid errors, employees cannot rely on the EHR but have to come up with their local solutions to obtain enough information to be able to provide adequate treatment. This need to improvise makes the EHR error-prone, and participants expressed fear that the information needed might not be readily available if they were using EHR alone. This problem only occurs when departments are not adequately connected through EHR. For example, this seemed not to be a problem in hospital B, as the interdepartmental connection of EHR was established. In this hospital, participants had fewer concerns around clinical error due to disjointed information.

7.2.6.2 Fear of losing data

Many participants expressed how important it was to keep paper files with the same or additional information on the patients. While initially, I thought this was a sign of reluctance to adopt new information systems, I can now understand how the fear of losing data might have led to keeping up paper record systems.

"I see that papers records are faster to achieve the work because the electronic system is likely to be crashed. The papers are important, because paperwork very easy to use especially at peak time. However, in the case of applying the electronic system without any obstacles, using it will be of great benefit to the unit". (Participant 22, physician, hospital A)

"We can't dispense paper files as the electronic records if affected, we will lose all data. The electronic records are much easier, but there should be a backup for it. If the doctor reports all data in the electronic data, it will protect the patient's data

> *from being lost. There is a need for a mass transfer of the electronic medical file". (Participant 30, manager, hospital A)*

> *"Paper files are still used with the electronic system, and they are indispensable. Not all data is present on it [the EHR]. Sometimes, old data and personal information like names and nationalities are lost. If the system crashes, it becomes a problem. The rest of the issues are man-made." (Participant 6, manager, hospital B)*

> *"The system sometimes exults and does not automatically save the data. The computer is slow and if the device fails, the whole job stops until the IT technician repairs the error". (Participant 10, physician, hospital B)*

> *"We use both systems, but electronic system is widely used. The doctor needs to take a note of the laboratory results as the electronic system may hang or not save the data". (Participant 12, nurse, hospital C)*

Possibly there is a need to understand the paper files not only as a residue, as a leftover that will slowly get eliminated but as a crucial part of a behavioural system of a way of organising work. This means it would not only be a question of ensuring access to electronic files and system stability, but one would also have to look at how the different systems, paper and electronic, currently integrate and how this could shift in a way that creates a better workflow. This would mean understanding the importance of paper records for recording particularly sensitive and meaningful information and speeding up daily tasks, and making, for example, daily follow-up work more efficient. If a system were aiming to be meaningful for staff, it would need to address data protection and accomplish daily tasks. For example, the current system needs improved functionality, or the existing functionality needs to be communicated better, so staff worry less about data loss and security breaches.

7.2.6.3 Fear of security breaches and misconduct

Some participants said that the most crucial feature that made EHR necessary was protecting patients' privacy. Their concern in the past was that it would have been challenging to determine who was responsible when data had been tampered with. The EHR system provided them with a possibility to have a trail of which staff members had entered data into the patient's file and therefore allowed them to investigate what happened if data had been manipulated.

Moreover, EHR has been particularly useful in protecting patient privacy because it allows each patient to be assigned an ID number. Therefore, the patient's confidentiality remained protected when ordering CT scans because they could request the relevant scans using the unique patient ID. Conversely, when test results such as laboratory tests and radiographic reports need to be entered into the patient's file, requesting an entire patient file was no longer necessary.

> *"Where previously we had to ask the full file of the patient, but currently only need the civil ID of the patient and show the patient's information and complete the last laboratory test and radiography reports on the system". (Participant 7, nurse, hospital B)*

Participants mentioned that this made it much easier to protect the patient's privacy by making only relevant sections for a particular task available to the relevant staff member.

Although some participants emphasised they liked the EHR because it offered a possibility to track each staff member's activity, for example, using different ID codes, this was not common practice in all the hospitals. Therefore, it is possible to imagine how this might cause fear of security breaches and misconduct in the workforce. For example, some participants explained how several staff members used one EHR ID code to log into the system and hence it would not be possible to identify who had entered incorrect data or otherwise manipulated a patient file. This lack of security could have potentially severe clinical consequences, and therefore, it is understandable that staff wanted a secure system that prevented misconduct, as expressed in the quote below:

> *"Paper files are essential as they are not forged; however, they can be lost, or it is possible for the patient to have more than on file which causes many problems". (Participant 3, physician, hospital B)*

This quote shows how participants were carefully evaluating the benefits and potential pitfalls of the new system and trying to act to agree with their ethical attitude of maintaining patient safety. It seems participants had experiences with incorrect or missing entries in the EHR, which led them to distrust the EHR independently. However, this leads to the question of whether using parallel systems can indeed eliminate the risk of incorrect (by accident or malicious intent) entering of data. From the description of participants around how they access electronic and paper files, it became clear that they see it as more of a transitional solution until their department is using EHR more effectively:

"Seven years ago, we didn't use PACS or HIS. We used paper-based records instead. We had to check multiple paper files -some were lost- if we want to follow up a patient. When began to use HIS, everything was organised as we archived all previous data. We could retrieve the data, organise it if needed, and compare the old and new datasets. This is especially important for cancer patients who enter all their data, so it can be delivered to all departments. We can view all the patient's data either old or new by entering the patient's own number. Previously, there could be more than one number for each patient which could cause data duplication. The patient's data can be delivered to the hot lab, radiology department, and the oncologist. This is very confidential as every patient has his own password. The patient is not released unless the consultant approves and checks all data. Electronic records can be used for statistical analyses based on the reports. PACS and RIS are different systems. Previously, there was not enough memory spaces, but now they are enough". (Participant 11, physician, hospital B).

This quote shows the extent of hope and belief in EHR's potential to streamline work and make it more secure and reliable. Participants believed that EHR could enhance their ability to deliver a confidential service to their patients in the long run. It also explains how important it is to continuously adapt technological solutions to organisational needs to integrate EHR into the workflow.

7.2.6.4 Overall interpretation of the theme "threat"

The sections show that in order to understand why staff resistance might occur, it is vital to understand how the EHR can be perceived as a threat to staff completing their work to a high standard. Although it might be true that some staff resist because they do not want to engage with change, there seems to be also a willingness to engage with the system that it is hindered by a perceived malfunction with regards to file loss, clinical error and security breaches.

7.2.7 Resistance grounded in fear

This theme discusses how fear around EHR functionality and use can lead to resistance. It is divided into three subthemes: *Ambivalence and resistance towards implementation of IT systems*, *Data collection supports managerial control* and *Resistance towards the growing importance of EHR*.

7.2.7.1 Ambivalence and resistance towards implementation of IT systems

Many of the participants were able to provide detailed accounts of the implementation process in their hospital and others:

"When I started working in the department there wasn't any electronic system, but it was partially applied later by the Ministry of Health in cooperation with the ATC company, and I was trained to it, but we did not continue to apply the system because the main company did not design it, instead, it was taken from another subsidiary company. There was an attempt to have an electronic system in the entire organisation. The OBD system is applied in pharmacies, but in a partial fashion. Each section has its own status e.g. it was applied in the pediatric department". (Participant 23, administrator, hospital A)

A contradiction expressed here is the significant effort from the central government to implement fully functioning EHRs that were then only partially adopted at the hospital or departmental level. What slowed down or prevented the adoption process? Was it the incompatibility of sub-systems as suggested in the quote above? A closer reading of other participant's accounts revealed that system incompatibility could only give a partial explanation to this phenomenon.

Many of the transcripts refer to a "we", more precisely, a way of doing things within one department that might differ from how things are done in another. A contradiction can be found between the aims of a nation and hospital-wide implementation strategy and training programme and the local culture within departments, which might not reflect the aims of the larger strategy. Interviewees express disregard and resistance: *"*

We cared about writing medications, laboratory tests and radiography". (Participant 21, physician, hospital A)

The quote implies a decision was made (on a collective level) about what aspects of EHR were beneficial to the department's work and that there might have been other aspects of EHR which were deemed as less valuable or not as important. This quote also hints at the collective dimension of decision-making regarding using EHR and how this can be used to provide room for resistance and ambivalence towards implementing new IT systems.

7.2.7.2 Data collection supports managerial control

Particularly staff in managerial positions expressed they were grateful for the data provided by EHR that they could not get hold of in other ways. Mainly cohort information and longitudinal data could not be obtained if EHRs were not in place. Staff expressed gratitude for being able to use this kind of data to inform research and also to support managerial decision-making.

Yes, it is so important. I can use it to make statistical analyses of the clinical, occupational and financial statuses. Financial matters like decisions about taking sick leaves for more than 20 days a year and admin matters like privileges, vacations, grants and medical committees are made easy in the electronic system. (Participant 20, manager, hospital C).

Upon initial reading, it was indicated that EHR data were mainly used to drive public health research and longitudinal understanding of the cause and treatment of disease. However, this quote demonstrates that staff see links between obtaining data from the electronic system and then using that data to justify managerial decisions. Thus, the data seems to support them exercising executive power and in providing an argument to support a particular decision. This is interesting because it explicitly links the data collected through EHRs with issues around management and power and can thus explain how staff might feel threatened by this power.

However, some staff saw the positives of creating greater accountability via monitoring and evaluating the data on HCP use of EHR, for example, by creating a penalty, reward and incentive-based programme to encourage good use of the system

"Some hospitals are fully committed to the system in all departments in terms of medical examinations and medications which helps monitor the physician's use of available resources. This varies from one administration to another. There are hospitals operating both paper and electronic systems, and others work using the electronic system only. In recent times, the administration has been focused on use of electronic medical record, because it is one of the accreditation requirements, but not for the required degree, and there is no follow - up on the use of it, and in case of negligence the user does not have any penalties". (Participant 22, physician, hospital A)

"There should be incentives for doctors or nurses using the system most like for patient's referral. These incentives may include appreciation certificates, sending him to other hospitals using the system or opportunities joining the system development team". (Participant 20, manager, hospital C)

7.2.7.3 Resistance towards the growing importance of EHR

When staff were asked about what makes EHR important in their work, many expressed resistance towards the growing importance of EHR in their work. Initially, it was surprising to see how they mentioned, for example, the need for paper-based records for legal matters, as this is not necessarily an argument against the importance of EHR. However, this is also an expression of resistance towards a perceived movement of relying more and more heavily on EHR when read in the context. This participant expresses their fear of not being able to work without EHR:

> *"I use HIS in my clinic to enter all the patient's data, including his past history, drugs and their side effects. I check it before the patient's visit. Also, we check our portable laptops in the internal department. I can't work without HIS, so it's a problem for us when it hangs". (Participant 8, physician, hospital B).*

This account summarises how some participants, whilst acknowledging the importance of EHR for the work, also fear that this growing importance means that they will not be able to get any work done without the EHR. Thus, relying so heavily on one piece of technology is frightening to them and explains how they might resist. Those findings have been mirrored in the literature, as discussed before.

7.2.7.4 Overall interpretation of the theme "Fear"

This theme highlights the potential contradictions between a national and a local agenda and how staff negotiate these. It also highlights how many EHR functionalities support better data knowledge concerning research and offer the possibility of controlling and evaluating staff performance, which can feel threatening. Interestingly, this seems to be a link between the growing importance of the system and the fear of not being able to work without it as a consequence.

7.3 Phase Two: interviews with three hospital directors

The previous section discussed the main findings from phase one of the qualitative study. This section discusses the main findings from phase two of the qualitative study. The study results are being discussed under two main themes identified using thematic analysis: Experiences of initial EHR implementation and lessons learned.

7.3.1 Experiences of initial EHR implementation

EHR hopes

The private hospital found EHRs appealing because they hoped to improve patient safety and reduce errors, for example, by using the EHR to enhance the accuracy of data entry and avoid errors in the doctor's handwriting. They also hoped to prevent files from being lost by using the EHR. However, the hospital director had observed many difficulties associated with paper files and the resulting lack of data integration, as demonstrated in the quote below:

> *"We had a paper system before the use of electronic files that were sometimes lost. Sometimes, we couldn't understand the doctor's handwriting in his notes and doses of medication, which may affect the safety of the patient. Also, these files needed a huge storage space. We also did not know about the state of drug consumption, the patient's medical history, his allergies or the drugs that were prescribed for him. There was no inter-departmental communication, and we could only open temporary files from the medical records department" (Hospital Director Primary Care Centre)*

Another primary hope for the private hospital was for improvements in workflows, for example, by getting data from the system in a smoother, more integrated and more reliable way, being able to share data. Finally, they were hoping to increase the patient turnaround time by implementing the EHR. The research institute got initially interested in EHR as a convenient way to do statistical analysis of their patient data. They collaborated with a Scottish and an American university and adopted a Canadian EHR system for their purpose. The main reason for choosing the system was related to cost savings and the company's reputation that provided the system for its fast and efficient customer service. Initially, they kept the system very basic. The decision to implement EHR in the form of a primary care information system (PCIS) in the primary care centre came about for two reasons. First, there was an expectation from the Department of Information in the MoH for primary care centres to implement EHR. However, what seemed equally important when the primary care centre implemented EHR in 2001 was that it was a new centre that was fortunate to have enough resources for implementing EHR because a donor supported the centre with both soft- and hardware purchases and installation. Second, however, another critical factor seemed to have been the enthusiasm and curiosity of the hospital leadership who had, out of their initiative, attended lectures about EHR and felt that the environment at their primary care centre was ready for implementation.

Reasons for Implementation decisions

One of the significant differences in implementation decisions seems to be whether a health care provider opts for a sequential introduction or implements the EHR as a fully integrated system in a broader manner. The primary care centre decided to adopt a simple system initially. They explained that the user's needs guided their decision on which elements to implement first. The quote below demonstrates how they could grow their EHR from a simple system initially by trusting in their ability to adapt it continuously:

"We started in 2001 with the application of a very simple system based on the users' needs such as the patient's complaint, diagnosis and treatment. This system was primitive and simple, but it was effective because users modified it according to their needs." (Hospital Director Primary Care Centre)

Initially, the primary care centre focussed on patients' complaints, diagnosis and treatment. As the quote above demonstrated, they found the system compelling because although it was simple, the users could modify it according to their needs, and therefore, it was highly usable from a very early point. The private hospital wanted to be a pioneer in technology adoption. Their aim with EHR introduction was to be paperless and reach a sophisticated level of system integration as early as possible. They, therefore, opted for an implementation approach that involved introducing a fully integrated EHR to several departments simultaneously. They started with a more limited precursor system to request laboratory tests, x-rays and medication. It took them one year of planning and working on a road map to ensure they were ready for the EHR implementation. The private hospital had to master the challenge of establishing co-operation between departments and staff groups such as technicians, doctors and the quality control unit by creating small teams overseeing each step in the implementation plan.

The research institute explained how they based their system on already existing systems whilst needing to adapt it to the context of Kuwait:

"Our hospital had mutual relationships with Dundee University in England and Harvard University in USA. Both universities helped us establish the health care system to make statistical analyses of diabetic patients in our center in Desman. The system was very basic at the beginning, then we updated it to integrate laboratory results and patient's pharmacy in it according to the user's feedback. The system was based on a Canadian health care system named Halloria (not sure of the name) as we wanted a company with a fast response and low cost. HTC and Epic were not applicable in Kuwait because of their cost and inappropriateness of the system. Each record contains brackets for history, allergies, general and local examination, medications, diagnostic tests, and diagnosis. This record can be shared among physicians and can be searched for any word like diabetes to get all the patients with diabetes in one click. We use records also for prescribing drugs and documenting the patient's condition. The record is always auto-saved to prevent the loss of data, and it is periodically updated" (Hospital director research institute).

This quote demonstrates the complexity of implementation decisions that HCPs have to make, particularly when adopting an off the shelf solution to local needs.

Vital role of IT support and training

The leaders found collaboration and planning with the IT department particularly crucial in their implementation experience. The IT department needs to communicate with the external system designers. Furthermore, this department was crucial in developing and delivering specialised training to teach users how to use the system. The private hospital said it was a significant effort for their IT department, and it was essential to ensure enough resources were available to them before, during and after implementation to support the process. The research institute equally emphasised the importance of appropriate IT support and training. Their staff had a two-week training conducted by the IT team before using the system. In addition to that, they were also given a user manual. The private hospital advised avoiding applying EMRs because they were believed to be too sophisticated and advised to be careful and possibly avoid collaborating with unknown financiers.

EHR Facilitators

The research institute felt they benefited the most by the ability to share the record amongst physicians and the function of searching for keywords across all records, which aids their collection and analysis of patient data. They also said that the autosave function was crucial in preventing data loss and ensuring that each shared record was up to date when different people across the centre accessed. The primary care centre leadership found that with the introduction of EHR, they minimised or got rid of some of the issues associated with paper records, such as frequent loss of files and difficulties in deciphering doctor's handwriting regarding notes and medication, which posed a potential danger to patient safety. They found that EHR addressed these issues. Another benefit was that the electronic storage of data took up less physical space than paper records. They found that by using EHR, they had more access to patient information that was unknown to them before, for example, the state of drug consumption, the patient's medical history, prescribed drugs or relevant allergies. Before introducing EHRs, there was a lack of communication between different departments. The EHR now links diabetes clinics, gynaecology and obstetrics, maternity, dentistry, preventive medicine, and medicine of chronic diseases in the primary care centre. Furthermore, it links back to the quality department and enables the centre to collect data on its overall performance. Furthermore, the files that were available via the medical records department could only be accessed a view- only temporarily records and therefore their very limited with regards to the ability to collaborate between different departments and ensure the data was always live and up to date.

7.3.2 Lessons learned

Ability to adapt EHR continuously

The primary care centre found that the initial EHR was well suited to their needs from the beginning and that they did not have to make any significant changes, apart from periodically updating the system. With each new version of the system comes a possibility to add new functionality. For example, recently, they added clinical indicators to indicate the centre's performance so that the quality improvement committee could monitor our performance better. The private hospital had to adjust its timeline for implementation. They had initially planned to implement it in one year, but it took significantly longer. This was partly due to resolving communication issues between consultants and EHR experts, and partly because the Health Care provider realised, they wanted additional functions added to suit their needs better. The research institute emphasised that user feedback was crucial in expanding the system. After some time, they implemented a function to integrate laboratory results and patient's pharmacy and found this a significant improvement. They had also experienced issues around integrating the laptops they were using to work and the EHR system itself, which was another issue experienced during implementation that needed to be resolved by making continuous adaptations.

Increasing user acceptance, reducing resistance

The private hospital leader felt they had significantly benefited from implementing EHR and wanted to encourage other colleagues to do the leap and implement it in their institution. They felt the most important lesson they had learned was the importance of ensuring EHR readiness by proper planning, involving different stakeholders and allowing enough time in the initial planning to account for adaptations of the EHR during the early implementation stage. This quote demonstrates how they perceived readiness as a factor that would involve multiple stakeholders from different departments:

> *"As for the application, they must be ready because it is not easy at all and must be done in cooperation between different departments such as technicians, doctors and the quality control unit. Small teams can be made responsible for applying each step in the plan. The administrative team is also vital to cope with the changes in the implementation to suit their needs. An information team (IT) must be present to communicate with the system designers, and specialized training should be done to teach the users to apply the electronic system. The technical team must be fully prepared" (Hospital director private hospital).*

Elaborating on their experience, the private hospital felt that stakeholder readiness was more important than the implementation timeline. They felt that both a sequential or all at once approach to implementation were appropriate and should depend on resources and whether a hospital was private or public. The leader of the research institute emphasised the taken approach of continuously reviewing user feedback, adjusting the system and trying out new modifications in reducing resistance towards the system:

> *"My advice is to keep things moving by taking the users' feedbacks, adjusting the system and trying new modifications" (Hospital director research institute).*

The research institute noted they had experienced resistance to the EHR initially, which they perceived as one of the main barriers to adopting and using the EHR. Therefore, they felt that being able to respond to users' needs flexibly was crucial in reducing resistance. In addition, the private hospital emphasised the importance of communicating with the company that was producing the system. In their experience, communication with the company could have been enhanced and helped them better and more gradually implement modifications to the system over time following user feedback. Furthermore, the hospital leadership believes that their staff's resistance to using the system might have been reduced by informing and supporting the users in adapting to using the system better. The primary care centre felt it had benefited them immensely, taking in users' opinions and needs from planning the functionality. They advised that a certain degree of flexibility within the system would benefit in continuously adapting and taking into consideration user feedback and needs and would, therefore, ensure a smooth running of the system over a long period. They also emphasised the importance of interdepartmental connectivity, particularly with the radiology and clinical pathology department. Their hope for the future of EHR was to eventually arrive at a system where all patient information from primary, secondary and tertiary care would be incorporated into one patient file across Kuwait. They did acknowledge the importance of supporting this step across functional units and departments to arrive at an integrated system. They felt that their experience as an early-adopting primary health care unit was crucial and should be listened to use their previous experience. The primary health care centre emphasised the role of the MoH in monitoring the performance of individual physicians and the whole hospital unit accurately. They felt that it was the duty of individual health care units in primary, secondary and tertiary care to collect and calculate statistical indices. They hoped that making periodic examinations of the records a mandatory requirement in each unit would ensure that they were accurate and updated appropriately.

7.3.3 Overall Interpretation of phase two themes

One interesting outcome of these three interviews was that all three participants had emphasised the importance of better understanding and responding to user experience without being prompted to do so. They thought adapting to the user's needs, ensuring their compliance, and using the system were crucial components for successful EHR implementation. A second important aspect was the importance of support from the IT department. The study emphasised the vital role the IT department in each unit had not only in ensuring that changes to hardware and software were implemented and integrated well but that they also played a crucial role in developing and delivering training to staff in-house. The third important finding from this study was the importance of identifying and linking up the different stakeholders, for example, the Ministry of health, individual departments, and the users. All three interviewed leaders agreed that a crucial ingredient for successful implementation and adaptation of the EHR system further down the line was that all stakeholders were communicating and working together on the same goal.

7.4 Summary of themes identified in phase one and two

This chapter presented the findings from phases one and two of the qualitative study. Using hermeneutic analysis of thirty semi-structured interviews with HCPs, phase one of the qualitative study identified six central themes concerning user engagement with EHR. A summary of the themes and subthemes can be found in the table below:

Theme	Subthemes
Trust in usefulness of EHR implementation	Overall contentment with EHR Praise for EHR as time-saving care improvement tool Pride in how EHR supports error reduction
Need to integrate knowledge	Desire for enhanced functionality and integration Training needs Desire for better information flow
Ambiguity	Conflicting views on EHR literacy Ambivalence towards EHR's benefits Role of managerial support
Experience of powerlessness	Frustration with IT issues and lack of resources Frustration with lack of EHR Interoperability and partial use of functionality 7.4.1.1 Conflicts among HCPs
EHR as a threat	Fear of clinical error due to disjointed information Fear of losing data Fear of security breaches and misconduct
Resistance grounded in fear	Ambivalence and resistance towards implementation of IT systems Data collection supports managerial control Resistance towards growing importance of EHR

The first theme, *Trust in usefulness of EHR implementation*, was centred around how EHR supported staff in accomplishing error reduction and how proud they were to be able to achieve this. Furthermore, staff were convinced that EHR was crucial in supporting them in timesaving and care improvement and improving data safety and privacy. This theme also addresses the role of trust and managerial support.

The theme *Need to integrate knowledge* addressed what staff seem to want from the system. It addresses the desire to enhance functionality and integration between paper files and electronic files, the desire for better information flow between different departments and members of staff. It also deals with how staff think that this better information flow can be achieved, for example, through formalised training and more informal aspects such as using IT support as an informal training opportunity.

Ambiguity discussed areas where staff were not quite in agreement, either internally or with each other. It examined ambiguity about the need for specialist training, to what extent disagreement about the necessary computer knowledge was related to this. It furthermore examined whether staff found the training content appropriate. It is addressed how staff felt ambivalent towards EHR's potential for improving workflows and outcomes.

Experience of powerlessness discussed how staff engagement with particular issues, for example, training content and frequency, EHR features and functionality, and IT support, does not automatically translate into necessary changes being implemented. This leads to the feeling of powerlessness, which also shows concerning staff relationships and the perceived lack of executive power.

The next theme was *EHR as a threat*. This section discussed how staff's perception of the use of the EHR system might lead to a higher likelihood or at least a fear of losing data, security breaches and misconduct, and increased clinical error.

The final theme *Fear leads to resistance,* showed overall how resistance can be rooted in issues around power and dependency, which might need to be further explored.

Phase two of the qualitative study consisted of three interviews with leaders of Health Care institutions in Kuwait that had already implemented EHRs in their institution. The semi-structured interviews centred around their experiences of EHR implementation and the lessons learned during implementation. The most important themes that emerged were:

- Need to listen to users: the importance of better understanding and responding to user experience to adapt EHR to user needs, increase system compliance and increase user buy-in.
- Vital role of IT support in supporting system use and training
- Stakeholder support and communication: need for support from MoH, individual departments and users

8 Chapter Eight: Mixed-Methods Results

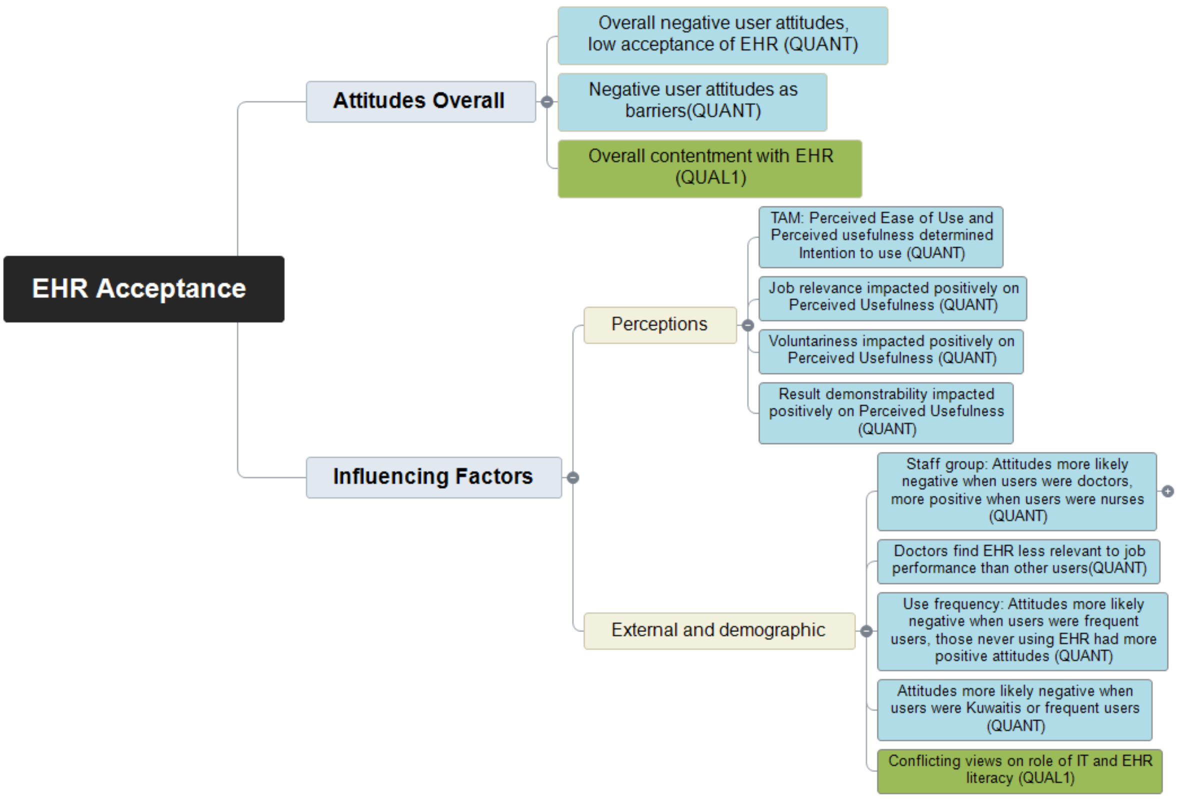
8.1 Introduction

This chapter provides the mixed-methods analysis and interpretation. It draws interpretations from the qualitative and quantitative studies and, as it is common in convergent mixed-methods designs, compares some of the results to determine whether they confirm, disconfirm or expand on each other (Creswell & Plano Clark, 2017). The comparison of the different findings and results was structured following commonly identified concepts. Please see Chapter Five: Methods for a detailed description of the steps to arrive at the concepts.

8.2 EHR Acceptance

The theme of EHR acceptance was divided into Overall EHR Attitudes and influencing factors (see Figure 8.1).

Figure 8.1 EHR Acceptance (QUAN and QUAL)



This theme addressed aim one of the thesis: To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals. Most of the results in this theme were derived from the quantitative study and then compared and contrasted with findings from phase one of the qualitative study.

The findings from phase one of the qualitative study disconfirmed the quantitative results in one instance. Whilst the EHT user attitude survey had overall negative user attitudes towards EHR as a result, indicating low EHR acceptance this was not the case in the qualitative study. Phase one of the qualitative study highlighted overall contentment with EHR, not low acceptance. Comparing these two different findings from the qualitve and quantitative studies side-by-side revealed a difference between perceptions of actual usage experience, evaluated by the quantitative attitude survey and perceptions of EHRs potential and hopes for the system as evaluated by the quantitative study. Comparing the data side by side demonstrated that users were willing to invest emotionally in the EHR system. They wanted to trust and like the system, despite more challenging and complex perceptions of actual usage.

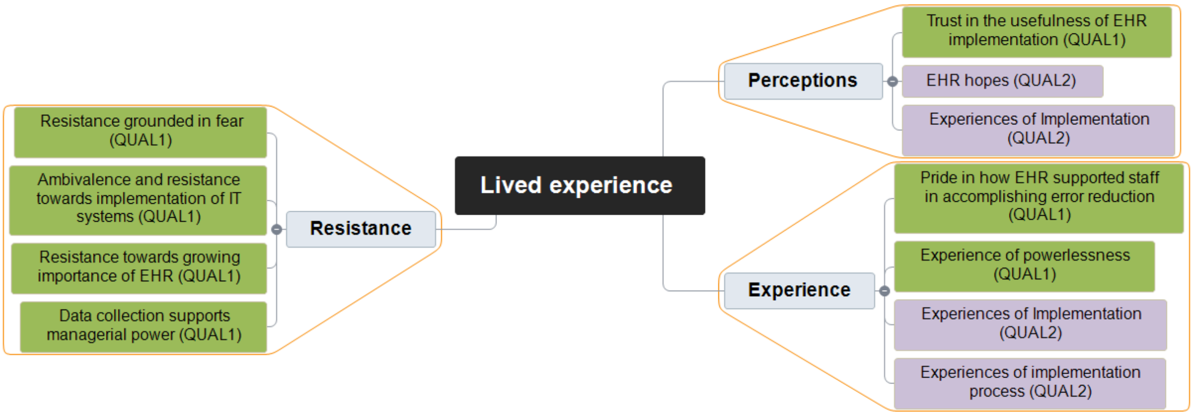
This finding needs to be read with care taking into account the different methods used to collect data. Whilst the quantitative survey was not very time consuming to complete, signing up for an interview meant more investment of personal time and resources, and there is a likelihood that HCPs who were more invested in the EHR doing well or who were more convinced of its benefits signed up to be interviewed.

An example of a theme identified in the qualitative study expanded on a quantitative study theme is use frequency and IT literacy. The TAM 2 study revealed that attitudes were more likely to be negative when users were using the EHR system frequently. The finding is expanding this result in phase one of the qualitative study where many of the thirty interviewees highlighted that, in their opinion, the most significant barrier to ease of use was not IT literacy and EHR knowledge but the usability of the system. This finding explains potentially why attitudes were more negative when a user used the system more frequently. If a system is not well designed, difficult to use or has frequent hangups, then using it will be frustrating. A user is then more likely to have negative attitudes towards the system when using it frequently.

8.3 Overarching themes: Perceptions, Experiences and Resistance

Following the process to analyse and interpret convergent mixed-methods data outlined by Creswell and Plano Clark (2017), the individual findings were compared in a table and subsequently in the form of a mind-map until shared overarching themes emerged. The overarching themes used to discuss the findings from phases one and two of the qualitative study are perceptions, experiences and resistance. Figure 8.2 provides an overview of the themes from phases one and two of the qualitative study discussed in Chapter Nine: Discussion concerning the concepts addressing aim two: To explore secondary care staff's experiences and perceptions of EHR in their everyday lives.

Figure 8.2 Findings Perceptions, experiences and resistance QUAL1 and 2



This comparison of themes from both qualitative studies showed how some of the themes confirmed what came up in other themes. For example, the theme EHR hopes confirmed what had already been discussed previously concerning the theme Trust in the usefulness of EHR implementation. Likewise, bot themes showed how important hope in the potential of new health care technology to improve care outcomes was for users and early adopters of EHR systems.

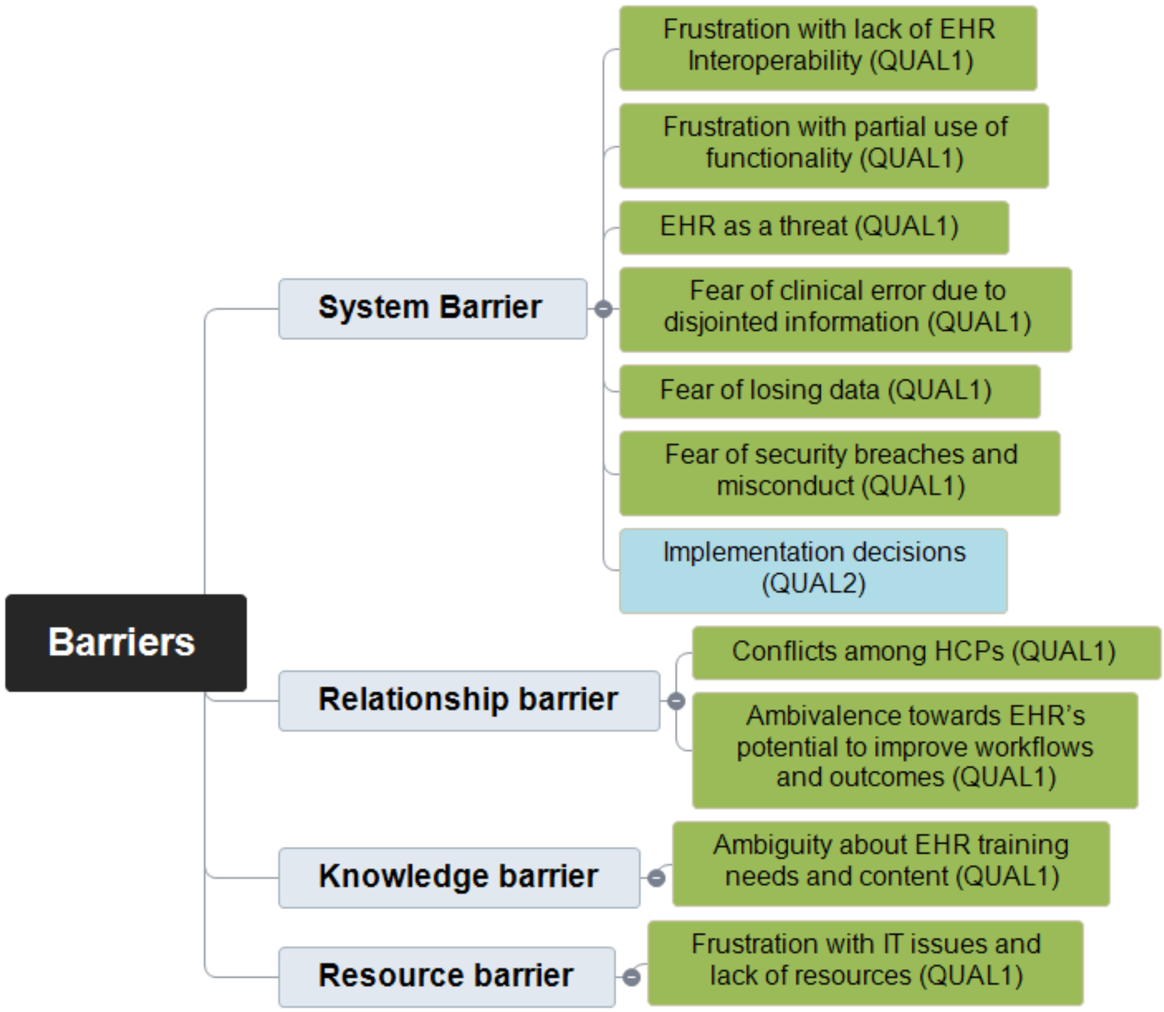
These hopes were confirmed in the themes Pride in how EHR supported staff in error reduction (QUAL1) and Experiences of Implementation (QUAL2), which highlighted the genuine benefit that EHR implementation had brought to the different health care settings.

The theme experiences of the implementation process (QUAL2) was expanded by the theme experience of powerlessness (QUAL1). The leaders sharing their implementation experiences in QUAL2 demonstrated how important their perceived sense of feeling empowered and able to make implementation decisions were for the successful transition in their institution. Furthermore, the theme demonstrated the importance of them feeling supported by the MoH in their implementation efforts. The theme of powerlessness highlighted how at times, what was perceived as challenging and frustrating in using the EHR was the lack of resources and a sense of not being supported enough or EHR not being put on the agenda high enough to receive the support that was needed. Comparing this finding with the implementation experiences of health care leaders showed the importance of all agents in a transition process feeling empowered to support the change in their system.

8.4 Barriers

Figure 8.3 show the themes identified across studies. Those are the themes addressing research aim 3: To understand perceived barriers to the EHR from the perspective of secondary care staff. The findings and results will be discussed further below. Figure 8.3 illustrates the findings across studies that were relevant for the discussion of barriers.

Figure 8.3 Barriers QUAL1 and QUAL2

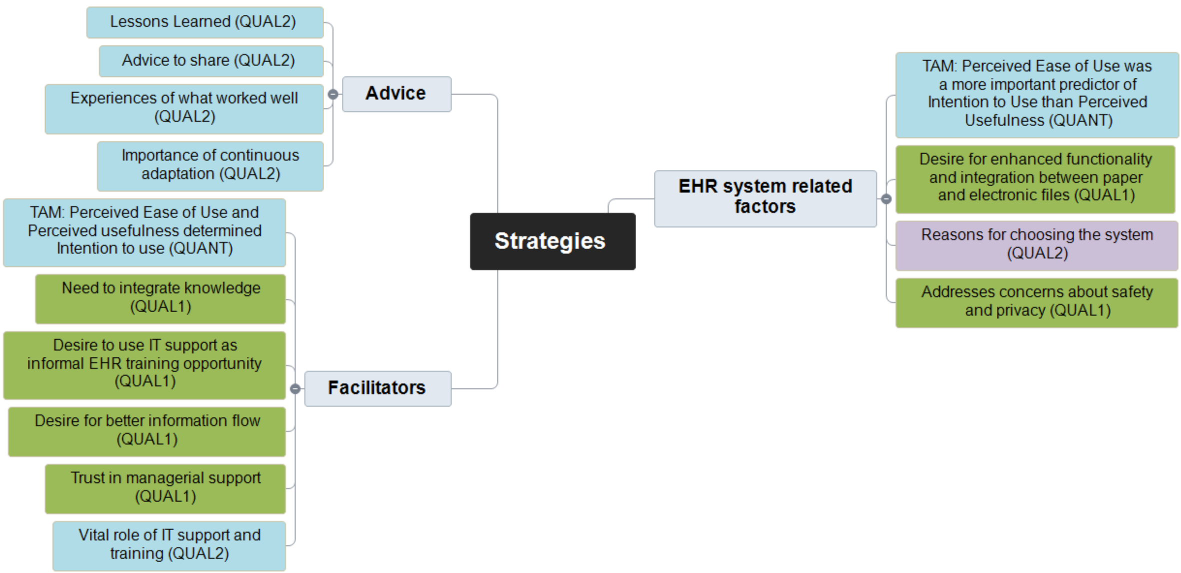


An interpretation of the findings from phases one and two side-by-side indicates that perceptions can play an enormously important role in system implementation. Phase two of the qualitative research demonstrated hope and trust in positive change through EHR that sustained the implementation efforts in each hospital. The more extensive qualitative study findings seem to converge in the same direction, i.e. indicate an importance of the emotional level that influences perceptions towards EHR. The interviewees emphasised the level of trust they had in the usefulness of implementation, despite the challenges they faced in their work during implementation.

8.5 Strategies

This section of the discussion chapter considers the findings from the quantitative and qualitative studies see Figure 8.4. They address aim 4 of the thesis, To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

Figure 8.4 Results and Findings Strategies (QUANT, QUAL1,QUAL2)



When analysing and interpreting all studies, the concepts identified were EHR system-related factors, Facilitators and Advice. Those are being discussed in more detail below.

EHR system-related factors and Facilitators came up as themes across all three studies, the TAM acceptance survey and phases one andtwo of the qualitative study. The different themes were compared. They are an excellent example of how a mixed-methods design can be used for findings and results to confirm each other.

The TAM 2 study demonstrated that *PEOU* was a more important predictor of *Intention to Use* than *Perceived Usefulness*. This result was confirmed by the findings in both phases of the qualitative study. Many of the interviewees from the three different hospitals in phase one of the qualitative study expressed a desire for enhanced functionality and integration of EHR, stating that this would make it much easier to work with the system and integrate it into existing workflows. The leaders who had already adopted EHRs successfully who were interviewed in phase two of the qualitative study confirmed how important user-friendliness and functionality were in their implementation decision.

Whilst perceived ease of use was a more important predictor of intention to use in the TAM 2 study. It was also confirmed that perceived ease of use and intention to use were essential predictors of user attitudes. The findings from both phases of the qualitative study expanded on this result, highlighting the importance of integrating knowledge across divisions and emphasising the vital role of IT support and training in disseminating best practices in using the EHR system.

8.6 Conclusion

This chapter demonstrated how a convergent mixed-methods framework was used to integrate results and findings from the quantitative and qualitative studies utilised in this thesis. It discussed how the identified themes across studies either confirmed, disconfirmed or expanded on the results and findings from the other studies. Chapter Nine: Discussion will discuss those findings and results in light of the research aims of the thesis.

9 Chapter Nine: Discussion

9.1 Introduction

The previous chapter presented the integration of qualitative and quantitative results and findings. This chapter discusses the commonly identified concepts following the research aims of the thesis:

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals
2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in six government hospitals
3. To understand perceived barriers to the EHR from the perspective of secondary care staff
4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

Aim of this chapter is to discuss the findings of the thesis concerning existing knowledge. Furthermore, this chapter illustrates how the thesis contributes to gaps in knowledge. This chapter discusses study limitations, followed by a presentation of the significant findings from both studies, comparing them with the relevant literature and research studies.

Aim one was addressed mainly by the quantitative study. This section draws on some of the qualitative study's findings to discuss contradictions. The second and third aims were addressed in phases one and two of the qualitative study. Both aims were achieved using a qualitative methodology that allowed an in-depth exploration of personal views. Finally, aim four was addressed by drawing on quantitative and qualitative data, comparing, contrasting and expanding the data after reviewing qualitative findings and quantitative results side by side.

9.2 Limitations

9.2.1 A priori limitations

This section discusses the range of limitations present in both studies due to the limitations of the specific study designs and country background.

Accessibility of Background information

It would have been helpful to know more about the current status of EHR implementation in Kuwait's secondary care hospitals. Unfortunately, however, there is a lack of publicly available EHR evaluation data (Alhuwail, 2021). As a result, it is unclear to what extent secondary care hospitals use EHRs.

TAM 2 limitations

This study utilised the TAM 2 questionnaire. Other models are available to discuss technology acceptance, as discussed in

Chapter Three: User Acceptance and Technology Acceptance Model. The survey measuring technology acceptance in six Kuwaiti secondary care hospitals was limited to the items that formed TAM 2. This study focussed on the quantitative measuring of technology acceptance on one model and has not applied other models.

Self-reported technology acceptance

The TAM 2 questionnaire uses self-reported data, which will always be subjective. Whilst this thesis benefited from having a mixed-methods design by minimising some of the issues that would have come up with a qualitative or quantitative only research design, it still relied on both the TAM 2 study and the qualitative interviews on self-reported attitudes and experiences. Furthermore, the study did not include participant observations, which would have provided a more realistic idea of actual EHR usage.

Participant recruitment

It is likely that in both studies, participants who had stronger-positive or negative- opinions on EHR were more likely to participate. However, participation in in-person interviews can be time-consuming and resource-intense for participants, and the study would likely have recruited people who had a vested interest in their opinions about EHR to be heard.

Semi-structured interview limitations

Both phases of the qualitative study utilised semi-structured interviews as a method. However, a limitation of semi-structured interviews is that they restrict the interview to a set of predefined topics and themes. Consequently, it might be possible that other important areas did not come up because they did not form part of the interview schedule.

9.2.2 Limitations emerged during and after data collection

This section discusses the limitations that became apparent during data collection and analysis.

Quantitative study

A limitation of the current TAM 2 survey is that it is unknown which of the six public hospitals the HCPs completing the survey worked. This information was not collected to protect the confidentiality and anonymity of the respondents. However, it would have been possible to collect this information by sending out three different links leading to the same survey items. The link to the survey was sent out via individual hospitals. Having different links would have enabled the researcher to distinguish between different groups of respondents, i.e., analyse whether there are any differences in EHR acceptance between hospitals. Doing this was not considered at the stage of setting up the study because it was not the focus to understand better differences between hospitals but to understand EHR adoption and use across all public hospitals in Kuwait. Nevertheless, it would have been helpful to access data evaluating hospital differences.

Regarding data analysis, several aspects could potentially threaten the trustworthiness of this study and have been discussed at length in Chapter Six: Quantitative Study Results, Limitations. These included the homogeneity of variances for most items, the differences in the sizes of the groups detailed while describing the sample, the unreliability of the scale assessing age, and the lack of independence of demographic variables. Furthermore, another limitation of the study was that it was impossible to identify which surveys were completed as an online version and which were completed as a paper version.

Qualitative study

As described above, there was a lack of information on the actual usage of EHR in the three government secondary care hospitals visited. Furthermore, information on the Health Care Sector, in general, was limited. For example, it was impossible to access publicly available data on the three individual secondary care hospitals evaluating their size, population served, or performance and outcome metrics. This is a limitation of the study because the researcher had to be careful in drawing inferences about differences between different hospital sites without establishing what stage of implementation and use those hospitals were in.

9.3 An evaluation of secondary care staff's acceptance of EHR (Aim 1)

This part of the discussion chapter addresses the first aim of the thesis, to evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals. The first aim was created in response to Kuwait's lack of EHR acceptance studies. Whilst there has been a drive in the country to focus on EHR implementation as an essential aspect of the current health policy agenda, and despite anecdotal evidence that acceptance may be an issue contributing to low uptake and use, to date, there have been no recent studies evaluating EHR acceptance in Kuwait. This section of the chapter discusses EHR attitudes overall as evaluated in the TAM 2 survey, followed by a discussion of influencing factors in perceptions, and external and demographic factors. The quantitative study used a well-established model to measure technology acceptance, the TAM 2 (Venkatesh & Davis, 2000), to evaluate secondary care staff's acceptance of EHR. The quantitative study was conducted as an online survey of 399 Healthcare professionals in six public hospitals in Kuwait.

9.3.1 Attitudes overall

The TAM study found that user attitudes towards the EHR were generally negative. This is an important finding as negative user attitudes towards EHR have been found to act as a barrier to EHR use (Alpert, 2016b; Pfoh et al., 2012; Strudwick & McGillis Hall, 2015). Moreover, in Kuwait's context, negative user attitudes have been named significant barriers to adopting EHR systems (Almutairi et al., 2014; Mogli, 2012). User attitudes acting as a barrier to use have been replicated in more recent studies in the context of GCC (Alkhaledi et al., 2020).

Overall, in the current TAM 2 study, respondents had little intent to use the EHR. They found it useless, irrelevant and hard to explain. Overall, the positive relationships between Perceived Usefulness and Intention to Use, Ease of Use and Intention to Use, and Ease of Use and Perceived Usefulness were all moderately supported at the level of correlations. In light of this thesis, these findings highlight the importance of gaining a more in-depth understanding of user attitudes, particularly perceptions and experiences, because they confirm that an individual's perception of the usefulness or ease of use of a system such as the EHR influences their intention to use the system.

Phase one of the qualitative study showed that the interviewees had positive attitudes towards EHR and trusted its potential. An attitude of overall contentment with EHRs was also confirmed in many other studies in a variety of different country contexts, for example, US (Moody et al., 2004; Yontz et al., 2015), Canada (McGinn et al., 2011), and various European countries (McGinn et al., 2011). Interestingly, this study did not confirm what was flagged in some other studies, namely that nurses feel EHRs decrease job performance since it reduces interpersonal interactions with their patients (McGinn et al., 2011). On the contrary, participants in this study placed some hope in EHR's function to prepare and equip them with a comprehensive vision before interacting with patients and therefore giving them tools to be more able to focus on personal interaction.

Interestingly, when comparing the user attitudes evaluated via TAM 2 with some qualitative themes, it became apparent that many interviewees had more positive user attitudes than the TAM 2 evaluation would indicate. This contradiction might be due to self-selection bias, i.e. the group choosing to participate is different to the group that chooses to opt out (Collier & Mahoney, 1996). It was not necessarily the same group of people completing the online questionnaire that did complete the interviews. There is a likelihood that those members of staff who were more involved in driving and supporting the EHR in their hospital would have been more willing to invest the time and resources to participate in interviews and would hence have been more likely to have more positive attitudes overall. Even if this were the case, it would still be good to gain a better understanding of what made the attitude of this group more positive compared to some of their colleagues, i.e. if these participants had overall more positive experiences with EHR. Another possibility could be that they wanted to save face and be friendly and not too negative during the interviews. However, the qualitative study might have provided interviewees with more time and space to elaborate on their attitudes towards EHR, considering not only an overall evaluation as measured by TAM 2 regarding whether EHR increased their job productivity performance and whether they found it easy to use. The in-depth interviews might have provided participants with more reflective space to remember other instances where EHR had been helpful and possibly lifesaving in their work, which might explain the overall expression of more positive user attitudes in the qualitative study. The qualitative study links the more positive user attitudes amongst interviewees with an emotional experience of trust and pride. Here the qualitative data expands the quantitative findings, elaborating on the relationship between user attitudes and emotions. If participants felt proud of what they could achieve using EHR and trusted that the system would support them in essential aspects of their work, such as error reduction, they expressed more positive attitudes towards EHR. In light of this thesis's overarching aim, this finding might indicate that strategies to enhance the use and update of EHR need to take on board this emotional dimension, for example, by publishing data on HCPs achievements whilst using EHR, for example, error reduction. It would also be an idea to use those HCPs who felt more positive and trusting toward the EHR to allow them to share their pride, for example, by making them staff champions, as suggested by Dastagir et al. (2012).

9.3.2 Role of Perceived Ease of Use and Perceived Usefulness

This study utilised the TAM 2 questionnaire. TAM 2 (Venkatesh & Davis, 2000) is an expanded version of TAM and was chosen as a model for this thesis because it takes into account how social influences impact Perceived Usefulness (PU) and Behavioural Intention to Use (BI). The TAM 2 differs most from the original TAM in recognising how these different variables – subjective norms, image, job relevance, output quality, and result demonstrability – affect perceived usefulness (Holden & Karsh, 2010). In addition, TAM 2 allows testing whether factors such as someone's perceived status within an organisation, i.e. image, influence PU and consequently BI and actual EHR use.

In the present study, the factors that had the most negative effect on Perceived Usefulness and, consequently on EHR attitudes were result demonstrability and job relevance. Job relevance captures technology's relevance to an individual's job (Venkatesh & Davis, 2000). In this study, job relevance captured how relevant EHRs were to the participant's job. Job relevance was found to have the second most substantial adverse effect on Perceived Usefulness *(PU)* in this study, i.e. the less relevant individuals found EHR in their everyday work, the more negatively they evaluated the PU of EHR. Other studies reported similar findings (Archer & Cocosila, 2011). Result demonstrability is an individual's ability to share the results (or benefits) of using the technology with others (Venkatesh & Davis, 2000). The current TAM 2 study found a link between result demonstrability and Perceived Usefulness. This finding is similar to the findings in other research studies (Okediran et al., 2020). Therefore, a lack of job relevance and result demonstrability explained why Perceived Usefulness and, consequently, the Intention to Use was relatively low in this study.

Conversely, the most positive impact on EHR user attitudes was associated with social image, i.e. social image was found to have the most substantial positive impact on *Perceived Usefulness* in this study. Social image refers to a person's perceived status within an organisation (Venkatesh & Davis, 2000). In the qualitative study, social image was not directly evaluated; interviewees were not asked directly about their perceived social status. However, interviewees gave more positive evaluations of PU if they had higher status, i.e. physician, head nurse, supervisor, higher-level administrator associated with their role. To date, only one study (Chismar & Wiley-Patton, 2003) has explored the relationship between Social image in the context of the TAM and EHR. However, that study found that physicians Intention to Use was not related to Social Image and was much better explained by Job Relevance. Therefore, it might be worth exploring this threat to understand better what may make higher-status individuals more likely to have positive attitudes towards PU.

9.3.3 Attitude Group differences

Attitude differences between professional groups

The quantitative study also examined whether demographic, experience and knowledge-related factors influenced user attitudes. Attitudes were more likely to be negative when users were either doctors, Kuwaitis or frequent users. Moreover, doctors seemed to find its use less relevant to the performance of their jobs than those with any other job. The findings of doctors are congruent with the broader research literature. EHR attitude studies have focused more on nurses (Ammenwerth et al., 2003; de Veer & Francke, 2010; Ifinedo, 2017; Strudwick & McGillis Hall, 2015; Tubaishat, 2018). Congruent with the findings in this study, nurses tend to have more positive attitudes towards EHR compared to other user groups (Darr et al., 2003). However, there is a notably smaller body of research literature on doctors' attitudes. Doctors tend to have more negative attitudes toward EHRs than other professions (Darr et al., 2003; Loomis et al., 2002; Ward et al., 2008). Other EHR attitude studies have also found that doctors were the least likely user group to perceive EHR's as having a positive impact on their job performance (Loomis et al., 2002). There is generally limited research on job performance as a factor in EHR attitudes. The studies that have been conducted tend to focus on the links between job performance, job relevance and result demonstrability (Ammenwerth et al., 2003; Archer & Cocosila, 2011; Chismar & Wiley-Patton, 2003; Ketikidis et al., 2012; Sieck et al., 2020) and will be discussed in more detail in the section on individual influencing factor in this chapter.

Attitude differences between Kuwaitis and non-Kuwaitis

No study could explain Kuwait's citizens' more positive attitudes than non-Kuwaitis. However, one study compared user attitudes between native, US American staff and immigrant workers from India. The study concluded that different technological cultures affected behavioural intentions to use the technology (Phichitchaisopa & Naenna, 2013). This might also be one possible explanation for the findings in this study. Another important finding from the TAM 2 study was that those 'Never' using the EHR had significantly more positive attitudes toward the EHR. The impact of use frequency on user attitudes is a largely unstudied area, and there were only a few studies exploring use frequency (Ammenwerth et al., 2003; Ketikidis et al., 2012; Loomis et al., 2002; Ward et al., 2008). This study's findings contradict other research that found non-users generally having more negative attitudes toward EHR (Loomis et al., 2002). It is impossible to determine why the study participants tended to have more negative attitudes if they were frequent users. However, one possible reason found in other studies was that if physicians felt like they were losing autonomy or were too burdened with data entry and administrative duties, their attitudes were likely to be more negative (Darr et al., 2003). Other possible reasons for the more negative attitudes of frequent users demonstrated in previous studies were the EHR being perceived as disrupting patient communication and contact and doctors struggling with a lack of support around technology resources and training (Sieck et al., 2020).

9.3.4 Summary Aim One Discussion

In summary, this study has contributed to the existing body of quantitative studies on EHR adoption. The quantitative research showcases the enormous potential of EHRs. Findings from quantitative studies have led researchers to ask why adoption and actual usage rates are still lower than expected. Models such as the TAM 2 have enabled researchers and health care professionals to understand better how the people in the system influence EHR usage. The TAM 2 (Venkatesh & Davis, 2000) has added a better understanding of how a user's experience or perceived voluntariness can get in the way of a user perceiving the system as beneficial. Quantitative models such as the TAM 2 have helped identify and determine the strength of how individual factors can influence a user's intention to use the EHR (Sadoughi et al., 2019). However, this section has demonstrated that there are local and contextual differences explaining what contributes to the Perceived Usefulness of the system. The TAM models have also been criticised for not picking up on crucial relationships and needing to be adapted for individual contexts (Holden & Karsh, 2010). What seems to get lost when we try to explain and quantify people's complex process interacting with a system is the dimension of meaning-making and how individual experiences are anchored within those models. For example, we know from the TAM 2 research (Venkatesh & Davis, 2000) that image and prestige associated with system use significantly impact (0.21) on *Perceived Usefulness*. However, TAM 2 cannot reveal how HCPs negotiate these issues in everyday interactions.

Furthermore, how different users make meaning of their use of the system, for example, how they might be influenced in their engagement with the system by working alongside a colleague who knows the system well and can advise others on its use. This thesis bridged the field of technology acceptance and informatics-based research while considering what we know about human behaviour and the adoption of new technologies from the field of management and leadership. The following section in this chapter adds a more in-depth exploration of meaning-making and experience of EHR users, addressing the thesis's second aim, to explore secondary care staff's perceptions and experiences of EHR.

9.4 Exploring secondary care staff's experiences and perceptions of EHR (Aim 2)

The second research aim, *exploring secondary Health Care Staffs' experiences with EHR* was addressed by the qualitative study elements of the thesis. The data were collected through semi-structured interviews with thirty healthcare professionals in three public hospitals and three semi-structured interviews with hospital leadership in non-government secondary care sites that had already implemented EHR successfully. Phase one and two of the study were analysed and interpreted separately, and then the results were compared as described in the previous chapter. Phase one of the qualitative study was described and interpreted using hermeneutic analysis, and phase two was analysed using thematic analysis.

9.4.1 Perceptions

Hope and Trust in EHR

The theme *Trust in usefulness of EHR implementation* established that staff were generally trusting in the usefulness of EHR in their work. The Interviewees from phase one of the qualitative study demonstrated this by highlighting how functional EHR was for clinical decisions and improving workflows and, therefore, the general quality of the work they could deliver. Interviewees felt EHR made it easier for physicians to gain a comprehensive and current vision of a patient's health status. Nurses said they felt EHR functionalities such as barcodes made it easier to automate recurring processes and speed up many of the tasks they had to complete daily. The theme, ' *Trust in usefulness of EHR implementation,'* demonstrated that the reason for not using the system as intended and to its full effectiveness was not a lack of practitioner buy-in.

On the contrary, participants had the same positive attitudes towards EHR as had been previously found in other studies (Alqurain et al., 2007; Moody et al., 2004; Yontz et al., 2015; McGinn et al., 2011). Like other studies (Jha et al., 2008; Al Farsi and West, 2006, Jones et al., 2017), participants in this study believed that EHR would save time and improve care outcomes and delivery. In addition, they also believed EHR would aid error reduction, as demonstrated in previous studies (Cheung et al., 2013; Wang & Biedermann, 2012). This is an interesting finding considering that the quantitative study generally found more negative attitudes toward EHR. It is impossible to establish the reason for this difference, but it might be rooted in the effects of the different ways of collecting data. For example, expressing negative attitudes in an anonymous survey might be easier than during an interview.

Regarding the overall study aims, the theme, 'Trust in the usefulness of EHR implementation', points towards the reasons for non-compliance and a lack of uptake, may not be due to a lack of information about the benefits of EHR or a lack of practical demonstrability of these benefits. Practitioners understand and appreciate that EHR can improve their clinical outcomes and processes. This study demonstrated how participants embraced the EHR as a technological aid in better understanding their patients and care needs. This new finding balances out the more established perspective (for example, McGinn et al., 2011) that there is a fear amongst staff that EHR might hinder meaningful contact with patients. This fear has been widely discussed in the literature (Al Farsi and West, 2006, Mogli 2012, for Kuwait).

In phase two of the qualitative study, the participants had a positive perspective on EHR overall. Phase two of the research involved exploring the implementation experiences of three Kuwaiti healthcare leaders. Thematic analysis of the interviews revealed that hope was an essential theme in explaining why they had adopted EHR in their institution and how they had experienced the implementation process. The hospital leaders had hoped for the EHR to address problems they had experienced with frequent loss of files and inaccuracies in data entry due to illegible handwriting. They also hoped for EHR to improve clinical workflows and facilitate a more streamlined and integrated work across individual departments. The interviews demonstrated that it was likely that the enthusiasm and commitment to EHR from hospital leadership had made it possible to endure the more negative and challenging aspects of EHR implementation, such as high implementation costs and high use of resources initially.

EHR perceived to improve care and save time

Error reduction has frequently been named as one of the most significant advantages of EHR implementation (Cheung et al., 2013; T. Wang & Biedermann, 2012), results that are confirmed in this study. The qualitative findings from phase one of the qualitative study suggest a greater trust in EHRs potential to help with error reduction and documentation of clinical interventions and their effectiveness. In addition, in phase one of the qualitative study, interviewees trusted EHR as a time-saving care improvement tool. The HCPs interviewed in phase one of the qualitative study shared many examples of experiencing the EHR as an improvement in their everyday work. However, they felt the most critical change they had observed was how EHR supported error reduction. Before EHR implementation, the loss of paper files had been a common, often daily, occurrence. Interviewees confirmed that with the EHR, it was possible to keep better track of patient and clinical information and counterbalance the likelihood of human error.

Phase two of the qualitative study demonstrated how a belief in EHRs potential to aid error reduction was one of the major driving forces for EHR implementation for all three health care leaders that took part in the interviews. The participants highlighted how EHR was a driving force in minimising file loss associated with using paper records, and not having to deal with illegible handwriting on paper records anymore. Another important factor that in their perception supported error reduction and time-saving was that it was easier to access a more complex set of patient information more instantaneously with the EHR. This increased access to patient records, prescription information and past medical history. All three health care leaders highlighted the vital role EHR had played in allowing better large-scale data collection on public health indicators and their institution's performance.

When the findings from phases one and two of the qualitative study are compared with the findings of the larger body of literature, it would be expected that most participants would think that EHR improves the quality of care and makes patient data handling more efficiently. In Al Farsi and West's (2006) study, for example, it was found that 85% of physicians agreed that EHRs improved the quality of care, 80% found it made data retrieval more accurate and more manageable, and 70% found that access to the EHR system is simple. Furthermore, Abdullah et al. (2016) found that trust in service quality facilitates user satisfaction with EHR. In addition, many practitioners seem to understand and buy into EHRs functionality to save time and improve many aspects of care delivery and outcomes (Abdulla et al., 2016). For example, Jha et al. (2008) found that EHR was believed to reduce the frequency of tests being carried out that was not necessary through making crucial medical information readily available to physicians in advance of the patient appointment (Jha et al., 2008).

More so than other studies, this study highlights how different factors are linked, for example, how real-time data sharing impacts error reduction and how it impacts error reduction through increased data sharing and improved workflows.

Privacy and security concerns

Concerns about privacy and data security were frequently raised in phase one of the qualitative study, often in conjunction with a fear of losing data. There is some controversy in the literature discussion around this point. On the one hand, EHRs provide much functionality associated with a lower risk of data loss, for example, the ability to be backed up remotely and the relatively more minor risk of damage to the actual physical data (Prokosch & Ganslandt, 2009). On the other hand, however, there seems to be an increased risk of temporary data loss through extended system downtime and crashes (Yoon-Flannery et al., 2008). Several other qualitative studies suggest that a fear of losing data is one of the significant barriers to successful EHR implementation (Morton & Wiedenbeck, 2009).

The participants in the study seem to be intuitively aware of one of the potential contradictions between protecting privacy and ensuring good quality of care. Providing good quality of care, particularly in emergencies, often depends on how quickly one can access the patient's data. However, at the same time, it is crucial not to compromise on safety and privacy and to ensure that the patient's data does not land in the wrong hands (Liginlal, Sim, & Khanasa, 2009; Wilson & Khanasa, 2018). Therefore, one of the more significant challenges is ensuring that the information collected and accessed is secure (Khalifa, 2013). Scull et al. (2014) have pointed out that this is particularly important in Kuwait and other Middle Eastern countries because of the high value associated with privacy amongst the general public. Al-Farsi & West's (2006) recommended for a privacy policy to be transparent and enforceable. They also said it was crucial to incorporate those into the EHR and the system's daily practices. The users questioned in the study would agree with this and place high importance on confidentiality and privacy issues.

Compared to other research, what stood out in this sample was how positive the attitudes were regarding security and privacy. Almost all participants agreed that the EHR was a significant improvement compared to the system before and supported them in protecting patient privacy and confidentiality. This finding is in contrast to other research conducted. Electronic health records are often a significant risk for patient privacy violations. For example, Al Farsi and West's (2006) outlined how most physicians in their study feared confidentiality breaches because of EHR. Mogli (2012) has also confirmed that these fears exist in the Kuwaiti context. The author's paper highlighted that privacy and security issues were often not considered enough in advance or not implemented thoroughly during and after EHR implementation.

The most important way of ensuring confidentiality is to control access to the records (Ozair et al., 2015). This access control can be established by assigning clear roles and having an excellent administrative system that authorises certain users with privileges related to their roles. This process ensures that the user will be accountable for their actions. For example, staff should not share their ID with another employee under no circumstances. Furthermore, should there be a security breach, it is of absolute necessity to track back who did the breach, i.e., track the user ID and identify the person associated with it. Ozair et al. (2015) recommend having a designated security officer in place who works on appropriate IT systems with a team of IT experts. Furthermore, a documentation system in place allows tracing back system activity. This documentation system could be established through audit trails, for example.

What might be a possible explanation for the difference in findings in this study? It is important to note that many participants mentioned privacy and security as an area they cared greatly about. However, the significant difference to other studies was that they saw the EHR as an improvement regarding the safety and privacy of data, whereas other studies would see EHRs as coming along with potential safety and privacy threats. One explanation for this difference in experience might be the number of paper records lost in the past. The EHR must have improved, ensuring records would not get lost and that participants generally showed very positive attitudes regarding privacy and security. However, not too long ago, one paper file patient record was only accessible to one person at a time. The implementation of EHR has completely changed the scope of privacy and security issues that had to be dealt with in this setting. Now one record can be accessed by several people simultaneously, and there is also the danger of leaking information to the outside world. This is generally seen as a great advantage of EHR, and staff demanded even better integration of the different systems. In light of these advantages, it is possible that it seemed difficult to reflect on potential safety and privacy threats that still exist in the new system.

The most significant difference to other studies was found when looking at how participants defined data security and privacy issues. Risks such as privacy and security breaches always come along with EHR use**.** Interviewees acknowledged that EHR came with risks to patient privacy, but they perceived it as a significant improvement compared to handling the risk of keeping, losing, and duplicating paper files. This issue is systemically linked to issues of interoperability. Not transferring patient files electronically might mean an increased reach of security and privacy breaches and medical errors, as Davis & Khansa (2016) pointed out. Menachemi et al. (2007) found that interface design can have a crucial impact on the quality of care. A well-thought-through and systemically integrated user interface can be crucial for successful implementation. Their study pointed out that if a user interface is designed poorly and interoperability is jeopardised, there can be a lack of patient safety, efficiency and poor quality of care. According to their study, poor interoperability can, in the worst-case scenarios, even lead to the abandonment of the whole EHR system. Mogli (2012) adds to this discussion that there is much evaluation of newly implemented EHR systems from the end-user perspective and, therefore, a lack of opportunity to detect poorly designed user interfaces early in the process when it is not too late. The author emphasises that interoperability is concerned with the more technical aspects such as interface design and needs to consider the everyday workflows and practices and how users interact with the system.

Knowledge, communication and training concerns

Drilling deeper to explore phase one interviewee's thoughts about EHR's potential to improve workflows and outcomes revealed that most participants cherished EHR functions when they improved workflows they were already familiar with. However, they felt more ambivalent about new functions and additions to EHR. Hesitation and resistance regarding new functionalities and new technology have been a concern in the research literature and are very common in health care contexts (Holden & Karsh, 2010). If HIT integrates well with existing workflows, it is more likely to adapt. Conversely, if it does not integrate well with existing workflows and organisational processes, it is more likely to get rejected by the end-users (Holden & Karsh, 2010). Other research (McAlearney et al. 2012) suggests that resistance to EHR adoption can partly be caused by a lack of knowledge of how to use the full functionality of the system so to make the use meaningful. This lack of knowledge means that the staff do not understand specific features of EHR systems. Consequently, they will be unable to integrate their work practices with technology.

Interviewees often felt unprepared for change due to a lack of training or perceived the training provided as inadequate. However, it became clear from the interviews with participants that this formal learning does not stop there but needs to constantly adapt to the changing context. This need for adaptation is congruent with organisational learning and technology learning theories. For example, Robey et al. (2000) studied IT implementation and the impact of situated cognition. The study was conducted almost twenty years ago but is still relevant regarding the links it draws between implementation processes and theories of learning. The study concluded that organisational learning cannot be limited to formal, classroom-based learning but needs to incorporate activities situated in the workplace context. This is what they called situated cognition and what might explain the demand raised by participants to have more informal and flexible ways to teach each other about changes to the system. So often, when formal training is either too formulaic or delivered too early in the implementation process, staff fail to learn through those more formalised ways and then have to draw on the knowledge of their peers. This can lead to inefficient operating habits and has also been found to make staff heavily reliant on support from other departments, particularly the IT department (Stroup et al., 2017).

Not feeling confident in using the EHR is one explanation why staff interviewed in this study had to use the IT department frequently to help them make the system more user-friendly, integrated, and easier to use. In addition, the strong desire to use IT support becomes more apparent in the research literature presented above.

What is striking here and has not been discussed adequately in literature is the function that learning and communication seem to be playing together. The literature discusses learning concerning EHR, mainly in the context of newly implemented systems and how to transition staff from paper-based records to the new EHR system.

9.4.2 Experiences

Whilst participants of phase one of the qualitative study had great trust in EHR in general, their experiences using EHR in their work were more ambiguous. Many participants were unsure whether the way they were currently using EHR in their work benefited them and their work. Similar findings have been produced in the larger body of literature. Acceptance and adoption often depend on the end-users and whether they can benefit from using the system (Abdullah & Ward, 2016).

Use of Paper Files and EHR simultaneously

Interviewees often mentioned how the introduction of EHRs had led to parallel use of paper files and EHR in their workplace. However, they did not feel they were at a point where they did not need to rely longer on paper files. Using two systems, EHR and paper files simultaneously was deemed necessary due to a lack of resources. Reliable internet, connection, computer access, and frequent system downtime were named the reasons why HCPs still use paper files as a backup daily. Another reason for the parallel use of EHRs and paper files was the system functionality of the EHR. It would not always allow all the needed data to be stored in the EHR to treat the patients.

There is not much research describing the transition between paper-based and EHRs. This lack of research is interesting, considering that an EHR is such a complex system that one would expect an intermediary phase where some processes would utilise the EHR whilst others would still be paper-based. However, there is one study that adds a quantitative perspective. Al Farsi and West (2006) asked physicians in Oman about their perceptions of EHR. As a result, three-quarters of the participants felt that EHRs were underutilised and that the simultaneous use of paper files for some processes would decrease overall productivity. The results from this study confirm issues encountered when EHR and paper files are being used simultaneously. Furthermore, this study adds depth and perspective, outlining the strong desire a variety of staff expressed to streamline the process.

Indeed, the literature agrees widely that EHRs have the potential to eliminate the issues encountered with paper-based files, for example, the lack of storage options, difficulties managing data, lost and misfiled charts, not being entered in the wrong order, and pages that fell out of one record just to be lost (Al Farsi & West, 2006). For example, Al Farsi and West (2006) raise issues around the storage of files, lost and misfiled charts, pages falling out of the patient's folder, and notes being entered incorrectly. These issues are frequently mentioned as facilitators to EHR adoption in comprehensive literature reviews, such as Kruse et al. (2016). EHRs are also known to improve care coordination, as confirmed by Jones et al. (2014).

Other findings in the literature might explain participants' distrust of other EHR components. For example, Barsley et al. (2017) found that some processes, particularly administrative processes, became more complex and involved more steps in accomplishing completion after introducing EHRs.

System design and interoperability

Furthermore, phase one of the qualitative study demonstrated how interviewees were concerned about the limited use of EHR functionality. Some participants in phase one had previously been using more fully-integrated EHRs, for example, in private hospitals. However, they expressed frustration with the only partial use of EHR in government secondary care. Furthermore, the frustration experienced by healthcare professionals seems to be enhanced through the non-standardised nature of EHR applications. Two studies identified issues around the no-standardised nature of EHRs (Ajami et al. 2013, Stablein et al. (2012). The issues the authors identified included programming errors, lack of interoperability, technical issues, such as computer crashes, concerns about privacy and confidentiality, a lack of health information data standards, retrieving invalid information from the system to many vendors to choose from, the unpredictability whether a vendor will stay in business and will offer follow-up support amongst many others. Previous research in Kuwait (Almutairi, 2011) has found that there were often failures in application design and IT professionals not fully understanding the process and requirements in the healthcare sector. These failures to understand are believed to cause the gap between what the system would need to deliver and what it delivers. This can understandably lead to frustration. However, this has been discussed in the literature as an annoyance or issue from the managerial point of view. In addition, this has been discussed as an issue that makes it hard to decide what system to choose. However, this study highlights the frustration with the lack of standardisation on the ground level. Furthermore, it shows how it impacts the everyday use of the system by HCPs such as doctors, nurses and administrators. Therefore, the study makes it more apparent how a lack of standardisation might negatively impact the adoption of EHR systems.

Participants in all three hospitals expressed frustration with the disjointed use of the system in different departments inside the hospital. Generally, they had negative experiences regarding system interoperability. They thought that the disjointed information caused by accessing different systems made clinical error more likely. Moreover, the literature confirms a link between the interoperability of systems and the quality of care, for example, Menachemi et al. (2007). His findings are interesting, as the consensus in the literature is that EHR can significantly contribute to error reduction and overall better quality of care (Kruse et al., 2016; Menachemi & Collum, 2011). However, the results from the study here agree with the broader literature that interoperability can be a significant barrier to entirely making use of those advantages and, on the contrary, can even lead to more potentially fatal errors (Dzau et al., 2017).

What stood out in the interviews was that interoperability can be seen as more than a technological issue and needs to consider the complexity of systems and humans interacting with those systems. The literature confirms that it is essential to look beyond technical interoperability. Benson and Grieve (2016) concluded that technological interoperability is just as important as the dimensions of data, human interaction, and institutional context. Their analysis shows that EHRs often consist of layers of clinical information and information stored for financial, bureaucratic, legal or research purposes. Those additional layers of information might sometimes conflict with clinical information and make achieving interoperability harder.

Many interviewees experienced interoperability issues that made their work more complex and privacy issues more likely to occur. They acknowledged that it was challenging to integrate the EHR into their workflows when it was in a transition, for example, when some aspects of their work were documented in the EHR whilst they still needed to keep handwritten notes for another aspect of the same process. This was due to EHRs being only partially installed in their workplace and not offering full functionality to allow every step of a process to be carried out using the EHR.

Design flaws and a lack of interoperability were named barriers to EHR use in phase one of the qualitative study. A large body of discussion dealing with interoperability in the literature shows the complexity and variety of factors that need to be considered. Of course, the common goal would be to increase interoperability to enhance efficiency further and streamline workflows. However, interoperability is often not ensured in practice because of the evolutionary nature of how IT systems were built for purpose (Ludwig & Doucette, 2009).

Overall, This theme has added more depth to exploring how participants were making meaning around interoperability issues, particularly around ensuring interoperability between individual computers and ensuring interoperability hospital- and eventually nationwide. This has been found a challenge (Benson and Gieve 2016) that has been even further complicated by a lack of standards in the sector (Almutairi 2011).

The hospital directors interviewed for phase two of the qualitative study shared their experiences with EHR implementation in their institution. Their experiences expanded the findings from phase one, as they explained how one of their most critical implementation decisions had been implementing EHR sequentially or as a fully integrated system. One hospital had opted for an off-the-shelf solution adopting an already existing EHR system from elsewhere. The other two hospitals had decided to opt for a basic system initially. Their intention of adopting only basic functionality initially was to allow the system to grow according to needs and input from its users. Both phases of the qualitative study highlight a need to involve users at every decision-making stage for implementation. The decision on how to implement a system is complex, and the more stakeholders are involved in the initial gathering of data helping to understand the possible impact of implementation decisions, the smoother the implementation will work. Both datasets also show that even with good planning and preparation, implementing and adding an EHR is highly complex, and it is impossible to predict how the EHR will affect all other parts of the organisation. Therefore, it is crucial to build in continuous reflection and improve and adapt the system to local needs. However, participants from both studies experienced a lack of integration between the national health strategy to implement EHR and the existing resources and support available for implementation at the local level. Notably, the lack of uniform standards seems to have slowed implementation efforts on the local level, leaving some hospitals in a state of partial implementation and functionality. Interviewees described how they had become aware of this contradiction between political will and the actual provision of resources and support on the level of their institution. This contradiction created a sense of powerlessness expressed in a feeling of ambivalence and resistance.

9.4.3 Resistance

Interestingly, during the analysis, one of the reasons for staff resistance might lie in staff being afraid that EHR might prevent them from completing their work to a high standard. This perception is shown in fear of EHR potentially leading to security and privacy breaches and clinical error. In conjunction with a perceived growing dependency on EHR, this fear can explain some of the resistance conveyed in the interviews, particularly in the theme Fear leads to resistance.

Resistance to being monitored

Furthermore, this theme discussed how issues around power and lack of control showed how EHR might give more managerial power to observe individual employees' performance. This power was also perceived as a threat. This study also elaborates on using EHR as a performance monitoring tool. The literature highlights the benefits of this approach's quality evaluation and control (Almutairi, 2011). However, the study participants were concerned about the potential element of power and control when thinking about their traceable and evaluateable actions on EHR. Whilst outwardly expressing the wish for a robust EHR monitoring system, the interviews revealed more resistance and ambivalence when exploring this issue more deeply.

With regards to the literature, this theme again draws on issues around interoperability, more specifically on the issue of how difficult it is to put a system of full-scale, i.e., not only to ensure interoperability between individual computers but to look at EHR interoperability, hospital- and eventually nationwide (Benson and Gieve 2016). What seems to show slowly is the importance of uniform standards for EHR implementation (Almutairi 2011). Several studies address the advantages of EHR for monitoring and evaluation purposes, such as monitoring prescriptions and examination and eventually determining whether those are necessary (Almutairi, 2011). Hence, there is an element of control in the monitoring function. The participants in this study perceive the control function expanded to how management can sense the work. This discussion is closely linked with whether users will reject a system because they believe it will increase their work demands.

Resistance grounded in fear and powerlessness

However, many of them also expressed that they felt powerless in the process of trying to facilitate improvement and better understanding, as demonstrated in the theme 'experience of powerlessness'. Other research has found that HC technology needs to adapt and integrate well with existing workflows to increase adaptation buy-in (Holden & Karsh, 2010). The experience of powerlessness seemed to be exacerbated by conflicts among HCPs where a lack of cooperation and communication led to increased workload for some staff groups, for example, when physicians did not enter data at the expense of other staff members who had to find time in their busy schedules to complete this additional task. The interviews made it clear that some of the hesitations toward new functionalities of the EHR system could be explained by HCPs fearing a lack of support in the transition phase and feeling like they could not absorb additional tasks in their workday without the provision of additional resources. In addition, HCPs highlighted the need for monitoring and evaluation to support management in better monitoring the use of EHR.

9.5 Understanding perceived barriers to the EHR

This section of the discussion chapter addresses the third aim of the thesis, To understand perceived barriers to the EHR from the perspective of secondary care staff. It draws on the data collected by interviewing thirty HCPs about their perceptions and experiences of using EHR.

9.5.1 System barriers

The links between interoperability issues and concerns about the quality of care were found, mirrored by other research studies (Dzau et al., 2017; Menachemi et al., 2007). Interviewees were concerned about the number of steps needed to enter data into multiple databases. They found this time-consuming and increased the likelihood of medical error. Interviewees were well aware of the complexity of ensuring the system was as secure as possible whilst trying to facilitate data integration. In practice, this led to some processes experienced as tedious and time-consuming, for example, having to email patient data files across departments due to the systems not being connected across departments despite being the same EHR system. Interoperability issues had been identified as one of the most significant technical barriers to EHR use and adoption in the scoping review (Abramson et al., 2014; Ajami & Arab-Chadegani, 2013; Boonstra & Broekhuis, 2010a; McGinn et al., 2012; Wilson & Khansa, 2018). This is a significant barrier as it is present from the design stage and challenging to resolve locally.

Interviewees demonstrated the complexity of barriers they face regarding security, privacy and interoperability. For example, interviewees were concerned about the protection of patient data. Whilst they found some functionalities of the EHR useful in accomplishing privacy protection, other aspects left them concerned about how easy it would be to tamper with data maliciously. For example, interviewees reported it was common practice for multiple staff members to share the same ID code to log into the system. This meant that whilst the EHR was designed to increase privacy protection, in practice, sharing IDs would make it impossible to find out which staff member had tampered with data. In phase one of the research, concerns about privacy and security were not directly linked to a perception of the EHR being unsafe but were raised more concerning unsafe working practices and a lack of monitoring and management of these issues. This theme also highlighted the common connection between security and interoperability issues (Mogli, 2012, Menachemi et al., 2007; Davis & Khansa, 2016).

Another crucial technological barrier raised in the interviews with HCPs was that of partial use of the functionality. Interviewees expressed frustration with only being able to partially use the system, mainly when they had previously worked in other departments where the EHR was utilised more fully. Here it was helpful to compare the data to what had been revealed in the interviews with hospital leadership. They explained that one of the most challenging decisions was to decide whether to buy an off-the-shelf solution or start implementing EHR gradually. A gradual implementation of functionality hoped that the EHR would be more able to adapt to local needs. However, the interviews with HCPs using the system show that this partial functionality can also lead to significant frustration when using the system.

The theme 'Need to integrate knowledge' shows that a lack of integration concerning practices involving paper files and electronic files can be a barrier to increasing EHR uptake. It has also shown links between inadequacies in learning delivery and how practitioners can use the EHR. The 'Need to integrate knowledge' explored in-depth aspects of the transition from paper-based to electronic records. To date, there has been no study that can provide the depth of exploration of the process of how paper and electronic records are being used alongside each other, although the use of paper files was mentioned in other studies as an issue that can contribute to the underutilisation of EHR (Al Farsi and West, 2006). Furthermore, it is mainly unknown the reasons for these usage patterns. Participants expressed a desire to streamline the process but were aware of many barriers that prevented them from doing so. The theme '*EHR as a threat'* highlighted some potential barriers to participants perceiving EHR as a potential threat to completing work to a good standard. Interviewees perceived the EHR as a threat to their ability to work safely when a lack of integration meant that patient data were shared in a disjointed way. Interviewees described how they invented and used multiple workarounds to ensure that all the information they needed to do their work was available. They expressed how this way of working was time-consuming and made them anxious about whether they had all the needed information, mainly when working under pressure. The need for multiple workarounds also resulted in fear of losing data. Interviewees expressed that their reluctance to get rid of paper files was rooted in a deep-seated fear of losing vital patient information if they did.

9.5.2 Knowledge barriers

Upon initial reading of the transcripts, every one of the thirty phase one participants expressed that the EHR was a valuable tool in improving their work. However, several areas of ambivalence also need to be addressed. Some significant areas of disagreement and confusion were extracted in the third theme. Many of them seemed to be about training. The ambiguity encompassed several aspects of training, for example, the delivery of training, the content and frequency. Participants disagreed on IT literacy and other knowledge needed to use the EHR effectively. Their perceptions and IT literacy seemed to influence their responses. This finding is important because it is suggested by Alqurain et al. (2007) that attitudes towards EHR vary not only by demographic such as nationality, gender or educational level but are also influenced by IT literacy and prior experience using computers. The study found a significantly higher likelihood of having positive attitudes towards EHR amongst those with more experience using computers and higher levels of IT literacy. This finding suggests those factors are influential in predicting EHR user attitudes.

They also disagreed about how training should be delivered and whether it should use more formalised or informal channels. The theme of 'Ambiguity' highlighted how even within a relatively small sample size, there were significant disagreements regarding the knowledge and training needed to use EHR effectively and to what extent staff felt they could put hope into improving their processes through EHR. Attitudes towards IT literacy can vary by demographic (Alqurain et al., 2007). This study had not focused on finding quantitative links between IT needs and literacy and demographic markers but has demonstrated in a qualitative way that Alqurain's (2007) findings are valid. Furthermore, this study has added depth to an understanding of various and differing ways participants ascribed meaning to IT literacy and what was expected of them as fundamental knowledge. Participants' opinions often corresponded with how they saw themselves and judged their IT literacy.

9.5.3 Resource barriers

The HCPs gave many examples of barriers in the form of a lack of resources, particularly regarding IT infrastructure. Those barriers range from a lack of internet connection, slow access to the system or the system crashing. Some of these issues frequently occur when many HCPs use the same EHR simultaneously. System breakdown was experienced as frustrating because it caused disruptions to work at the moment it happened, but it also meant that HCPs could not rely on the accuracy of the data in the EHR. Data loss due to system crashes was a frequent occurrence that was impossible to trace and remedy. In addition to HCPs' concerns about the lack of stability to the IT system, they also raised concerns about the IT hardware infrastructure. They mention, for example, that there were not enough computers available for all staff to use the EHR, which negatively impacted workflows.

Furthermore, they perceived the computers provided as not up to standard. Many computers were too old and too heavy, i.e. not mobile enough. Mogli (2012) has discussed challenges concerning resources confirmed in this study. This study highlighted and explored how the lack of resources prevented a meaningful use of EHR. For example, Mogli (2012) identified several technological challenges: limited server capacity, a lack of high-speed Internet, a lack of resources to ensure IT support and technical maintenance, and a lack of a backup strategy in the case of system failure. Khalifa (2013) also identified a lack of technological know-how and support and a shortage of financial resources as a significant barriers to meaningful EHR use. The literature also sheds light with regards to what makes errors more likely. For example, Benson (2007) listed various factors related to the complexity of options entered and the time it took to retrieve the information. Those were, for example, the probability of misunderstanding any part of the specification, the length of specification, the number of options permitted, and the number of times different implementations need to be made.

Participants were keen to ensure better interdepartmental communication, and they felt EHR was an underutilised tool to accomplish that. The research literature points out that one of the significant perceived advantages of EHR implementation is the hope amongst staff, for example, physicians (Al Farsi and West, 2006), that this will improve interdepartmental communication. However, Al Farsi and West (2006) also discussed that for this feature to function, it needs to be integrated with sufficient speed of connection which is not always the case, and systems are too slow. Why does a lack of resources seem to be such a common post-implementation? Baron et al. (2005) suggest that more financial support is often available for the initial EHR implementation and is not matched by a sufficient budget for maintenance, training and continuous improvement.

9.5.4 Relationship barriers

One point that is new in this study is what seems to be a lack of trust and coordination between different staff groups. Conflicts between staff groups seemed to centre around the responsibility for data entry. Data entry is a time-consuming task, and it seemed one staff group was blaming the other for not fulfilling their obligation with regard to using the EHR appropriately. The interviews with HCPs highlighted that there were maybe not enough additional resources to integrate the additional workload through EHR into the already existing daily tasks. Consequently, HCP felt pressed for time and found it challenging to make time in their day to complete their EHR data entry. This time pressure led to more conflicts among staff members. Mogli (2012) raised this issue of concern that can be highly influential for successful EHR implementation. The author found that a general lack of coordination between different staff groups can lead to implementation resistance. These team-related factors range from how coordination between IT and administrative staff is organised to how users are given opportunities to contribute to redesigning the workflow in light of technological changes. The interviews revealed conflicts between different staff groups around the use of EHRs. Several studies mirror the findings in this study, saying that some staff groups were easier to engage in EHR practices than others. Physicians, in particular, seem to be the most challenging group to engage (Ajami & Bagheri-Tadi, 2013; Pfoh et al., 2012). Ajami and Bagheri-Tadi's (2013) meta-review of more than 100 articles found the following results. Physicians experience these barriers to EHR use a lack of time, absence of computer skills, high cost, loss of autonomy, workflow, disruptions, loss of productivity, lack of access to computers, higher flexibility of paper records, lack of interoperability, lack of confidence in security and confidentiality, extra time needed to spend on data entry and a lack of time to acquire knowledge about the system. Their conclusion regarding why physicians might find it more challenging to adopt an EHR was that physicians find it harder to invest the initial time and resources needed to learn a system. They felt they could not attend training and find the time to learn the system appropriately. This lack of time would explain some of the differences found in this study.

The analysis of the thirty semi-structured interviews showed that many participants were deeply engaged with the process of wanting optimal use of the EHR and improving its functionality when necessary. Findings and the broader literature body confirm that not asking stakeholders enough is common practice while emphasising the importance of including a broad sense of a stakeholder in the consultancy phase. The stakeholders should include, for example, support staff such as nurses, administrators, IT support and data management support. Those groups can contribute their knowledge about operational and technical aspects of the process (Miller et al., 2003). This informal support and training provided by IT professionals is often an aspect that is not considered sufficiently when implementation programs are being rolled out (Scott et al. 2005, Protti et al. 2007). The studies have found that a systemic approach involving multiple stakeholder groups, i.e. the whole healthcare team, in developing and implementing EHR systems can lead to better implementation outcomes.

9.6 Devising potential strategies to enhance user acceptance of electronic health records

This section addresses research aim four, To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait. This section of the discussion chapter considers the findings from the quantitative and qualitative studies.

9.6.1 EHR system-related factors

The TAM 2 study demonstrated that PEU was a more important predictor of Intention to use than PU. Hence it is vital to consider the factors that were perceived as supporting perceived ease of use for the participants. If a system adapts quickly and fits the task, it will be perceived as more relevant for the job and increase Perceived Usefulness. Even more importantly, if the EHR system is well adapted to local needs, this will also positively impact the perceived Ease of Use. The qualitative interviews with thirty HCPs revealed that handling the challenges coming with periods of transition well seems to play an essential role in increasing EHR acceptance. Notably, the transition from paper-based to electronic records was experienced as challenging by many participants. This area might need further research; however, the current findings demonstrate that a long period of parallel use of paper and electronic records puts additional strain on healthcare staff. Therefore, moving from one system to another might be beneficial as quickly as possible. Transitioning swiftly would be supported by creating EHR systems adaptable to local needs. Phase two of the qualitative research demonstrated how health care leaders' intentions to identify a system adaptable to local needs meant that they would often start with an EHR system with limited functionality, which brought along its issues. However, it is known from the literature that creating adaptive systems and ensuring interoperability can be a challenging endeavour (Menachemi & Collum, 2011) and that there is currently a lack of standards (Dzau et al., 2017) and regulatory bodies enforcing system standards (Benson & Grieve, 2016). Therefore, this thesis highlights the need for interoperability standards to ensure smoother transitions for healthcare staff.

Furthermore, this study links interoperability questions and the need to involve stakeholders from different groups in application design. Previous research has demonstrated that poor application design is often a significant barrier to successful EHR implementation. The HCPs in this study demonstrated how they would have been able to add valuable contributions to the application design but were not consulted on a larger scale. However, participants knew that engaging all staff groups in such a consultation process might have been challenging. For example, several studies have shown that physicians are difficult to engage (Ajami & Bagheri-Tadi, 2013; Pfoh et al., 2012).

The findings from this thesis highlight that several facilitating factors need to be present to ensure better transitions into the use of the new system. Those will be discussed in more detail in the following sections.

9.6.2 Facilitators

The TAM 2 study confirmed that PEU and PU positively impact behavioural intention to use the system. This section discusses the facilitators perceived to make the system more useable, more enjoyable, and more robust overall. The findings of this thesis have demonstrated that transition periods in particular and the general maintenance of an EHR system needs to be equipped with sufficient resources. The qualitative study showed how a lack of resources, for example, hardware, software, and Internet connectivity, could have a very disruptive effect and how easy it was to operate the system. This disruption was frustrating and would also negatively impact patient contact and communication. Therefore, one important strategy is to design and maintain the EHR to minimise patient contact and communication disruptions. This could be, for example, in the form of additional resources for data entry and administrative tasks. In addition, software updates and maintenance issues were experienced as disruptive by many of the participants across occupations. Therefore, another critical strategy is to find solutions to increase EHR acceptance is to provide sufficient support for software updates and maintenance.

The training was probably where participants' opinions and experiences differed the most. Many found the existing training sufficient and felt able to ask for support if they needed additional help. However, others found that the training provided was insufficient for their needs because it was too general and not tailored to how they would use the system. Some of these differences could be explained by different degrees in IT literacy. However, the data revealed that other factors, such as different individual learning needs and styles, and different cultural approaches to learning, might be essential to consider. The findings from phase one of the qualitative study indicated a desire to formalise training, peer learning and shadowing colleagues perceived as valuable. As explained by one of the participants, initial EHR training programmes are often delivered with a more technical focus on functionality but not customised to the Learner's area of clinical expertise or IT literacy (Stroup et al., 2017).

Consequently, the learning outcomes then vary greatly and can lead to limited efficiency. There has not been a consensus in the research literature as to what format of training delivered at what time is the most efficient (Pantaleoni et al., 2015; Dastagir et al., 2012; Jeyakumar et al., 2021). Research in this area is not very far advanced, yet there is limited availability of studies, and the studies that were conducted often rely on participants' self-rating and therefore lack objective measurements. The outcome of any intervention might well depend on the specific context and setting, and there might not be a one-fits-all solution. The research literature did confirm that training can have a significant impact on the success or failure of EHR implementation (Vuk et al., 2015; Dastagir et al., 2012; Boonstra & Broekhuis, 2010a)

Some research suggests a need for hands-on practice with a foundation in cognitive theories and adult learning principles to enhance learning outcomes through training (Atwater et al., 2016; Reed et al., 2014; McAlearney et al., 2012). The peer-to-peer learning described in the findings of this study is not uncommon (Atwater et al., 2016) but comes with a significant set of disadvantages. Individual learners adopt the habits and workarounds of their colleagues, which at times can result in ineffectiveness, frustration and the need for significant ongoing support from IT professionals.

As previously mentioned, training effectiveness and efficacy research findings are very limited. The ambiguity amongst participants regarding the kind of training they would like to receive might reflect that. Individual preferences might vary considerably. One finding that was also found in the larger body of literature was a general reluctance to engage in formal training. Mogli (2012) found that many senior members of staff feared wasting time they could spend doing clinical work if they had to go through formalised EHR training. The older the staff members were, the more reluctant they were to engage in formal training.

A body of literature considers those mixed findings around formalised versus informal learning opportunities. For example, there might be an argument to acknowledge and support peer learning, such as having a champion and peer support system (Whiteside 2015). Whiteside found that the students felt more connected with their peers. They were more likely to connect with the courses as a whole, i.e. a strong peer engagement would facilitate better EHR-related learning. This depended, however, on the instructor's involvement, more specifically, to what extent the instructor was able to facilitate the sense of community cohesion, for example, by encouraging students to engage in critical dialogue inside and outside the classroom.

Giving the peer learning that is taking place informally a more prominent status might help acknowledge the importance of prior knowledge and experience that staff members brought from other institutions. Whiteside (2015) points out that acknowledging prior knowledge and experience and understanding the impact on the learning experience is crucial. However, Whiteside's (2015) study on the influence of social connectedness was conducted with youth and in the context of the USA. Therefore, her model of social presence or connectedness of learners might be an exciting way of looking at the learning experience in the context of Kuwait, taking into account cultural and organisational differences between different learning contexts and to what extent social presence and connectedness might facilitate a better learning experience for the participants of this study.

In order to find solutions to increase EHR acceptance, it is therefore recommended to put more emphasis on designing flexible and tailored training to users' needs. Ideally, there should be a mix of formal training and informal learning opportunities. The formal training should be designed and delivered so that staff can access it when needed. It is also essential to update the training when system updates are planned. Many staff mentioned how they benefited from informal learning opportunities with either IT staff or colleagues. Those informal learning opportunities seemed to work well because the learning would often go along with real-world problem-solving in the moment. This is an essential takeaway from this study that might support future EHR implementation plans in planning for formal learning opportunities and providing resources for the more informal and ongoing learning between colleagues.

Many of the accounts showed how difficult it seems to find an appropriate approach to integrating knowledge. There was much ambiguity regarding how training should be delivered, by whom, in what format, frequency, and focus. Literature and research studies that try to establish how different learning theories might be used to better understand new IT systems and how this knowledge might enhance knowledge shows that there are still significant debates regarding how effective learning can be facilitated. One contribution of this study might be an in-depth perspective on what seems to be the most common practice, namely, peer-to-peer learning and a closer look at participants' experiences with this. Situational learning might be excellent theoretical learning (Robey et al., 2000). Champion and peer support systems have also been proven to be efficient ways to facilitate peer learning (Whiteside 2015). However, if this is not formally recognised and supported, not all practitioners benefit similarly from informal learning, for example, because they do not share the same access to social learning opportunities and professional networks.

The study also shed light on how a lack of more formalised learning opportunities might lead to relying more extensively on informal learning (as demonstrated by Stroup et al. 2017), for example, utilising IT support as an informal training opportunity. The second theme further addressed this belief in EHR as a crucial tool in saving time and highlighted that staff wanted more, for example, more integrated knowledge and using the EHR to foster collaboration between different departments. In addition, this theme highlighted the importance of informal knowledge sharing and creating networks to support staff using the EHR. Finally, the third theme, '*Ambiguity'*, showed how a potential facilitator to better EHR user compliance might provide various training opportunities tailored to an individual's needs and prior knowledge rather than creating a one-fits-all solution.

9.6.3 Advice

This section discusses the findings from phase two of the qualitative study regarding lessons learned from previous implementation projects and advice the interviewees found worth sharing. They emphasised the importance of permitting the system not to be perfect from the beginning. Moreover, they said that continuous adaptation of the EHR system would need to happen and that it was best to choose an EHR system provider that allowed for the system to change, grow and expand with changing needs of the secondary care provider. The importance of user feedback in this process was emphasised. They felt that involving all stakeholders from the beginning ensured that resistance to the system was minimised. Furthermore that the system was developed with many different users in mind from the get-go. Finally, the Ministry of Health's role in monitoring system use and adaptation was emphasised as crucial in ensuring that individual HCPs adhered to standards and that the whole hospital administration was on track with their implementation efforts.

9.7 Summary

This chapter has discussed the most relevant findings in light of the research's aim *to devise and evaluate potential strategies to increase EHR uptake in Kuwait*. It has discussed how the research finding addressed the four research aims. Aim one was addressed by the TAM 2 study and discussed overall negative user attitudes and how those might be explained. It also discussed influencing factors such as perceived ease of use and perceived usefulness. The TAM 2 study also revealed other influencing factors on attitudes, for example, demographic factors.

Aim 2 explored secondary care staff's experiences and perceptions of using EHR. It discussed the trust in EHR’s usefulness and perceptions around EHR’s potential to save time and improve care. Furthermore, it discussed the privacy and security concerns raised by the participants. The interview study revealed ambiguous experiences with the transition from paper-based records. Moreover, the parallel use of paper-based records negatively affected user attitudes and perceptions. This section also discussed EHR training experiences and a perceived lack of stakeholder involvement.

Aim 3 explored the barriers to EHR use and used data from phases one and two of the qualitative study. The barriers identified were related to knowledge, resources and relationships.

Aim 4 used data from both the quantitative and qualitative studies. It aimed to devise potential strategies to enhance user engagement with EHR. The potential strategies were related to system factors, facilitators, and advice from previous implementation efforts.

10 Chapter Ten: Conclusion

10.1 Introduction

This chapter presents the conclusion and the strategic recommendations. It starts by providing an overview of the research context and background summarises the most important findings from the scoping review of the literature. It then presents an overview of the methodology and methods used. Finally, it summarises the discussion of the findings in light of the research aims. Furthermore, it presents the strategic recommendations derived from this research study.

This mixed-methods design consisted of a cross-sectional survey and semi-structured qualitative interviews. It explored the limited use of EHRs amongst Kuwait secondary care staff in public hospitals. It explored user attitudes and perceptions and experiences of the barriers and facilitators to EHR use in Kuwait quantitatively and qualitatively in secondary care.

10.2 Research context and background

Despite investments into healthcare reform and HIT, Kuwait has not managed to utilise the EHR fully in the public secondary care sector despite it being mandatory (Alhuwail, 2021). As a result, adoption and maturity levels vary, and to date, only two out of six government secondary care hospitals have integrated their EHR systems with other digital systems such as laboratory information systems and radiology (Alhuwail, 2020). The challenge of implementing EHR is particularly pressing in secondary care services which need to respond to a large variety of customer and patient needs. Furthermore, secondary care services deal with a complex set of services and needs, and EHR integration is challenging (Alhuwail, 2020).

10.3 Scoping review of the literature

A scoping review of the literature was conducted to explore the existing research into the facilitators and barriers concerning EHR adoption and use. The purpose of the scoping review was to identify knowledge gaps and to scope the existing body of literature, particularly the literature describing barriers and facilitators to EHR adoption in Kuwait.

The scoping review included fifty publications, among them thirty-five empirical studies. More than half of the empirical studies were focused on the US health sector. Only four studies were concerned with facilitators and barriers to EHR use and adoption in Kuwait. The scoping review identified external, infrastructural, organisational, technical and individual barriers and facilitators influencing the adoption of EHRs worldwide and in Kuwait.

10.4 Research aims

It identified Gaps in current research that informed the research aims in the thesis. There is currently a lack of research on EHR acceptance in Kuwait, particularly a lack of research on barriers. Furthermore, the scoping review of the literature demonstrated that most research into EHR acceptance and use had been conducted as quantitative cross-sectional surveys. Therefore, the current research lacks an in-depth perspective on user experiences and meaning-making. In addition, there needs to be more research into facilitators to EHR adoption and how to increase meaningful engagement with EHRs. These gaps identified led to the following research aims:

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals
2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in three government hospitals
3. To understand perceived barriers to the EHR from the perspective of secondary care staff
4. To devise potential strategies to enhance user acceptance of electronic health records amongst secondary care staff in Kuwait.

10.5 Methodology and methods

In order to address the aims, the research has adopted a mixed-methods design utilising quantitative and qualitative methods.

The quantitative study evaluated secondary care staff's acceptance of EHR following the technology acceptance model 2, a well-established model to measure technology acceptance in the context of EHR adoption. The qualitative study's contribution to the thesis links commonly found behaviours with a rich explanation of the meaning-making process. The overall objectives of phase one of the qualitative study were to explore practitioners' meaning-making concerning EHR and their experiences using EHR. Phase two of the qualitative study was focused on understanding and learning from previous implementation experiences in Kuwait. The data for phases one and two of the qualitative study were collected and analysed separately

Quantitative study

The quantitative study was conducted as an online survey of 399 Healthcare professionals in six public hospitals in Kuwait. It used the TAM 2 questionnaire to collect data. The data were analysed using statistical analysis. The TAM used to measure technology acceptance in this study has been accepted worldwide as a robust model to measure technology acceptance

(Holden & Karsh, 2010; Martono et al., 2020). It follows the TRA (Ajzen & Fishbein, 1977, 1980), proposing that the attitude towards using a system will determine the intention to use, influencing actual system usage.

Qualitative study

The qualitative study consisted of phases one and two. Phase one data were collected through semi-structured interviews with thirty healthcare professionals in three public hospitals. Phase two consisted of three semi-structured interviews with health care leadership in non-government secondary care sites that had already implemented EHR successfully. Phase one of the qualitative study was described and interpreted using hermeneutic analysis. This methodological approach was chosen because it enabled the researcher to explore individual experiences whilst also linking them back to other experiences described by other participants. Phase two was much smaller in scope compared to phase one. The data were analysed using thematic analysis to understand the common themes.

Mixed-methods analysis

As typical in convergent mixed methods designs, the qualitative and quantitative data were collected and analysed separately. Subsequently, the data were compared to identify commonalities and differences along with shared themes. The quantitative study mainly addressed aim one. Aim two and three were addressed by phases one and two of the qualitative study. Aim four was addressed by both the quantitative and qualitative studies.

10.6 Discussion of findings and results

This section summarises how the results from the quantitative study and the findings from the qualitative study addressed the aims of the thesis.

1. To evaluate secondary care staff's acceptance of EHR in their everyday role in six government hospitals

A quantitative cross-sectional online survey of 399 health professionals was carried out in six public hospitals in Kuwait. It utilised the TAM 2 questionnaire to collect quantitative data providing a snapshot of user attitudes towards EHR and identifying the relevant factors affecting acceptance and resistance.

The study found generally negative user attitudes. Interestingly, those using the system more tended to have more negative attitudes than colleagues who used the system less. This indicates that using the system led to negative attitudes rather than general positive or negative impressions that people might have had. This indicates that one barrier to EHR acceptance was the use of the system itself.

The TAM 2 model (Venkatesh & Davis, 2000) predicts that perceived ease of use (PEU) and perceived usefulness (PU) are both predictors of intention to use (IU). The present study found support on the level of correlations for this relationship, i.e. perceived ease of use and perceived usefulness predicted intention to use. This study confirmed the TAM 2 position that perceived usefulness and perceived ease of use were related and could be used to predict an individual's intention to use the system. Both perceived usefulness and ease of use yielded more marketly negative ratings and could therefore be interpreted as barriers to EHR acceptance. Furthermore, the quantitative study demonstrated that attitudes were more likely to be negative when users were doctors, Kuwaitis, or frequent users.

These results were compared with findings from the qualitative study. Interviewees in phases one and two of the qualitative study generally had more positive attitudes towards EHR. One possible explanation that has been discussed is that this is due to the interviewees reflecting on general hopes for EHR to improve their work rather than actual user experience. Another possible explanation for this difference in the data collected would be due to the self-selection of the different samples in the qualitative and quantitative studies.

2. To explore secondary care staff's experiences and perceptions of EHR in their everyday roles in six government hospitals

Despite the negative ratings in the TAM 2 study, many of the thirty interviewees expressed trust in the usefulness of EHR implementation. They felt proud and content to have a system supporting error reduction and establishing time savings. This finding indicated that the overall lack of technology acceptance was not simply due to a lack of customer buy-in. Instead, staff wanted the EHR and wanted to make use of it.

The qualitative study with thirty HCPs revealed some of the more challenging experiences participants had with the EHR, particularly in the implementation phase. Many found that a lack of interoperability and functionality posed additional challenges. In addition, participants had very different experiences and needs regarding training, highlighting the difficulty of a one-fits-all solution.

The data analysis revealed that using the EHR was sometimes perceived as a threat to their clinical and ethical responsibility towards patients. For example, participants feared clinical error due to disjointed information and losing data. In addition, there was a wariness of security breaches and misconduct, which heightened participants' perceptions because of the EHR. The perceived powerlessness and experience of fear explained how many healthcare professionals resist the EHR despite believing in its usefulness.

3. To understand perceived barriers to the EHR from the perspective of secondary care staff

Aim three was addressed by phases one and two of the qualitative study. The barriers identified were related to systems, knowledge, resources and relationships. System barriers were related to EHR functionality. For example, all phase one interviewees testified that their hospital was simultaneously using paper files and EHRs. One of the reasons for this was that the EHR did not provide all the functionality needed for patient care in one place.

Furthermore, the present study revealed links between the need for interoperability and safety and security concerns. For example, interoperability issues were often raised, where paper files were needed to ensure information transmission between departments. This was done in the spirit of handling patient data securely. However, participants were well aware that using paper files brought its own security concerns, such as the likelihood of paper files getting lost. Moreover, participants also raised security concerns regarding how the system was used, for example, when they shared that several employees were sharing the same ID to log into the system.

The knowledge barriers identified were centred around communication and the sharing of knowledge. One of the essential barriers seems to be regarding training. Some HCPs said they would benefit from more hands-on training opportunities delivered more regularly. All participants valued the support they received via peer learning and the IT support team.

Resources were another significant barrier identified. A lack of resources regarding IT infrastructure seems to be the most significant barrier. System breakdown and slow connection speeds did cause disruptions to work and made HCPs experience the system as unreliable. The resource barrier is another explanation for why staff were still so heavily reliant on paper records. They felt they had no choice but to have a backup option in the form of paper records when faced with frequent system downtime or slowness.

The relationship barriers identified were related to the experience of teamwork and conflict amongst HCPs. Furthermore, there were barriers concerning stakeholder involvement and communication with hospital leadership. Whilst interviewees felt that there was support from hospital leadership for EHR implementation at times, they felt there was not enough support in the form of additional resources to support tasks like data entry that were experienced as tedious and time-consuming.

The three healthcare leaders who were interviewed for phase two of the qualitative study and had implemented EHR's successfully in their setting previously emphasised the importance of user engagement and continuous adoption of the system following user feedback. However, the phase one interviewees from the three hospitals said there was a lack of opportunity to engage in feedback and improve the system.

Overall, both faces of the qualitative study contributed to a better understanding of the specific barriers on the level of systems, knowledge, resources and relationships.

4. To devise potential strategies to enhance user acceptance of EHRs amongst secondary care staff in Kuwait.

The fourth aim was addressed by both the quantitative and qualitative studies. The TAM 2 study established the presence of general negative user attitudes. Furthermore, it confirmed negative ratings for perceived usefulness and perceived ease of use. The findings from the qualitative study were used to inform a greater understanding of how users' experiences might have resulted in negative user attitudes. Furthermore, the findings from both studies were used to inform strategies that might lead to more positive user attitudes and, consequently, better uptake of EHRs in Kuwait.

The interviews with health care leaders highlighted that more appropriately support for transition periods is necessary to increase technology acceptance. Whilst this is an area that needs more research, this thesis has established that in order to support the transition period, it needs to be kept as brief as possible, the system needs to have a degree of interoperability and adaptability, and there needs to be the provision of appropriate resources and training.

System-related factors were closely linked to increasing perceived ease of use. A system that adapts quickly and fits the task is more likely to be perceived as easy to use. One crucial factor in increasing functionality is ensuring interoperability between the different systems used in the hospital, for example, between patient records and radiology lavatory results. Furthermore, the thesis demonstrated that additional data entry and administrative tasks are crucial, particularly in the transition from paper-based records.

Increasing available resources was understood as one of the most important facilitators to successful EHR adoption. Participants felt they needed better hardware, software and Internet connectivity to aid the transition. It is important to note that providing appropriate resources to support EHR use would support ease of use of the system and immediately contribute to clinical error reduction. Implementing a backup system, for example, to support in dealing with power cuts or lack of wireless connectivity, would most likely positively impact clinical error reduction and, therefore, positively affect clinical service provision and clinical outcomes.

Other facilitators were training needs. The most critical solution with regards to training is to acknowledge that there is no one size fits all and that, ideally, EHR implementation should be supported by a variety of formal and informal training offers, this could be in-person workshops, online modules and the availability of refresher training for specific tasks. However, the findings of this thesis also highlighted the need for informal problem centred training. For example, this need should be considered when budgeting for IT service staff.

Overall, this thesis's most crucial contribution is a more in-depth understanding of staff experiences and meaning-making regarding EHR. This is the first qualitative hermeneutic analysis study to explore EHR in depth. It adds to the existing literature body by addressing previously identified gaps. More research is needed in the future to focus on capturing users' lived experiences with EHR technology to improve acceptance.

The following section will discuss the strategies arising from the findings of this study.

10.7 Strategies

Strategy 1: The need to keep the transition into new EHR systems as brief as possible

The findings from this study pointed towards the being many issues with the simultaneous use of paper-based and EHRs. Those issues range from privacy and security issues, increasing the likelihood of clinical error, to interfering negatively with HCP’s workflow and workload. One recommendation arising from the findings of the study would be to keep the transition period as short as possible whilst at the same time resourcing appropriately and providing additional support to aid the transition. For example, additional support could be provided by temporarily hiring more administrative staff. Another vital recommendation arising from a need to keep the transition period as brief as possible is establishing an EHR maturity evaluation system that enables the hospital and healthcare leaders to evaluate how they measure up against local and national benchmarks.

Strategy 2: The need to invest in monitoring and evaluation

Concerns around security and privacy were raised as one crucial factor for being sceptical about using the EHR. Therefore, it is recommended to ensure EHR is fit to support staff to maintain high security and privacy standards. Furthermore, to communicate safety standards to the system clearly to staff to reduce anxiety. One recommendation would be to invest in monitoring and evaluating EHR implementation and use to increase uptake whilst not losing sight of the need to comply with privacy and security requirements. Monitoring and evaluating EHR use and safety would ensure compliance with policies and procedures.

Strategy 3: Invest in IT infrastructure and ongoing IT support

The present study has demonstrated that the Kuwaiti government hospitals lack the IT infrastructure and ongoing IT support to support the smooth running of the EHRs. As a consequence, parallel use of paper-based records and EHRs is typical. HCPs feel anxious and distrustful about using the EHR system alone because they experience frequent system downtime and lack a reliable internet connection. Therefore, one strategy is to continue investing in IT infrastructure and ongoing IT support.

Strategy 4: Increase system interoperability and capacity

this study has demonstrated that government secondary care hospitals in Kuwait still have some way to go to establish system interoperability of EHRs. Another recommendation that falls under transitions would need to consider system interoperability and the capacity to adapt it quickly when new functionality is needed. This goal could be reached by developing a national standard for all government secondary care hospitals. The participants in this study wanted a safe and secure system that allowed them to safeguard patient data. At times they felt interoperability would get in the way of establishing a more safe system. Therefore, one recommendation would be to ensure that there is also sufficient resource and IT support to create safe and secure systems when interoperability is increased. An example of this would be to provide audit trail logins to ensure that each shared care professional uses their personal logins and those are not being shared. Another recommendation that can be learned from the advice shared by the healthcare leaders who had already implemented EHRs was that interoperability and adaptability to local needs need to be negotiated simultaneously. Whilst an off-the-shelf solution can be an excellent idea for ensuring interoperability, Kuwait may need to consider whether tailor-made solutions would not be more appropriate as they can adapt to the changing needs of the patients and healthcare professionals. This study demonstrates that adaptable software would most likely positively affect EHR acceptance.

Strategy 5: Provide formal and informal training opportunities

This thesis has established that it is still unclear what role IT and EHR literacy and user experience play in perceiving the EHR as easy to use. However, this thesis's findings demonstrate that EHR users want more formal and informal training opportunities inspired by their previous knowledge and IT literacy. Therefore, this thesis suggests broadening the training currently on offer, including formal training opportunities in the form of departmental workshops that are practical and oriented towards real-life problem-solving. Furthermore, it recommends establishing informal training opportunities, such as peer mentoring and peer-to-peer support.

Strategy 6: Enhance trust in EHR by creating a transparent communication flow

the interviews with health care leaders who had already implemented EHR successfully in their institutions emphasised the importance of stakeholder involvement. In contrast to this finding, many of the thirty interviewees currently using EHRs said they felt not involved enough in crucial decision-making. This thesis has established that HCPs in Kuwait care about the adoption of EHR and would wish to be more involved in the decision-making in their institution. They feel this would be particularly beneficial when buying a new functionality and expanding the system. They feel that the system could be adapted to their needs more appropriately by asking end-users. Furthermore, the participant wished to receive more communication about EHR. Therefore, this thesis suggests introducing robust feedback loops, for example, in stakeholder involvement groups, email newsletters, and WhatsApp groups, to ensure a broader option for participation and more regular user engagement.

Strategy 7: Need to increase stakeholder involvement

this study demonstrated that whilst user experiences were not always positive, there was overall great trust and enthusiasm for EHR. Participants wished to be more involved and felt this would have positively increased their ability to engage with the system. Therefore, it is suggested to include stakeholders in all stages of the EHR process, before the implementation and from design to continuous improvement.

10.8 Conclusion

This study has contributed to the health informatics field by linking EHR acceptance studies with an in-depth perspective on user experiences and perceptions. The phenomenon of EHR adoption and acceptance has been understudied in Kuwait, and this thesis is contributing by shedding light on a country that is not often in the spotlight.

This thesis contributed to advancing mixed methods research designs by demonstrating how a convergent mixed methods design can explore similarities and differences in two different datasets. As a result, a mixed-methods design can critically analyse and interpret overlapping themes in different research methodologies and, therefore, come to a more rounded and well-informed conclusion than using only one method.

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12 Appendices

Appendix A. **Research Poster: Experience of electronic health record use in Kuwait: A hermeneutic analysis of health care professionals' perceptions, motivations and emotions**

Appendix B. **PRISMA-ScR Scoping Review Checklist**

Section	Item	PRISMA Extension for Scoping Reviews (PRISMA-ScR) Checklist item (based on (Tricco et al., 2018)	Reported on page #
Title			
Title	1	Identify the report as a scoping review.	Ch 2, p. 20
Abstract			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Ch 2, p. 20
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Ch 2, p. 20
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Ch. 2, p. 20
Methods			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Ch 2, p. 21
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Ch 2, p.21
Search	7	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Ch 2, p. 21
Selection of sources of evidence	8	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Ch 2, p. 21
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Ch 2, p. 21
Data items	10	List and define all outcomes for which data were sought and any assumptions and simplifications made.	Ch 2, p. 20

Section	Item	PRISMA Extension for Scoping Reviews (PRISMA-ScR) Checklist item (based on (Tricco et al., 2018)	Reported on page #
Critical appraisal of individual sources of evidence	11	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	12	Describe the methods of handling and summarizing the data where chartered.	Ch 2, p. 21
Results			
Selection of sources of evidence	13	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Ch 2, Figure 2.125
Characteristics of sources of evidence	14	For each source of evidence, present characteristics for which data were charted and provide the citations.	Appendix D, Table 2.3 Overview of barriers and Facilitators to EHR adoption and use p. 256
Critical appraisal within sources of evidence	15	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	16	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Appendix D, p. 256
Synthesis of results	17	Summarize and/or present the charting results as they relate to the review questions and objectives.	Ch 2, p. 26
Discussion			
Summary of evidence	18	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Ch 2, p. 47
Limitations	19	Discuss the limitations of the scoping review process.	Ch 2, p. 47
Conclusions	20	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Ch 2, p. 47
Funding			
Funding	21	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

Appendix C. **Overview of search terms used**

Database	Search terms	Results
COCHRANE		
	(*electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator*)	**383**
Pubmed		
	(*electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (OR Barrier* OR Facilitator*)	8494115
Added NOT Outcomes OR Population Health	(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Barrier* OR Facilitator*) NOT Outcomes OR Population Health	557536
Added AND (Implementation or adoption)	(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Barrier* OR Facilitator*) NOT Outcomes OR Population Health	573866
Added NOT mobile health	(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Barrier* OR Facilitator*) NOT (Outcomes OR Population Health OR mobile health)	8697
Added: search title and abstract only	((electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Barrier* OR Facilitator*)) NOT (Outcomes OR Population Health OR mobile health)	1430
Removed digital health OR e-health, Added AND Implementation or Adoption	(((electronic health record*[Title/Abstract] OR EHR[Title/Abstract] OR electronic medical record*[Title/Abstract] OR digital record[Title/Abstract] OR digital medical record*[Title/Abstract] OR digital health record*[Title/Abstract] OR digitised record*[Title/Abstract] OR digitized record[Title/Abstract] OR electronic health information system[Title/Abstract] OR health information system*[Title/Abstract] OR HIS[Title/Abstract] OR health information system*[Title/Abstract] OR HIS[Title/Abstract]) AND (Barrier*[Title/Abstract] OR Facilitator*[Title/Abstract])) AND (Implementation[Title/Abstract] OR Adoption[Title/Abstract])) NOT (Outcomes[Title/Abstract] OR Population Health[Title/Abstract] OR mobile health[Title/Abstract])	**998**
CINAHL		
	(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator*)	2400
Added AND Adoption or Implementation	(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND (Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator*)	**634**
ASSIA		

	noft(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND noft(Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator*)	5728
Added AND Adoption or Implementation	noft(electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS) AND noft(Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator*) AND noft(Adoption OR Implementation)	**935**
Web of Science		
	electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS AND Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs OR Barrier* OR Facilitator	131371
Removed Acceptance OR Uptake OR Perception OR Attitude OR Perspective OR Beliefs	electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS AND Barrier* OR Facilitator*	18207
Added NOT Outcome* OR Population Health OR mobile health	electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR ehealth OR digital health OR health information system* OR HIS AND Barrier* OR Facilitator* NOT Outcome* OR Population Health OR mobile health	2669
Removed e-health OR digital health, added AND Adoption or implementation, searched title and abstract only	electronic health record* OR EHR OR electronic medical record* OR digital record OR digital medical record* OR digital health record* OR digitised record* OR digitized record OR electronic health information system OR health information system* OR HIS OR OR health information system* OR HIS AND Barrier* OR Facilitator* AND Adoption or Implementation NOT Outcome* OR Population Health OR mobile health	**975**

Appendix D. **Charting form Scoping review**

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Abdulla et al.	2016	Peer reviewed article	Bahrain	Cross-sectional, quantitative	Survey	Primary and Secondary Care	Physicians, Nurses, Lab technicians, clerk and others	152	To examine the factors that affect users' satisfaction with the current Health Record System	facilitators: service quality and technical support
Abramson et al.	2013	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Primary Care	HCP	375 nursing homes	Assess level of EHR implementation, automation of key functionalities, participation in HIE, and barriers to adoption	Facilitator: Size of hospital (bed size): bigger more likely to implement barrier: cost, lack of incentive, lack of interoperability, competitiveness, ongoing cost of maintenance
Wilson and Khansa	2018	Peer reviewed article	USA and UK	Descriptive	comparison of legal and historical background				To compare EHR migration efforts, adoption, interoperability and patient safety between USA and UK; to discuss major challenges	Barriers: top-down approach to implementation, lack of cooperation between EHR system providers, competition factors in the market, human error, security and privacy issues, complexity of systems, costs associated with system implementation, maintenance and resource allocation, limited resources, lack of health care standards, lack of interoperability
Alasmary et al.	2014	Peer reviewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Secondary Care	nurses and physicians	112	To explore the relationships between age, occupation, computer literacy, clinical productivity and user satisfaction with the EMR.	Facilitator: computer literacy
Alhuwail, D.	2020	Peer reviewed article	Kuwait	Cross-sectional , mixed methods	analysis of qualitative and quantitative data, self-assessment surevy and on-site survey	Secondary Care	HCP (management)	6 public hospitals	To uncover the status quo of information management practices in public hospitals and to offer recommendations to improve them.	Overall, public hospitals had made positive progress in their compliance with the information management standard. However, issues still existed with (i) developing and implementing an information management plan, (ii) involving the appropriate stakeholders in selecting health IT solutions and (iii) access to the Internet by staff and patients
Ali et al	2015	Peer reviewed article	Kuwait	Cross-sectional, quantitative	Survey	Primary Care	dieticians and nutritionists	103	ICT Literacy prior to EHR adoption	The ICT literacy of dietitians and nutritionists is important to identify individual needs and ensure the proper use of ICT and to avoid wasting time and money. Recommending training courses on ICT for dietitians and nutritionists can provide better nutritional care to patients.

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Alpert	2016	review article	USA	Descriptive	review article				Review the EMR system with respect to goals, utilization, advantages compared with handwritten records, as well as problems and/or disadvantages of the EMR system	Barriers: training, lack of IT skills, cost, EMR notes take longer to write than handwritten notes, lack of interoperability, difficult to use programs, technical failures, the cost associated with training staff, lost passwords slowing access, and the fact that there are so many templates and not enough narrative notes (system usability).
Al-Jafar	2013	Peer reviewed article	Kuwait	Cross-sectional, quantitative	Survey	Primary Care	Patients	518	To investigate patient satisfaction with the quality of services provided before and after the implementation of electronic health records (EHRs)	Decreased physician attention towards patients during patient visits due to the use of EHR.
Almutairi	2011	PhD Thesis	Kuwait	Case study	quantitative analysis	Primary Care	HCP and Policy makers	325 HCP 12 policy makers	Investigate benefits and barriers to EHR adoption; to identify strategies and a roadmap for EHR implementation	HCPs perspectives: Facilitators: improve timely access to medical records, delivery of chronic illness care and overall quality of care to patient. Barriers: EHRs do not improve communication with patients, lack of EHRs awareness, system maintenance, system downtime, loss of clinical data and not sharing medical information, lack of computer skills and experience Policy makers perspectives: The MOH is looking to improve the quality, accessibility, and productivity of health services, but It requires converting strategic thinking into an actual plan.
Ancker et al	2013	Peer reviewed article	USA	Cross-sectional , mixed methods		Primary Care	544 practices		to measure time to EHR implementation and identify factors associated with successful implementation in small practices receiving financial incentives and implementation support.	Factors associated with implementation success were: fewer providers, practice sites, and patients; fewer Medicaid and uninsured patients; having previous experience with scheduling software; enrolling in 2010 rather than earlier; and selecting an integrated EHR plus practice management product rather than two products. Interviews identified positive attitude toward EHRs, resources, and centralized leadership as additional practice-level predictors of success. Barriers: Cost, lack of tech assistance

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Audet et al.	2013	Peer reviewed article	USA	Cross-sectional , quantitative	secondary analysis of quantitative survey data from 2009 and 2012	Primary Care		Physicians	To describe trends in primary care physicians' use of health information technology (HIT) between 2009 and 2012, examine practice characteristics associated with greater HIT capacity in 2012, and explore factors such as delivery system and payment reforms that may affect adoption and functionality.	Receiving or being eligible for financial incentives is associated with greater adoption of EMRs and information exchange. Barriers: Cost lack of experience Lack of tech-support infrastructure
Bahnassy	2018	Peer reviewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Tertiary Care	nurses	980	To understand nurses' perceptions of the HIS	barrier and facilitator: Level of education and years of computer knowledge predicted satisfaction
Buabbas & Al-Shawaf	2011	conference paper	Kuwait	Cross-sectional, quantitative	Survey	Primary Care	Pharmacists	40	To evaluate the impact of the primary care information system on pharmacy practice in Kuwait primary healthcare centres	Several improvements were recommended to upgrade the system, such as supply the system with a database full of drugs details and messaging alerts like drug-drug interactions to reduce medications errors and to enhance drug information management.
Cheung et al	2016	Peer reviewed article	Hong Kong	Cross-sectional, quantitative	Survey	Primary Care	Physicians	524	Survey measured the adoption level, enabling factors, and hindering factors of eMR,	Facilitators: age (younger and female), clinical experience (users had less clinical experience), fewer worked under Health maintenance organisation, more worked with practice partners, efficiency, reduction of medical errors; barriers: patient-unfriendliness, limited consultation time, Reduction of medical errors, Ability to share patient information in public sector, Eliminate need to store paper records, Eliminate illegibility of practice partners Barriers: Patient unfriendliness, Limited consultant time, Cost concerns, Computer use more time consuming, Concerns on data migrations from paper to system, Insufficient space for computer installation
Cucciniello et al	2015	Peer reviewed article	UK	Case study	documentary analysis, interviews and observations. Qualitative thematic analysis drawing on ANT	Secondary care	HCP	a major teaching hospital in central Scotland	This study examined the interaction of sociological and technological factors in the implementation of an Electronic Medical Record (EMR) system by a major national hospital	The results illustrate how important it is to plan innovative and complex information systems with reference to (i) the expressed needs and involvement of different actors, starting from the initial introductory phase; (ii) promoting commitment to the system and adopting a participative approach; (iii) defining and resourcing new roles within the organization capable of supporting and sustaining the change and (iv) assessing system impacts in order to mobilize the network around a common goal. Facilitators: commitment promotion, role defining, system

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
										impacts assessments Barriers: Change processes
Dastagir et al	2012	conference proceedings	USA	Longitudinal	pre-test, post-test study, survey design, qualitative and quantitative analysis	Secondary Care	HCPs	155	to explore approaches to EHR user training	facilitators: clinical peers/champions, local support desk, onsite non-clinical support staff, national help desk, nurses, web-based help, off-site training
Davis and Khansa	2016	Peer reviewed article	USA	cross-sectional, qualitative		Secondary Care	HCP	30 Interviews and focus groups	to propose recommendations on how the EpicEMR system can be used to improve patient care.	Barriers: lack of usability , system features (a, user resistance, lack of integration into daily workflow, time spent on data entry, Facilitators: complete system integration, improved and new system functionality (for example tools that prompt for best practice or for clinician to examine symptoms and results, pop up alerts), unified platforms, better integration of lab ordering, collecting and result reporting, regular additional training
Ozair et al	2015	review article	worldwide	Descriptive	descriptive overview				to discuss the various ethical issues arising in the use of the EHRs and their possible solutions.	security and privacy facilitators: firewalls and antivirus software, intrusion detection software, policies and procedures to protect and maintain patient privacy and confidentiality, conducting routine random audits to ensure compliance, audit trails to track all system activity, barriers: outside vendors often create privacy issues, general barrier: accuracy and reliability of data in EHRs, loss or destruction of data through human error, data transfer, medical identity theft
El Mahalli	2015	Peer reviewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Secondary Care	Nurses	185	to assess the adoption and barriers to use of EHR	barriers: loss of access to medical records due to computer or power failure, lack of continuous training, lack of support from IT staff, additional time for data entry, system hanging up, complexity of technology and lack of system customizability

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Hasanain et al.	2015	Peer re-viewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Secondary Care	Physicians, Nurses, Pharmacists, Laboratory Staff, Receptionists, Administrators and others	333	to examine knowledge and preferences of current or potential EMR users	Barriers: lack of knowledge or experience using EMRs and staff resistance
Iqbal et al	2013	Peer re-viewed article	Taiwan	Cross-sectional, quantitative	Survey	Primary Care		Physicians	measure the relationship between usage intention and adoption behavior.	facilitators: Perceived usefulness, Perceived ease to use, Computer self-efficacy, Security, Intention to use Barriers: Clinics with high number of outpatient visits, Subjective norm
Jamoom et al.	2013	Report	USA	Cross-sectional , quantitative	secondary analysis, quantitative	Primary care	physicians		To present a nationally representative profile of physician use of EHR systems.	facilitators: Age (under 50 more likely) Size of practice Enhanced patient care
Jones and Furukawa	2014	Peer re-viewed article	USA	Cross-sectional, quantitative	Survey	Secondary Care	administrative data	all federally qualified health centers, totaling 1,123 organizations in 2010, 1,128in 2011, and 1,198 in 2012	Evaluate EHR adoption facilitators	facilitators: Engage patients and family in their care Improve care coordination Improve population and public health Quality recognition barriers: Health centres with large share of Hispanics and Blacks had lower adoption rates Centers located in rural areas Health center size, income status and region Health centers with larger share of patients whose family incomes were below poverty level had lower rate of EHR adoption
Kahouei et al.,	2015	Peer re-viewed article	Iran	Cross-sectional, quantitative	Survey	Secondary Care	nurses and supervisors	316	To understand the perceptions of supervisors and head nurses views of the EPR and understand its impact on nursing management functions	barriers: low system quality, low level of computer literacy facilitators: computer knowledge

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Khalifa	2013	Peer reviewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Secondary Care	HCP	158	To identify categorise and analyse barriers perceived by different health care professionals to the adoption of EMRs	Barriers: human and financial barriers
Kirkendall et al.	2013	Peer reviewed article	USA	Longitudinal	quantitative survey pre and post implementation (1 year apart)	Tertiary Care	HCP	298	To examine healthcare worker's perceptions, expectations, and experiences regarding how work processes, patient-related safety, and care were affected when a quaternary care centre transitioned from one computerized provider order entry (CPOE) system to a full electronic health record (EHR).	Facilitators: Communication Job satisfaction Quality and patient data Quality and safety of patient care Employee understanding and support Organizational support The "Rights" of patient care Barriers: Transition of data
McAlearney et al.	2012	Peer reviewed article	USA	cross-sectional, qualitative		Secondary Care	HCP	43 interviews, 6 focus groups	investigated EHR implementation training to understand training facilitators to support EHR implementation	facilitators: Active learning and observation, positive role models, recognition of past experience, communities of practice
McCullough et al.	2014	Peer reviewed article	USA	cross-sectional, qualitative		primary and secondary care	physicians	24 HCPs,administrators and office staff	assess electronic data exchange activities and identify barriers and benefits to HIE participation in two underserved settings.	identified barriers to HIE use at three levels—regional (e.g., lack of area-level exchanges; partner organizations), inter-organizational (e.g., strong relationships with exchange partners; achieving a critical mass of users), and intra-organizational (e.g., type of electronic medical record used; integration into organization's workflow) facilitators: availability of clinical data, support from management, competition Barrier: competition
Pantaleoni et al	2015	Peer reviewed article	USA	Case study	case report	Secondary Care	HCP	1 hospital	to evaluate EMR training	facilitators: engage medical staff in organisational change, install physician champions, have a dedicated physician lead of training, involve physicians in design and delivery of training, communicate timing, duration and structure in advance of EMR training delivery, timely delivery, delivery training approximate to clinical practice setting, ensure clinical relevance, enforce training requirement, recognise time spent on training,
Mogli	2012	Peer reviewed article	GCC/Middle East	Descriptive	personal review			Kuwait, Saudi Arabia, Bahrain, Qatar,	understand problems encountered before, during and after implementation of EHR	Barriers: Lack of coordination between computer, medical/nursing and MR personnel, extensive 24/7 support not found, high net work speed was not offered

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
								UAE, Oman		
Pfoh et al	2011	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Secondary Care	HCP	197	To understand facilitators and barriers to satisfaction with EHRs	Facilitators: satisfaction with transition; barriers: dissatisfaction with maintaining problem and medication, tracking health maintenance information, referring to clinical practice guidelines, ordering laboratory and radiology test
Shaker et al	2015	Peer reviewed article	Saudi Arabia	Cross-sectional, quantitative	Survey	Secondary Care	Physicians	317	to determine physician perceptions of EMR	barriers: ease of use and workflow disruptions
Shen et al	2012	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Secondary Care	HCP	40	determine the level of adoption and barriers to implementation of meaningful use (MU) of EHR systems	facilitators: Size of practice barriers: Cost Lack of integration with other systems Lack of national guidelines for implementation
Stroup et al.	2017	Peer reviewed article	USA	Longitudinal	pre-and post-training survey	Secondary Care	HCP	19	to develop an enhanced EHR learning curriculum for PostGraduate Year 1 (PGY1) residents and measure changes in EHR skill proficiency, efficiency, and self-efficacy	Facilitators: Training: efficiency and self-efficacy barriers: lack of proficiency and competency in using EHR
Top et al.	2012	Peer reviewed article	Turkey	Cross-sectional, quantitative	Survey	Secondary Care	nurses	200	to investigate nurses' views on electronic medical record systems	barriers: lack of integration into workflow, lack of training, not using the system often facilitator: frequent system use
Vuk et al	2015	Peer reviewed article	USA	Longitudinal	pre-and-post intervention survey, quantitative	Tertiary Care	physicians and nurses	293 physicians, 94 nurses	To examine whether simulation training enhanced self-efficacy of physicians and nurses to use electronic medical records, and whether the training changed their perceptions about EMRs.	facilitator: Simulation training in the current study enhanced physicians' and nurses' level of self-confidence and preparedness to use EMRs

Author(s)	Year of Publication	Type of Publication	Country	Study design	Type of instrument	Setting	Focus on	Participants	Purpose and objective	Key findings
Wang and Biedermann	2012	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Primary Care	LTC facilities in Texas	264	Study examines the adoption and utilization of EHRs in LTC facilities in Texas and identifies the barriers preventing implementation of EHRs	In the LTC facilities, the administrative functions of EHRs have been more widely adopted and are more widely utilized than the clinical functions of EHRs. Among the clinical functions adopted, the resident assessment, physician orders, care management plan, and census management are the leading functions used by the LTC facilities in Texas. Lack of capital resources is still the greatest barrier to EHR adoption and implementation-study did not address facilitators
Xierali et al.	2013	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Primary Care	physicians	40000	to test associations between demographic, geographic, and practice characteristics and EHR adoption.	facilitators: Health maintenance organizations more likely to adopt EHR. Those with faculty status more likely to adopt EHR barriers: Medically underserved locations less likely to adopt EHR Geographic health professional shortage areas less likely to adopt EHR. International medical graduates less likely to adopt EHR Group practice/solo practice and small practice physicians less likely to adopt EHR
Yontz et al	2015	Peer reviewed article	USA	Cross-sectional, quantitative	Survey	Secondary Care	nurses	80	Identify perioperative nurses' attitudes toward the use of the EHR.	positive attitudes towards EHR barriers: adequate training, lack of support when computer malfunctioned, lack of practice time before going life, poor placement of work stations, computer issues: Slow system, system freezing or not working, documentation issues such as flipping through multiple screens, resources: too many people using one computer, limited work space, computers not linked, programme does not follow workflow, facilitators: using bar coding items instead of manual entry of charges and supply, adequate training and practice time

Appendix E. **Approval from Ministry of Health**

State Of Kuwait
Ministry Of Health
Asst. Undersecretary for Planning & Quality

دولة الكويت
وزارة الصحة
وكيل الوزارة المساعد لشئون التخطيط والجودة

التاريخ 2-4-2018
الرقم : 1998

To Whom it May Concern

***From**: Ministry of Health – Kuwait*

The Standing Committee for Coordination of Medical Research

*To : **DR: Naser Albazzaz.- Swansea University.***

<u>Enhancing uptake existing of Electronic Health Record (HER) systems amongst secondary care staff in Kuwait</u>

(#764/2018)

The above mentioned Proposal was given an ethical approval by the Committee on its meeting # 3 / 2018 held on March 27, 2018

Asst. Undersecretary for Planning & Quality

Head, Standing Committee for Coordination of Medical Research

Ministry of Health – State Of Kuwait

وكيل الوزارة المساعد لشئون التخطيط والجودة [redacted]

Dr. Mohammad Jassem Al Kha[redacted]
Asst. Undersecretary for Planning & Quality

Hassan

Appendix F. **Ethical application and approval quantitative study**

Application for Standard Ethical Approval

<u>CHECKLIST</u>

Please note that we are able to review an application only when all documentation is submitted alongside this application form. Should any necessary appendices not be attached, this could delay the submission until the following month. Please use this checklist below to ensure that the application is complete. Many thanks.

	Attached Yes / No / N/A	Comment
Recruitment advertisement or email(s)	Yes	----
Participant information sheet(s)	Yes	----
Consent form(s)	Yes	----
Debrief sheet(s)	----	----
Questionnaire(s)	Yes	----
Interview or Focus Group schedule(s)/questions	----	----
Workshop schedule(s)/questions	----	----
Written consent from public or private body	Yes	----
Supervisor signature	Yes	----

PLEASE COMPLETE THE FORM USING TYPESCRIPT
(hand-written applications will not be considered)

Principal Investigator	Naser Albazzaz
Date	16/08/2019
School	School of Medicine
E-mail address	[redacted]
Title of Proposed Research	Enhancing the uptake existing of electronic health record (EHR) systems amongst secondary care staff in Kuwait.
Type of Researcher (please tick)	Undergraduate student ✓ **Postgraduate student** Member of staff Other, please state:
Name of course & supervisor	PhD. Medical and health care studies Dr. Jodie Croxall
Supervisor e-mail address	[redacted]
Qualifications and professional background	BSc in Health Information Adminstration , Kuwait University MSc in Health Informatics , Swansea University

1. Briefly describe the rationale and the main aims of the research you wish to undertake, including a statement of the intended benefits of the research. Please use non-technical language wherever possible.
This thesis is based on the hypothesis that there is a need to enhance the uptake of existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait. It aims to devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait. The first aim is to explore secondary health care staffs' experiences with the implementation of electronic health records (EHR) in Kuwait. The second aim is to identify barriers to acceptance and implementation and the third aim is to find solutions to increase EHR acceptance in the country. Based on the results, a roadmap will be developed for better EHR uptake and staff engagement in Kuwait. The impact of the thesis could be more staff engagement in and a higher, more efficient and more reliable use of EHR systems which eventually translates into more clinical efficiency, greater patient satisfaction and better overall health outcomes.

2. Briefly describe the overall design of the project including dates and/or the proposed period of investigation
Data Collection Ethical approval has been gained (April/May 2018) for the first stage of the research, a qualitative study exploring perceptions of Kuwaiti healthcare staff regarding the use of EHR. In particular this study was used to evaluate and better understand the staff's reasons against EHR, as EHR adoption in Kuwait remains very low. Following data collection and analysis this qualitative stage will now be complemented and evaluated using a quantitative approach. The study proposed will evaluate staff's intention to use the EHR. It will use a survey instrument, the Technology Acceotance Model 2 questionnaire. The second phase of the research draws on the Technology Acceptance Model 2 (TAM 2) as a model explaining EHR user acceptance as a consequence of someone's intention to use a system. Intention to use is explained by the perceived usefulness of a system and perceived ease of use. The TAM 2 has been chosen as it specifically explains perceived usefulness and intention taking into account social influences and cognitive determinants. The model is therefore being used to test and expand on the findings from study one. Ethical approval permitting, data will be collected during October 2019. Please also find an overview of the whole research process in appendix 1.

3. Briefly describe the methods of data collection and analysis. Please describe all measures to be employed. If questionnaire or interviews are to be used, please provide the questionnaire / interview questions and schedule.
Data will be collected using an online survey questionnaire and an opportunistic sampling strategy. The survey will be advertised via email including a link to an online survey tool, Survey Monkey. SurveyMonkey is a self-serve survey platform assisting reseachers in creating, deploying and analysing surveys through an online interface. The research tool, the TAM 2 survey questionnaire, has been validated in previous studies. It has been chosen for its high validity and reliability (Cronbach alpha coefficients exceeding 0.80 in previous studies). The survey consists of 26 different questions, all mapped out on a 7-point Likert scale (see appendix 3). The sample for the survey questionnaire shall include the following health professionals: 1. Management Level of Health Professionals: Users of Aggregated Data For Management or Onwards Reporting (Not Accessing Individual Electronic Health Records). The Management level includes Director, Assistant Director, Monitoring And Evaluation Officer who Reports To MOH (Ministry Of Health). 2. Users Who Mainly Access Individual Electronic Health Records: These include Doctors, Nurses and other healthcare technical staff. 3. Users Who Mainly Input Individual Electronic Health Records: These include Doctors, Nurses and other healthcare technical staff. The survey data will be anonymously collected (IP address tracking will be disabled on Survey Monkey). The data will be analysed using descriptive statistics and suitable software, i.e. SPSS.

4. Location of the proposed research (i.e., Departmental labs, schools, etc)
Secondary health care in Kuwait, all six public hospitals will be chosen in collaboration with the Ministry of Health in Kuwait.

5. Describe the participants: give the age range, gender, inclusion and exclusion criteria, and any particular characteristics pertinent to the research project.
Inclusion criteria: The respondents in the research will be healthcare professionals such as Management officials, M&E (Monitoring& Evaluation) officials, Doctors, Nurses, other hospital staff, who are currently employed in Kuwaiti public healthcare institutions.. Gender: Both male and female healthcare professionals will be included in the research. Age Range: All of the participants will be 21 years of age or above. Exclusion criteria: Health care professionals who work in health care but have not been using EHRs in the past six months will be excluded.

6. How will the participants be selected and recruited? Please describe in detail the process of recruitment, including how and by whom initial contact is made with participants (e.g. advertisement, e-mail).
Sampling Technique to be used: Non-Probability Sampling (Convenience sampling) A convenience sample of six hospitas will be used for the qualitative phase of the study. The initial contact will be through email to all the healthcare professionals (see appendix 2) and invite them via web link to participate in the study via Survey Monkey. A reminder email will get sent out 14 days after the initial research email to encourage staff who did not respond to the initial email to participate in the survey.

7. What procedures (e.g., interviews, computer-based learning tasks, etc.) will be used to gather information from participants?
Data will be collected using an online survey questionnaire containing 26 Likert type questions (see appendix 3). The participants can take part in the study during October 2019.

8. What potential risks to the participants do you foresee and how do you propose to ameliorate/deal with potential risks? Declare any relationship with the participants.
The risk is low. The study guarantees participants confidentiality and anonymity. The study is voluntary and this will be made clear in the participant information sheet. The risk of unforeseen emotional impact is also low as participants are not expected to share very personal details.

9. What potential risks to the interests of the researchers do you foresee and how will you ameliorate/deal with potential risks?
The risk to the researcher is considered low as the study is conducted online.

10. How will you brief and debrief participants? *(Please attach copy of participant information sheets and relevant debrief information)*
The researcher will explain the purpose of study to participants in the initial email and more detailed after they have clicked on the Survey Monkey link. In addition, the information sheet and consent form will be available on survey monkey. Before the survey starts, participants will be given enough time to read through the information carefully and will see the researcher's email contact details should they have any questions before answering the survey. The survey will allow for "no response "or "prefer not to respond" as an option for every survey question. This ensures that respindents can proceed if they decide not to answer a particular question. If further questions should come up days or weeks after the survey they will receive a contact email address. The Participant Information Sheet and consent form have been attached as Appendix 4 and 5 in this document.

11. Will informed consent be sought from participants?	Yes *(Please attach a copy of the consent form and participant information sheet)*	X
	No	
If no, please explain below:		

12. If there are doubts about participants' abilities to give informed consent, what steps have you taken to ensure that they are willing/competent to participate?
All healthcare providers are above 21 years and therefore able to give informed consent. The researcher will explain the aims of the research in written form and they will also be available during the data collection phases via email in order to answer any questions about the research. The researcher's contact details will be provided on the participant information sheet and at the end of the survey.

13. If participants are under 18 years of age, please describe how you will seek informed consent.
Not applicable

14. How will consent be recorded?
By signing the consent form online, attached for reference as Appendix-5.

15. Will participants be informed of the right to withdraw from your study without penalty? If no, please explain why.
Yes, they will be informed in the consent form and participant information sheet. At the end of the survey, the particpants will be given an option to withdraw from the survey.

16. How do you propose to ensure participants' confidentiality and anonymity?
Each transcript will retain participant confidentiality by assigning each set of answers with an ID and not saving any reference to their name, or any potential identifiers such as IP addresses. Data access will be restricted to the researcher and the study supervisor. Participants will be advised that information will be published in the study, but only in collated and anonymous form.

17. Please describe the arrangements for storing and disposal of data:
Please explain, for each of the above, the arrangements you will make for the security of the data The data will be safety stored in encrypted format on a safe and secure password protected Swansea university computer. The researcher is the only person using this computer and will ensure that there is password protection on the computer, the data folder and the backup copy. It will also be ensured that any data stored in computer, external hard drive or any USB is always password protected and encrypted. The backup copy of all the data will be kept safe in the locked cabinet, second floor of the data science building in the Swansea University. The data will be deleted after the PhD has been completed. This will be no more than 10 years in accordance with University guidelines.

18. Does your research require the written consent of a public or private body, e.g. school, local authority or company? If so, please attach letter of consent.
Yes. The researcher will ask for consent from the Ministry of Health. The approval has been granted and has been attached as Appendix-6 in this document.

19. If your proposed research is with 'vulnerable' groups (e.g., children, people with a disability etc.), has an up-to-date Disclosure and Barring Service (DBS) check (previously CRB check) if UK, or equivalent non-UK clearance been requested and/or obtained for all researchers?
Not applicable

20. Does your research involve the collection of Human Tissue? E.g. saliva, urine	Yes	
	No	X

Applicant's signature: __________Date: __________________

Supervisor's signature: _____________ Date: __________________

(if appropriate)

Upon completion, please forward an electronic copy (as a single document, Word or PDF) by e-mail to sumsresc@swansea.ac.uk and a signed hard copy to the Chair of the Committee, Dr Deyarina Gonzalez.

Administrative Support

Research Ethics Sub- Committee,

SUMS

Swansea University

Singleton Park, Swansea, SA2 8PP.

Dr Deyarina Gonzalez

Research Ethics Sub-Committee,

SUMS

Swansea University

Singleton Park, Swansea, SA2 8PP.

Email: [redacted]

Chairperson REG

****RESEARCH MAY ONLY COMMENCE ONCE ETHICAL**

APPROVAL HAS BEEN OBTAINED**

Ethical Approval

Ethics Committee Use Only

Principal Investigator	Naser Albazzaz
Title of Proposed Research	Enhancing the uptake existing of electronic health record (EHR) systems amongst secondary care staff in Kuwait

Application approved	Yes	√	No			
Conflict of interest	Yes		No	√		

If yes, please supply details	
Chair of SUMS RESC	Deya Gonzalez Professor of Molecular Medicine [redacted] Swansea University Medical School Singleton Park, Swansea, SA2 8PP, UK. Email [redacted] Tel [redacted]
Date 26.09.19	Signature [redacted]

This application **has been granted ethical approval,** via the Chair's actions, in its current form.

Please ensure that you quote project reference number 2019 – 0059 or 2018-0018 in any correspondence with the SUMS RESC

CHECKLIST

Please note that we are able to review an application only when all documentation is submitted alongside this application form. Should any necessary appendices not be attached, this could delay the submission until the following month. Please use this checklist below to ensure that the application is complete. Many thanks.

	Attached Yes / No / N/A	Comment
Recruitment advertisement or email(s)	----	----
Participant information sheet(s)	Yes	----
Consent form(s)	Yes	----
Debrief sheet(s)	----	----
Questionnaire(s)	----	----
Interview or Focus Group schedule(s)/questions	Interview questions	----
Workshop schedule(s)/questions	----	----
Written consent from public or private body	Yes	----
Supervisor signature	Yes	----

PLEASE COMPLETE THE FORM USING TYPESCRIPT

(hand-written applications will not be considered)

Principal Investigator	Naser Albazzaz

Date	16/04/2018
School	School of Medicine
E-mail address	[redacted]
Title of Proposed Research	Enhancing the uptake existing of electronic health record (EHR) system amongst secondary care staff in Kuwait.
Type of Researcher (please tick)	Undergraduate student ✓ **Postgraduate student** Member of staff Other, please state:
Name of course & supervisor	PhD. Medical and health care studies Dr. Jodie Croxall
Supervisor e-mail address	[redacted]
Qualifications and professional back-ground	BSc in Health Information Adminstration , Kuwait University MSc in Health Informatics , Swansea University

21. Briefly describe the rationale and the main aims of the research you wish to undertake, including a statement of the intended benefits of the research. Please use non-technical language wherever possible.
This study is based on the hypothesis that there is a need to enhance the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait. It aims to devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait. Based on the Technology Acceptance Model (TAM) model, this study will explore secondary health care staffs' experiences with the implementation of electronic health records (EHR) in Kuwait. The second part aims to identify barriers to acceptance and implementation and the third part aims to find solutions to increase EHR acceptance in the country. It draws on the TAM as a theoretical basis explaining how

staff engagement with regards to EHR uptake in the local context of Kuwait could be enhanced.

Based on the results, a roadmap will be developed for better EHR uptake and staff engagement in Kuwait. The impact of this study could be more staff engagement in and a higher, more efficient and more reliable use of EHR systems which eventually translates into more clinical efficiency, greater patient satisfaction and better overall health outcomes.

22. Briefly describe the overall design of the project including dates and/or the proposed period of investigation

The study will evaluate factors contributing to limited staff engagement and use of EHRs in secondary care settings. Using phenomological approach, the study seeks to illuminate on the perceptions of Kuwaiti healthcare staff regarding the use of EHR. In particular, phemenology was adopted in order to evaluate and better understand the staff's reasons against EHR, as EHR adoption in Kuwait remains very low.

This research work was started in October 2017 and every effort will be made to compile the thesis by October, 2020. The study has been divided into three phases viz.

1**. Design Phase**: It mainly includes gathering secondory data and developing the research design.

2. **Empirical Phase**: It includes two phases, a qualitative phase to explore the reasons for not using EHRs and then a quantitative phase to derive results from the probable reasons explored through interviews.

   2.1 Phase-1: Qualitative research to be achieved through SSI (Semi-Structured Interviews)

   2.2 Phase-2: Quantitative research to be achieved through Survey Questionnaire

3. **Output Phase:** It includes deriving meaningful interpretations from the collected data and arriving at a conclusion which can be suggestive in terms of increasing the usefulness of EHR. A detailed Gantt chart to describe the period of investigation has been attached as an appendix-1 for ready reference.

Semi-structured and indepth qualitative interviews amongst staff in three public hospitals in Kuwait to explore among others evaluating their reasons for not using EHRs, their user experiences of EHRs, and their perception on the training and other interventions they have received.

Ethical approval permitting, data will be collected from middle of May 2018 to end of June 2018.

23. Briefly describe the methods of data collection and analysis. Please describe all measures to be employed. If questionnaire or interviews are to be used, please provide the questionnaire / interview questions and schedule.

An explorative qualitative phenomenological study with an opportunistic sampling strategy. It will utilise a semi-structured interview (SSI) schedule to prompt 30 staff from a variety of different user backgrounds from three hospitals in Kuwait, to give an in-depth exploration of their user experience of EHRs with particular focus on their engagement with the EHR system and their perceptions around the usefulness of EHRs. The proposed sampling grid is based on similar studies and is aiming to be of adequate size to reach sufficient levels of depth, appropriateness and saturation.

The sample to be selected for Semi-Structured interviews (SSI) shall include the following health professionals:

1. Management Level of Health Professionals: Users of Aggregated Data For Management or Onwards Reporting (Not Accessing Individual Electronic Health Records). The Management level includes Director, Assistant Director, Monitoring And Evaluation Officer who Reports To MOH (Ministry Of Health).

2. Users Who Mainly Access Individual Electronic Health Records: These include Doctors, Nurses and other healthcare technical staff.

3. Users Who Mainly Input Individual Electronic Health Records: These include Doctors, Nurses and other healthcare technical staff.

Total Sample Size for Semi Structured Interviews (SSI) = 30

Sample Break-up:

Management officials - 2

M&E (Monitoring& Evaluation) officials -2

Doctors = 10

Nurses = 10

Others = 6 where Others include technical staff like medical laboratory technicians, radiologists, and other allied health works or administrators who deal mainly with data input or who work in the medical records department. The interviews will be recorded with the participants' permission, transcribed, anonymised and analysed using thematic content analysis and Nvivo Software. An iterative and interpretive process of qualitative data analysis will be used for this study. Immediately after every interview, the data will be transcribed into a word processor. In this step, care will be taken to capture and represent audio and visual data in written form. Although there are pre-identified themes based on the interview questions, the next step will involve coding the interview data to capture the most pertinent themes. After coding, interpretation of the data will take place. In this step, the results of the interview will be compared with the existing literature. In addition, new prompts and follow-up questions for the next set of interviews will be generated. This process will be repeated until all the 30 interviews have been conducted, transcribed, coded and interpreted.

24. Location of the proposed research (i.e., Departmental labs, schools, etc)
Secondary health care in Kuwait, three public hospitals will be chosen in collaboration with the Ministry of health in Kuwait .

25. Describe the participants: give the age range, gender, inclusion and exclusion criteria, and any particular characteristics pertinent to the research project.
Inclusion criteria: The respondents in the research will be healthcare professionals like Management officials, M&E (Monitoring& Evaluation) officials, Doctors, Nurses, other hospital staff, who are currently employed in Kuwaiti public healthcare institutions.. Gender: Both male and female healthcare professionals will be included in the research. Age Range: All of the participants will be 21 years of age or above. Exclusion criteria: Health care professionals who work in health care but have not been using EHRs in the past six months or have been using a different system to the one the hospital is currently using will be excluded.

26. How will the participants be selected and recruited? Please describe in detail the process of recruitment, including how and by whom initial contact is made with participants (e.g. advertisement, e-mail).
Sampling Technique to be used: Non Probability Sampling (Convenience sampling) A convenience sample of three hospitas will be used for the qualitative phase of the study. The three hospitals are among the biggest hospitals in Kuwait and are deemed to be the closest representation of most of the public hospitals in the country that are using the state mandated EHR. In total, 30 participants will be included in the study. The initial contact will be through email to all the healthcare professionals of a particular hospital to volunteer for interview regarding EHR. The already existing networks, personal visits and telephonic introductions will be used later to achieve the aim. Within the hospitals, a sample of participants will be selected that will include: - Four participants in managerial positions that will include monitoring and evaluation officers and assistant directors - Ten doctors - Ten nurses - Six other staff members which may include technical staff like medical laboratory technicians, radiologists, and other allied health works or administrators who deal mainly with data input (that are in the medical records department) In total, 30 participants will be included in the study.

27. What procedures (e.g., interviews, computer-based learning tasks, etc.) will be used to gather information from participants?
Data will be collected using qualitative semi-structured interview questions. The participants can take part in the study during the duration of the researcher's stay in Kuwait from May 2018 until June 2018. Each interview is expected to last about 45 to 60minutes. It will be audio-recorded with permission from the participants. Otherwise if permission for audio-recording is not given, the researcher will take handwritten notes. The interviews will be conducted in a private office which will be safe and comfortable, away from any disturbances. The interviewer will be issuing prompts, and follow up questions to get more information from the interview. The interview protocol is included in the appendix-2 of this application.

28. What potential risks to the participants do you foresee and how do you propose to ameliorate/deal with potential risks? Declare any relationship with the participants.
The risk is low. The study guarantees participants confidentiality and the right to withdraw at any time during the interview. In addition, the study is voluntary and this will be made clear in the participant information sheet. The interviews will be carried out in a safe and comfortable space. It is planned to use one of the rooms in the hospitals provided by hospital management if participants are comfortable in meeting in their workplace. This reduces time constraints and enhances convenience for the participants. Furthermore this will ensure interviews take place in a safe environment. If a participant would rather meet outside their workplace, for example to guarantee confidentiality then the interviews can take place in a quiet public cafe close to the hospital. The risk of unforeseen emotional impact is also low as participants are not expected to share very personal details of their lives with the researcher. If something unexpected should happen then which was upsetting to one of the participants then the researcher would ensure to contact the appropriate medical professionals for further support for the participant.

29. What potential risks to the interests of the researchers do you foresee and how will you amelio rate/deal with potential risks?
The risk to the researcher is considered low. Most of the interviews will be carried out in a safe workplac environment. The advantage of conducting interviews in the workplace is that it reduces risks to safety an security as well as ensuring comfort for the researcher. If there would be participants who would prefer t

meet outside the workplace the risk would still be considered relatively low. Alternative meeting spaces wi either be in a quiet public space, i.e. a café.

30. How will you brief and debrief participants? *(Please attach copy of participant information sheets and relevant debrief information)*
The researcher will explain the purpose of study to participants before setting up an appointment for the interview. In addition, the information sheets and consent form will be sent to them via email. On the day of the interview, the participants will be provided with hard copies of the information sheet, and the consent form for their signature. Before the interviews start, they will be given enough time to ask questions or get clarifications where necessary before the start of the interview, during the interview and right after. If further questions should come up days or weeks after the interview they are invited (and this will be communicated during the interview) to voice their thoughts via phone or email to the researcher. The Participant Information Sheet has been attached as Appendix-3 in this document.

31. Will informed consent be sought from participants?	Yes *(Please attach a copy of the consent form and participant information sheet)*	X
	No	
If no, please explain below:		

32. If there are doubts about participants' abilities to give informed consent, what steps have you taken to ensure that they are willing/competent to participate?
All healthcare providers are above 21 years and therefore able to give informed consent. The researcher will explain the aims of the research in written form and they will also be available during the data collection phases in person, by email in order to answer any questions about the research. The researcher's contact details will be provided on the participant information sheet.

If a participant does not seem to have read and/or understood what they are going to be asked and what the research is for, i.e. if consent cannot be established they will be excluded from data collection

33. If participants are under 18 years of age, please describe how you will seek informed consent.
Not applicable

34. How will consent be recorded?
By signing the consent form, attached for ready reference as Appendix-4.

35. Will participants be informed of the right to withdraw from your study without penalty? If no, pleas explain why.
Yes, they will be informed in the consent form and participant information sheet.

36. How do you propose to ensure participants' confidentiality and anonymity?
Each transcript will retain participant confidentiality by assigning each with a number and deleting any reference to their name, or any potential identifiers (for example colleagues or patients) if mentioned during interview.This numbering system will not be used in presentation of the data in the study as it is for analysis only. Data access will be restricted to the researcher and the study supervisor. Participants will be advised that information will be published in the study, but outputs will not disclose any specific information. Also, identifying information will not be available in presentation of the completed paper.

37. Please describe the arrangements for storing and disposal of data:
<u>Please explain, for each of the above, the arrangements you will make for the security of the data</u> The data will be safety stored in encrypted format on a safe and secure Swansea university computer. The recordings will be completely destroyed after transcription. The researcher is the only person using this computer and will ensure that there is password protection on the computer, the data folder and the backup copy. It will also be ensured that any data stored in computer, external hard drive or any USB is always in encrypted format. The backup copy of all the data in text or audio form, whether physical or electronic, will be kept safe in the locked cabinet , second floor of

the data science building in the Swansea University. The data will be deleted after the PhD has been completed. This will be no more than 10 years in accordance with University guidelines.

38. Does your research require the written consent of a public or private body, e.g. school, local au thority or company? If so, please attach letter of consent.
Yes. The researcher will ask for consent from the Ministry of Health. The approval has been granted an has been attached as Appendix-5 in this document.

39. If your proposed research is with 'vulnerable' groups (e.g., children, people with a disability etc.), has an up-to-date Disclosure and Barring Service (DBS) check (previously CRB check) if UK, or equivalent non-UK clearance been requested and/or obtained for all researchers?
Not applicable

40. Does your research involve the collection of Human tissue? E.g. saliva, urine	Yes	
	No	X

Applicant's signature: _________ [redacted] Date: 13th April 2018
____

Supervisor's signature: ___________ [redacted] Date: 13th April 2018___________________

(if appropriate)

Upon completion, please forward an electronic copy (as a single document, Word or PDF) by e-mail to sumsresc@swansea.ac.uk and a signed hard copy to the Chair of the Committee, Dr Deyarina Gonzalez.

Administrative Support

Research Ethics Sub- Committee,

SUMS

Swansea University

Singleton Park, Swansea, SA2 8PP.

Dr Deyarina Gonzalez

Research Ethics Sub-Committee,

SUMS

Swansea University

Singleton Park, Swansea, SA2 8PP.

Email: [redacted]

Chairperson REG

****RESEARCH MAY ONLY COMMENCE ONCE ETHICAL APPROVAL HAS BEEN OBTAINED****

Ethical Approval

Ethics Committee Use Only

Principal Investigator	Naser Albazzaz
Title of Proposed Research	Enhancing the uptake existing of electronic health record (EHR) systems amongst secondary care staff in Kuwait.
RESC Project reference number	2018-0018

Application approved	Yes	X	No			
Conflict of interest	Yes		No	X		

If yes, please supply details	
Chair of SUMS RESC	Deya Gonzalez Associate Professor of Molecular Medicine [redacted] Swansea University Medical School Singleton Park, Swansea, SA2 8PP, UK. Email [redacted] Tel [redacted]
Date 03.05.18	Signature [redacted]

This application **has been granted ethical approval** in its current form.

Please ensure that you quote project reference number **2018-0018** in any correspondence with the SUMS RESC

Time limit for applicant to respond	(two months from receipt of email from ethics panel)

Appendix H. **Email to recruit study participants TAM 2 study**

You are being invited to take part in this study because you are working in Kuwaiti secondary health care and have experience of Electronic Health record use. My PhD research explores electronic health record uptake in the Kuwaiti secondary care setting. Your views and experiences are highly valued for understanding this process better.

If you are a current user of Electronic Health Record could you please click on the link below and fill in the survey. The whole survey should take between five and ten minutes to fill in.

Click here: https://www.limesurvey.org/

It is of course completely it is up to you to decide whether or not to take part. You can withdraw from the study at any point before being asked whether you want to finally submit your answers.

Please let me know if you would prefer to fill in a paper version of this survey via email [redacted]. I can send you a paper copy of the survey which you can leave anonymously in an envelope in your administrator office.

Thank you for your time and interest.

Kind regards
Naser Albazzaz

Appendix I. **Participation Information Sheet (Quantitative Study)**

I would like to invite you to take part in a research study which forms part of my study for a PhD at Swansea University. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions (using the contact details below) if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

Study Title

Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

What is the purpose of the study?

The purpose of this research study is to devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait. The objective of this study is to identify factors influencing the electronic health record uptake in the Kuwaiti secondary care setting.

Why have I been invited?

You have been selected to take part in this study because you are working in Kuwaiti secondary health care and have experience of Electronic Health record use. Your views and experiences are highly valued for understanding better what are the factors that impact the electronic health record uptake in the Kuwaiti secondary care setting.

Do I have to take part?

No. It's completely it is up to you to decide whether or not to take part. You can withdraw from the study at any point before being asked whether you want to finally submit your answers.

What will happen to me if I take part?

You will be asked to answer the survey questions, which we estimate will take you between five and ten minutes. The questions will ask you about your user experience of EHR, how useful you find the EHR and how easy you find I to use.

What are my rights if I take part in this study?

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. If you decide to take part in this study, you may leave the study at any time whilst completing the questionnaire. No matter what decision you make, there will be no penalty to you in any way.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. All information that is collected from the survey will be securely stored by the researcher according to Swansea University policy in a way that means you cannot be identified from the information you give us. Data access will be restricted to the researcher and the study supervisor. All data that is collected will be destroyed 10 years after the end of the study.

If you choose to take part and give your consent in this study. Should you need any further information, please do not hesitate to contact me.

Supervisor: Dr. Jodie Croxall

Email: [redacted]

Researcher: Naser Albazzaz

Email: [redacted]

Contact number: [redacted]

Thank you for your time and interest

Appendix J. **Consent Form (Quantitative Study)**

CONSENT FORM

Thank you for agreeing to participate in this study. Your views are important. Please answer the following questions as honestly as possible. The purpose of this study to help the researcher devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait.

The survey will take 5-10 minutes. I do not anticipate that completing this survey will contain any risk or inconvenience to you.

Title of Project: Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

Name of Researcher: Naser Albazzaz.

Please initial box

- I confirm that I have read the information sheet dated................... (version...........) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

- I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

- I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers. ☐

- I agree to take part in the above study ☐

____

Signature, Date

Appendix K. **Arabic language version of survey**

نموذج استبيان طاقم العمل

يرجى الاجابة على جميع الأسئلة من القسم الأول (معلومات عامة) حتى القسم الثاني (استخدام السجل الصحي الالكتروني).

مُدة الاجابة على الدراسة بأكملها قد تستغرق من 5 الى 10 دقائق

يرجى قراءة ما يلي قبل البدء في الاجابة على الأسئلة:

السجلات الصحية الالكترونية هي عبارة عن منتج يشمل عدد متزايد من تطبيقات الحاسوب الطبية التي يتفاعل من خلالها مزودو الرعاية الصحية مع الحاسوب. وتشمل أمثلة السجلات الصحية الالكترونية السجل الطبي الالكتروني ونظام معلومات المختبر ونظام معلومات الصيدلية ونظام معلومات الأشعة الخ. ويشار الى نظام السجلات الصحية الالكترونية القائم على الكمبيوتر بشكل عام باسم نظام السجل الصحي الالكتروني أو نظام المعلومات الاكلينيكية. كما تتضمن السجلات الصحية الالكترونية بيانات مخزنة على الحاسوب تحتوي على معلومات المريض من أجل دعم ادخال الطلب الطبي وتقارير النتائج ونظم دعم اتخاذ القرار ورسائل التذكير الاكلينيكية وتطبيقات الرعاية الصحية الأخرى (اندرسون 1992)

القسم الأول : معلومات عامة

يقد تستغرق حوالي دقيقتين في الاجابة على هذا القسم

يرجى الاجابة على الاسئلة التالية

1. ما هو جنسك:
   - □ ذكر
   - □ أنثى
2. ما هو عُمرك؟
   - □ أقل من 30
   - □ 31-40
   - □ 41-50
   - □ 51-60

□ أكثر من 60

3. ماهو المسمى الوظيفي الذي يناسب وظيفتك الحالية (اختر واحد فقط من التالي)

□ طبيب	□ ممرض	□ إداري
□ فني	□ أخرى (حدد):	

4. ما هي جنسيتك؟

□ كويتي

□ غير كويتي

5. كم مرة تستخدم نظام السجل الصحي الالكتروني كجزء من عملك؟

□ كل يوم

□ 2-3 مرات اسبوعيًا

□ مرة اسبوعيًا

□ 2-3 مرات شهريًا

□ اقل من ثلاث مرات شهريًا

□ لا استخدمه على الاطلاق

القسم الثاني: استخدام السجل الصحي الالكتروني:

تتطلب منك الأسئلة التالية تصنيف تجربتك لاستخدام نظام السجل الصحي الالكتروني.

رجاءًا قراءة كل سؤوال بعناية وضع دائرة حول الرقم الذي يصف رأيك. (انظر التعريفات ادناه)

قد يستغرق اكمال هذا القسم 3-5 دقائق

1= ارفض بشدة **2**= ارفض **3**= ارفض نوعًا ما **4**= محايد (غير موافق أو معترض) **5**= موافق نوعًا ما **6**= موافق **7**= أوافق بشدة	
1. لدي وصول لنظام السجل الصحي الالكتروني واقوم باستخدامه	7 6 5 4 3 2 1
2. لدي وصول لنظام السجل الصحي الالكتروني وسوف اقوم باستخدامه	7 6 5 4 3 2 1
3. يؤدي استخدامي لنظام السجل الصحي الالكتروني إلى تحسين أدائي في وظيفتي	7 6 5 4 3 2 1
4. يؤدي استخدامي لنظام السجل الصحي الالكتروني في وظيفتي إلى زيادة إنتاجيتي	7 6 5 4 3 2 1
5. استخدام نظام السجل الصحي الالكتروني يزيد من الفعالية في وظيفتي	7 6 5 4 3 2 1
6. أجد أن نظام السجل الصحي الالكتروني مفيد في وظيفتي	7 6 5 4 3 2 1
7. تفاعلي مع نظام السجل الصحي الالكتروني واضح ومفهوم، أي أنني أعرف كيفية استخدامه في وظيفتي	7 6 5 4 3 2 1
8. لا يتطلب التفاعل مع نظام السجل الصحي الالكتروني الكثير من الجهد العقلي	7 6 5 4 3 2 1
9. أجد أن نظام السجل الصحي الالكتروني سهل الاستخدام	7 6 5 4 3 2 1
10. أجد أنه من السهل الحصول على نظام السجل الصحي الالكتروني لفعل ما أريد أن أفعله	7 6 5 4 3 2 1
11. يعتقد الأشخاص الذين يؤثرون في سلوكي أنه يجب عليّ استخدام نظام السجل الصحي الالكتروني	7 6 5 4 3 2 1
12. يعتقد الأشخاص المهمّون بالنسبة لي أنني يجب أن أستخدم نظام السجل الصحي الالكتروني.	7 6 5 4 3 2 1
13. استخدامي لنظام السجل الصحي الالكتروني أمر طوعي	7 6 5 4 3 2 1
14. لا يطلب مني المشرف استخدام نظام السجل الصحي الالكتروني	7 6 5 4 3 2 1

7 6 5 4 3 2 1	15. على الرغم من أنه قد يكون مفيدًا، إلا أن استخدام نظام السجل الصحي الالكتروني ليس إجباريًا في وظيفتي
7 6 5 4 3 2 1	16. يتمتع الأشخاص الذين يستخدمون نظام السجل الصحي الالكتروني في مؤسستي بمكانة أكبر من أولئك الذين لا يقومون باستخدامه
7 6 5 4 3 2 1	17. يتمتع الأشخاص الذين يستخدمون نظام السجل الصحي الالكتروني في مؤسستي بمكانة عالية
7 6 5 4 3 2 1	18. يعتبر امتلاك نظام السجل الصحي الالكتروني هو رمز المكانة في مؤسستي
7 6 5 4 3 2 1	19. يعد استخدام نظام السجل الصحي الالكتروني أمرًا مهمًا في وظيفتي
7 6 5 4 3 2 1	20. يعد استخدام نظام السجل الصحي الالكتروني مناسب في وظيفتي
7 6 5 4 3 2 1	21. جودة الإنتاج التي أحصل عليها من نظام السجل الصحي الالكتروني عالية
7 6 5 4 3 2 1	22. ليس لدي مشكلة في جودة ناتج النظام الصحي الالكتروني
7 6 5 4 3 2 1	23. لا أجد صعوبة في إخبار الآخرين بنتيجة استخدام نظام السجل الصحي الالكتروني
7 6 5 4 3 2 1	24. أعتقد أن بإمكاني إبلاغ الآخرين بعواقب استخدام نظام السجل الصحي الالكتروني
7 6 5 4 3 2 1	25. نتائج استخدام نظام السجل الصحي الالكتروني واضحة بالنسبة لي
7 6 5 4 3 2 1	26. سأواجه صعوبة في شرح سبب أن استخدام نظام السجل الصحي الالكتروني قد يكون أو قد لا يكون مفيدًا

شكرًا لمشاركتكم في هذه الدراسة،

اطيب التحيات

ناصر البزاز

Appendix L. **Online survey sections I and II -before piloting**

Please respond to all questions in Sections I (General Information) through II (Electronic Health Record use)

It should take you about 5-10 minutes to complete the whole survey.

Section I. General Information

It should take you about two minutes to complete this section.

Please answer the following background questions:

1. What is your gender:
   - ☐ male
   - ☐ female
   - ☐ prefer not to say

2. What is your age?
   - ☐ Please specify____________

3. What is the job title that most closely matches your current position (check only one):

☐ Doctor	☐ Nurse	☐ Administrator
☐ Technician	☐ Other (specify):______	

4. What is your nationality
   - ☐ Please specify____________

5. How often do you use EHR system as part of your job?
   - ☐ Every day
   - ☐ 2-3 times per week
   - ☐ Once per week
   - ☐ 2-3 times per month
   - ☐ Less than three times per month
   - ☐ Never

Section II. Electronic Health Record use

The following questions ask you to rate your **experience of using the EHR system.**
Please read each question carefully and circle the number which best describes your opinion. (See definitions below)

It should take you about 3-5 minutes to complete this section.

1= strongly disagree **2**= moderately disagree **3**= somewhat disagree **4**= neutral (neither agree nor disagree) **5**= somewhat agree **6**=moderately agree **7**=strongly agree	
1. I have access to the EHR system and I intend to use it.	1 2 3 4 5 6 7
2. I have access to the EHR system and I will use it.	1 2 3 4 5 6 7
3. Using the EHR system improves my performance in my job.	1 2 3 4 5 6 7
4. Using the EHR system in my job increases my productivity.	1 2 3 4 5 6 7
5. Using the EHR system enhances the effectiveness in my job.	1 2 3 4 5 6 7
6. I find the EHR system to be useful in my job.	1 2 3 4 5 6 7
7. My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job.	1 2 3 4 5 6 7
8. Interacting with the EHR system does not require a lot of mental effort.	1 2 3 4 5 6 7
9. I find the EHR system to be easy to use.	1 2 3 4 5 6 7
10. I find it easy to get the EHR system to do what I want I to do.	1 2 3 4 5 6 7
11. People who influence my behavior think that I should use the EHR system.	1 2 3 4 5 6 7
12. People who are important to me think that I should use the EHR system.	1 2 3 4 5 6 7
13. My use of the EHR system is voluntary.	1 2 3 4 5 6 7
14. My supervisor does not require me to use the EHR system.	1 2 3 4 5 6 7
15. Although it might be helpful, using the EHR system is certainly not compulsory in my job.	1 2 3 4 5 6 7
16. People in my organsiation who use the EHR system have more prestige than those who do not.	1 2 3 4 5 6 7

17. People in my organsiation who use the EHR system have a high pro-file.	1 2 3 4 5 6 7
18. Having the EHR system is a status symbol in my organisation.	1 2 3 4 5 6 7
19. In my job, the usage of the EHR system is important.	1 2 3 4 5 6 7
20. In my job, the usage of the EHR system is relevant.	1 2 3 4 5 6 7
21. The quality of output I get from the EHR system is high.	1 2 3 4 5 6 7
22. I have no problem with the quality of the system's output.	1 2 3 4 5 6 7
23. I have no difficulty telling others about the result of using the EHR system.	1 2 3 4 5 6 7
24. I believe I could communicate to others the consequences of using the EHR system	1 2 3 4 5 6 7
25. The results of using the EHR system are apparent to me.	1 2 3 4 5 6 7
26. I would have difficulty explaining why using the EHR system may or may not be beneficial.	1 2 3 4 5 6 7

Thank you for your participation in this study.

Thank you.
Yours truly,
Naser Al-Bazzaz

Appendix M. **Amended online survey sections I and II -changed after piloting**

Changes in **bold and green**

Please respond to all questions in Sections I (General Information) through II (Electronic Health Record use)

It should take you about 5-10 minutes to complete the whole survey.

Please read before proceeding:

Electronic Health Records (EHR system): is a product that includes a growing number of medical computer applications in which healthcare providers interact directly with the computer. Examples of EHR system include electronic medical record, laboratory information system, pharmacy information system, radiology information system, etc. The computer-based EHR system is referred to generally as EHR system or clinical information systems (CIS). EHR system involves computer-stored databases containing patient information to support medical order entry, result reporting, decision support systems, clinical reminder and other healthcare applications (Anderson, 1992).

<u>Section I. General Information</u>

It should take you about two minutes to complete this section.

Please answer the following background questions:

1. What is your gender:
   - ◻ male
   - ◻ female
   - ◻ prefer not to say

2. What is your age?
   - ◻ Please specify____________

3. What is the job title that most closely matches your current position (check only one):

◻ Doctor	◻ Nurse	◻ Administrator
◻ Technician	◻ Other (specify):______.	

4. What is your nationality

- ☐ Please specify ____________

5. How often do you use EHR system as part of your job?
   - ☐ Every day
   - ☐ 2-3 times per week
   - ☐ Once per week
   - ☐ 2-3 times per month
   - ☐ Less than three times per month
   - ☐ Never

Section II. Electronic Health Record use
The following questions ask you to rate your **experience of using the EHR** system**.**
Please read each question carefully and circle the number which best describes your opinion. (See definitions below)

It should take you about 3-5 minutes to complete this section.

1= strongly disagree **2**= moderately disagree **3**= somewhat disagree **4**= neutral (neither agree nor disagree) **5**= somewhat agree **6**=moderately agree **7**=strongly agree

1. I have access to the **EHR** system and I intend to use it.	1 2 3 4 5 6 7
2. I have access to the **EHR** system and I will use it.	1 2 3 4 5 6 7
3. Using the **EHR** system improves my performance in my job.	1 2 3 4 5 6 7
4. Using the **EHR** system in my job increases my productivity.	1 2 3 4 5 6 7
5. Using the **EHR** system enhances the effectiveness in my job.	1 2 3 4 5 6 7
6. I find the **EHR** system to be useful in my job.	1 2 3 4 5 6 7
7. My interaction with the **EHR** system is clear and understandable, **i.e. I know how to use it in my job.**	1 2 3 4 5 6 7
8. Interacting with the **EHR** system does not require a lot of mental effort.	1 2 3 4 5 6 7
9. I find the **EHR** system to be easy to use.	1 2 3 4 5 6 7
10. I find it easy to get the **EHR** system to do what I want I to do.	1 2 3 4 5 6 7
11. People who influence my behavior think that I should use the **EHR** system.	1 2 3 4 5 6 7

12. People who are important to me think that I should use the **EHR** system.	1 2 3 4 5 6 7
13. My use of the **EHR** system is voluntary.	1 2 3 4 5 6 7
14. My supervisor does not require me to use the **EHR** system.	1 2 3 4 5 6 7
15. Although it might be helpful, using the **EHR** system is certainly not compulsory in my job.	1 2 3 4 5 6 7
16. People in my organisation who use the **EHR** system have more prestige than those who do not.	1 2 3 4 5 6 7
17. People in my organisation who use the **EHR** system have a high profile.	1 2 3 4 5 6 7
18. Having the **EHR** system is a status symbol in my organisation.	1 2 3 4 5 6 7
19. In my job, the usage of the **EHR** system is important.	1 2 3 4 5 6 7
20. In my job, the usage of the **EHR** system is relevant.	1 2 3 4 5 6 7
21. The quality of output I get from the **EHR** system is high.	1 2 3 4 5 6 7
22. I have no problem with the quality of the system's output.	1 2 3 4 5 6 7
23. I have no difficulty telling others about the result of using the **EHR** system.	1 2 3 4 5 6 7
24. I believe I could communicate to others the consequences of using the **EHR** system	1 2 3 4 5 6 7
25. The results of using the **EHR** system are apparent to me.	1 2 3 4 5 6 7
26. I would have difficulty explaining why using the **EHR** system may or may not be beneficial.	1 2 3 4 5 6 7

Thank you for your participation in this study.

Thank you.
Yours truly,
Naser Al-Bazzaz

Appendix N. **Online survey used in research**

Please respond to all questions in Sections I (General Information) through II (Electronic Health Record use)

It should take you about 5-10 minutes to complete the whole survey.

Please read before proceeding:

Electronic Health Records (EHR system): is a product that includes a growing number of medical computer applications in which healthcare providers interact directly with the computer. Examples of EHR system include electronic medical record, laboratory information system, pharmacy information system, radiology information system, etc. The computer-based EHR system is referred to generally as EHR system or clinical information systems (CIS). EHR system involves computer-stored databases containing patient information to support medical order entry, result reporting, decision support systems, clinical reminder and other healthcare applications (Anderson, 1992).

Section I. General Information

It should take you about two minutes to complete this section.

Please answer the following background questions:

1. What is your gender:
   - ☐ male
   - ☐ female
   - ☐ prefer not to say

2. What is your age?
   - ☐ Please specify____________

3. What is the job title that most closely matches your current position (check only one):

☐ Doctor	☐ Nurse	☐ Administrator
☐ Technician	☐ Other (specify):______.	

4. What is your nationality
   - ☐ Please specify____________

5. How often do you use EHR system as part of your job?

- ☐ Every day
- ☐ 2-3 times per week
- ☐ Once per week
- ☐ 2-3 times per month
- ☐ Less than three times per month
- ☐ Never

Section II. Electronic Health Record use
The following questions ask you to rate your **experience of using the EHR system.**
Please read each question carefully and circle the number which best describes your opinion. (See definitions below)

It should take you about 3-5 minutes to complete this section.

1= strongly disagree **2**= moderately disagree **3**= somewhat disagree **4**= neutral (neither agree nor disagree) **5**= somewhat agree **6**=moderately agree **7**=strongly agree	
1. I have access to the EHR system and I intend to use it.	1 2 3 4 5 6 7
2. I have access to the EHR system and I will use it.	1 2 3 4 5 6 7
3. Using the EHR system improves my performance in my job.	1 2 3 4 5 6 7
4. Using the EHR system in my job increases my productivity.	1 2 3 4 5 6 7
5. Using the EHR system enhances the effectiveness in my job.	1 2 3 4 5 6 7
6. I find the EHR system to be useful in my job.	1 2 3 4 5 6 7
7. My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job.	1 2 3 4 5 6 7
8. Interacting with the EHR system does not require a lot of mental effort.	1 2 3 4 5 6 7
9. I find the EHR system to be easy to use.	1 2 3 4 5 6 7
10. I find it easy to get the EHR system to do what I want I to do.	1 2 3 4 5 6 7
11. People who influence my behavior think that I should use the EHR system.	1 2 3 4 5 6 7
12. People who are important to me think that I should use the EHR system.	1 2 3 4 5 6 7

13. My use of the EHR system is voluntary.	1 2 3 4 5 6 7
14. My supervisor does not require me to use the EHR system.	1 2 3 4 5 6 7
15. Although it might be helpful, using the EHR system is certainly not compulsory in my job.	1 2 3 4 5 6 7
16. People in my organisation who use the EHR system have more prestige than those who do not.	1 2 3 4 5 6 7
17. People in my organisation who use the EHR system have a high profile.	1 2 3 4 5 6 7
18. Having the EHR system is a status symbol in my organisation.	1 2 3 4 5 6 7
19. In my job, the usage of the EHR system is important.	1 2 3 4 5 6 7
20. In my job, the usage of the EHR system is relevant.	1 2 3 4 5 6 7
21. The quality of output I get from the EHR system is high.	1 2 3 4 5 6 7
22. I have no problem with the quality of the system's output.	1 2 3 4 5 6 7
23. I have no difficulty telling others about the result of using the EHR system.	1 2 3 4 5 6 7
24. I believe I could communicate to others the consequences of using the EHR system	1 2 3 4 5 6 7
25. The results of using the EHR system are apparent to me.	1 2 3 4 5 6 7
26. I would have difficulty explaining why using the EHR system may or may not be beneficial.	1 2 3 4 5 6 7

Thank you for your participation in this study.

Thank you.
Yours truly,
Naser Al-Bazzaz

Appendix O. **Reminder Email to recruit study participants TAM 2 study**

Please take the time to complete the survey on electronic health records if you are interested and you haven't completed it yet.
You are being invited to take part in this study because you are working in Kuwaiti secondary health care and have experience of Electronic Health record use. My PhD research explores electronic health record uptake in the Kuwaiti secondary care setting. Your views and experiences are highly valued for understanding this process better.

If you are a current user of Electronic Health Record could you please click on the link below and fill in the survey. The whole survey should take between five and ten minutes to fill in.

Click here: https://www.limesurvey.org/

It is of course completely it is up to you to decide whether or not to take part. You can withdraw from the study at any point before being asked whether you want to finally submit your answers.

Please let me know if you would prefer to fill in a paper version of this survey via email ([redacted] I can send you a paper copy of the survey which you can leave anonymously in an envelope in your administrator office.

Thank you for your time and interest.

Kind regards
Naser Albazzaz

Appendix P. **Email to recruit participants phase one qualitative research**

You are being invited to take part in this study because you are working in Kuwaiti secondary health care and have experience of Electronic Health record use. My PhD research explores electronic health record uptake in the Kuwaiti secondary care setting. Your views and experiences are highly valued for understanding this process better.

I am currently looking to recruit participants to interview for my research. Interviews are expected to last one hour.

If you are a current user of Electronic Health Records and would be interested in sharing your experiences with electronic health records, please contact me and I can share more information with you: [redacted]

Thank you for your time and interest.

Kind regards
Naser Albazzaz

Appendix Q. **Email with participant information for phase one qualitative research**

Thank you for your interest in participating in my PhD research on electronic health record (EHR) uptake in the Kuwaiti secondary care setting. Your views and experiences are highly valued for understanding this process better.

To become eligible for participation you would need to be:

- a member of staff in [name] hospital
- currently using EHR in your work
- be either a manager, doctor, nurse, administrator or technician

If you are working with EHRs in a different role, please contact me so we can discuss whether you would be eligible to participate in the study.
Please read the attached participant information sheet to gain a better understanding of the study. You can contact me if anything is unclear or if you have any further questions about to study.

Please read, sign and return the signed consent form if you would like to participate in the study.

Thank you for your time and interest.

Kind regards
Naser Albazzaz

Appendix R. **Participant information sheet (qualitative study-phase one)**

I would like to invite you to take part in a research study which forms part of my study for a PhD at Swansea University. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions (using the contact details below) if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

Study Title

Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

What is the purpose of the study?

The purpose of this research study is to devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait. The objective of this study is to explore your experiences and perceptions of EHR. Furthermore, this study is interested in what you think are the barriers to using EHR more effectively in your work.

Why have I been invited?

You have been selected to take part in this study because you are working in Kuwaiti secondary health care and have experience of Electronic Health record use. Your views and experiences are highly valued for understanding better what are the factors that impact the electronic health record uptake in the Kuwaiti secondary care setting.

Do I have to take part?

No. It's completely it is up to you to decide whether or not to take part. You can withdraw from the study at any point before the interviews have been completed and up to one month after we have conducted the interview.

What will happen to me if I take part?

You will be invited to take part in an interview in a comfortable, confidential location in or near your workplace. The interviews will be audio recorded and last up to one hour. The researcher is going to ask you about your experience of using the EHR, what you think is working about the EHR and about aspects that might not be working so well or that might need improving.

What are my rights if I take part in this study?

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. If you decide to take part in this study, you may leave the study at any time before completing the interview and up to one month after the interview has been conducted. You can chose to answer all the questions or not to answer questions you do not want to answer. No matter what decision you make, there will be no penalty to you in any way.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. All information that is collected from the interviews will be securely stored by the researcher according to Swansea University policy in a way that means you cannot be identified from the information you give us. The researcher is taking the utmost care to ensure that data is being anonymised and unidentifiable. Data access will be restricted to the researcher and the study supervisor. All data that is collected will be destroyed 10 years after the end of the study.

If you choose to take part and give your consent in this study. Should you need any further information, please do not hesitate to contact me.

Supervisor: Dr. Jodie Croxall

Email: [redacted]

Researcher: Naser Albazzaz

Email: [redacted]

Contact number: [redacted]

Thank you for your time and interest

Appendix S. **Consent Form (Qualitative Study Phase One)**

CONSENT FORM

Thank you for agreeing to participate in this study. Your views are important. Please answer the following questions as honestly as possible. The purpose of this study to help the researcher devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait.

The interviews will take up to one hour. I do not anticipate that completing the interviews will contain any risk or inconvenience to you.

Title of Project: Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

Name of Researcher: Naser Albazzaz.

Please initial box

- I confirm that I have read the participant information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
- I understand that my participation is voluntary and that I am free to withdraw at any time up to one month after completion of the interview without giving any reason, without my medical care or legal rights being affected. ☐
- I understand that the information collected about me will be used to support other research in the future and may be shared anonymously with other researchers. ☐
- I agree to take part in the above study ☐

____

Signature, Date

Appendix T. **Phase one interview questions – semi-structured interview guide (pre-piloting)**

User experiences of EHR	
Real use of the software	• Have you gained experiences with learning an EHR?
Perceived ease of use	• Do you enjoy using the EHR?
Perceived usefulness	• Research often claimed EHR use would reduce the workload for staff. Do you think this accurately describes your situation? • Did EHR change the way you document patient data? What is positive about that? What is negative about that? • For managers only: Did EHR change the way you pull data reports?
Intention to use	• Do you perceive EHR use as an essential task for your work? (or as additional burden?)

Experience of training	
What training took place	• What training was provided in your institution?
How training was provided	• Would you have liked a different format, for example, online, or over several weeks or one to one support? And what would that have changed?
Usefulness	• Did you find the training provided useful? • What was the most useful? -the least useful?
Influence of IT literacy	• How would you describe your experience with computer use? • What role did your experience play in learning the EHR system?

Reasons for low EHR Uptake

What would need to change	• Have you experienced barriers? • Can you give examples of barriers • What could be done to overcome those barriers? • Which kind of action is necessary to be taken to users to and keep them using the EHR? • Which EHR characteristics create and foster acceptance • Which kind of action can be taken to increase EHR acceptance?
Corporate culture	• How do your colleagues/department use EHR? • Do you trust your supervisors/colleagues use the system well? If yes, what supports them in doing so. If no what prevents them from doing so?
Voluntariness	• What it is like to experience the change from paper health records to electronic health records? • Did you feel included in the change?
Implementation	• How was the EHR implementation organised in your workplace? Who was involved? Who wasn't involved?

Appendix U. **Phase one interview questions – semi-structured interview guide (post-piloting)**

User experiences of EHR	
Real use of the software	• Since when have you been using EHR? • Can you give me an example of you using the EHR. Can you walk me through the individual steps? What works? What doesn't?
Perceived ease of use	• Do you enjoy using the EHR? What would help you enjoy it more? • If you compare the paper-based system with the EHR system, has the new system made your work easier or more difficult? (or time saving-time consuming, efficient-inefficient)
Perceived usefulness	• Research often claimed EHR use would reduce the workload for staff. Do you think this accurately describes your situation? • Did EHR change the way you document patient data? What is positive about that? What is negative about that? • For managers only: Did EHR change the way you pull data reports?
Intention to use	• Do you perceive EHR use as an essential task for your work? What is good/not good about that?

Experience of training	
Influence of IT literacy	• How would you describe your experience with computer use? • What role did your experience play in learning the EHR system?
What training took place	• Was there any EHR training provided? What training was provided in your institution? When did the training take place? • Did you find the training useful? What was the most useful? -the least useful? • Should anything have been done differently? Is there anything you can think of that would have improved training?

Reasons for low EHR Uptake	
What would need to change	• Have you experienced barriers? • Can you give examples of barriers • What could be done to overcome those barriers? • Which kind of action is necessary to be taken to us-ers to and keep them using the EHR? • Which kind of action can be taken to increase EHR acceptance?
Corporate culture	• How do your colleagues/department use EHR? • Do you trust your supervisors/colleagues use the system well? If yes, what supports them in doing so. If no what prevents them from doing so?
Voluntariness	• What it is like to experience the change from paper health records to electronic health records? • Did you feel included in the change?
Implementation	• How was the EHR implementation organised in your workplace? Who was involved? Who wasn't involved?

Appendix V. **Participant information sheet (qualitative study-phase two)**

I would like to invite you to take part in a research study which forms part of my study for a PhD at Swansea University. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions (using the contact details below) if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

Study Title

Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

What is the purpose of the study?

The purpose of this research study is to devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait. The objective of this study is to explore your experiences and perceptions of EHR implementation in your institution, particularly the lessons you have learned during implementation.

Why have I been invited?

You have been selected to take part in this study because you are one of the decision makers in your institution and were involved in deciding on EHR implementation in your institution. Your views and experiences are highly valued for understanding better what are the factors that impact the electronic health record uptake in the Kuwaiti secondary care setting.

Do I have to take part?

No. It's completely it is up to you to decide whether or not to take part. You can withdraw from the study at any point before the interviews have been completed and up to one month after we have conducted the interview.

What will happen to me if I take part?

You will be invited to take part in an interview in a comfortable, confidential location in or near your workplace. The interviews will be audio recorded and last up to one hour. The researcher is going to ask you about your experience of using the EHR, what you think is working about the EHR and about aspects that might not be working so well or that might need improving.

What are my rights if I take part in this study?

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. If you decide to take part in this study, you may leave the study at any time before completing the interview and up to one month after the interview has been conducted. You can chose to answer all the questions or not to answer questions you do not want to answer. No matter what decision you make, there will be no penalty to you in any way.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. All information that is collected from the interviews will be securely stored by the researcher according to Swansea University policy in a way that means you cannot be identified from the information you give us. The researcher is taking the utmost care to ensure that data is being anonymised and unidentifiable. Data access will be restricted to the researcher and the study supervisor. All data that is collected will be destroyed 10 years after the end of the study.

If you choose to take part and give your consent in this study. Should you need any further information, please do not hesitate to contact me.

Supervisor: Dr. Jodie Croxall
Email: [redacted]

Researcher: Naser Albazzaz
Email: [redacted]
Contact number: [redacted]

Thank you for your time and interest

Appendix W. **Consent Form (Qualitative Study Phase)**

CONSENT FORM

Thank you for agreeing to participate in this study. Your views are important. Please answer the following questions as honestly as possible. The purpose of this study to help the researcher devise and evaluate potential strategies to increase EHR uptake in secondary care in Kuwait.

The interviews will take up to one hour. I do not anticipate that completing the interviews will contain any risk or inconvenience to you.

Title of Project: Enhancing the uptake existing of Electronic Health Record (EHR) systems amongst secondary care staff in Kuwait.

Name of Researcher: Naser Albazzaz.

Please initial box

- I confirm that I have read the participant information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
- I understand that my participation is voluntary and that I am free to withdraw at any time up to one month after completion of the interview without giving any reason, without my medical care or legal rights being affected. ☐
- I understand that the information collected about me will be used to support other research in the future and may be shared anonymously with other researchers. ☐
- I agree to take part in the above study ☐

____

Signature, Date

Appendix X. **Phase two interview questions – semi-structured interview guide**

Semi-structured interview guide for preliminary interviews with EHR implementation leaders

Experiences of initial EHR implementation

Why did you introduce EHR? On what basis did you make the decision to implement it?

(Did they have to do it?)

Also, what were the Benefits/limitations

Lessons learned during implementation

Did you have to make any changes during the implementation? Did you have to make any improvements?

What would be your advice to smeoneo who implements now?

Appendix Y. **List of Variables**

Table 12.1 Variables, their SPSS classification, and the meaning of values

Survey Item	**SPSS designation**	**TAM 2 Construct**	**Role**
Variable	Variable Type	Variable Levels	Role
Language	Nominal	1 = 'English' 2 = 'Arabic'	Input
Consent	Nominal	1 = 'Yes' 2 = 'No'	Input
Last page	Quantitative Discrete	1 2 3	Input
Age Groups	Ordinal	1 = 'Less than 30' 2 = '31-40' 3 = '41-50' 4 = '51-60' 5 = '60 and above'	Input
Above Forty	Ordinal	1 = '41 or more' 2 = '40 or less'	Input
Gender	Nominal	1 = 'male' 2 = 'female'	Input
Nationality	Nominal	2 = 'Non-Kuwaiti' 1 = 'Kuwaiti'	Input
Job Title	Nominal	1='Doctor' 2='Nurse' 3='Technician' 4='Administrator' 5='Other'	Input
EHR Use frequency	Ordinal	1 = 'Every Day' 2 = '2-3 times per week' 3 = 'Once per week' 4 = '2-3 times per month' 5 = 'Less than three times per month' 6 = 'Never'	Input
Weekly Use	Ordinal	1= 'More than once a week' 2 = 'Once a week or less'	Input
Daily Use	Ordinal	1= 'Daily' 2 = 'Not daily'	Input

Items Q6-Q31 (see Table 2 for further specifications)	Ordinal	1 = 'strongly disagree' 2= 'moderately disagree' 3= 'somewhat disagree' 4= 'neutral (neither agree nor disagree)' 5 = 'somewhat agree' 6 = 'moderately agree' 7= 'strongly agree'	Input
Intent	Quantitative Discrete[1]	Q6+Q7	Target[2]
Usefulness	Quantitative Discrete[1]	Q8+Q9+Q10+Q11	Both[2]
Ease	Quantitative Discrete[1]	Q12+Q13+Q14+Q15	Input[2]
Social Norm	Quantitative Discrete[1]	Q16+Q17	Input[2]
Voluntariness	Quantitative Discrete[1]	Q18+Q19+Q20	Both[2]
Social Image	Quantitative Discrete[1]	Q21+Q22+Q23	Input[2]
Job relevance	Quantitative Discrete[1]	Q24+Q25	Input[2]
Output Quality	Quantitative Discrete[1]	Q26+Q27	Input[2]
Result Demonstrability	Quantitative Discrete[1]	Q28+Q29+Q30+Q31	Input[2]
Constructs (see Table 2 for specifications regarding the grouping of items)	Quantitative Discrete[1]	Sums of ratings per construct assessed	
InteractionNormIntent	Multiplication of the standardized values of Social Norm, and Intent, per respondent (ZSocial Norm*ZIntent)	Multiplication of the standardized values of Social Norm, and Intent, per respondent (ZSocial Norm*ZIntent)	Both
Note: 1. In SPSS, discrete quantitative variables are classified as 'scale' variables 2. Role drawn from Khoa, Ha, Nguyen, and Bich's (2020, p.5).			

Table 12.2 Items, their SPSS labels, and associated TAM 2 constructs

Survey Item	SPSS designation	TAM 2 Construct
27. I have access to the EHR system and I intend to use it.	Q6 Access and Intent	Access and Intent
28. I have access to the EHR system and I will use it.	Q7 Access and Will Use	Access and Intent
29. Using the EHR system improves my performance in my job.	Q8 Improves Performance	Perceived Usefulness
30. Using the EHR system in my job increases my productivity.	Q9 Increases Productivity	Perceived Usefulness
31. Using the EHR system enhances the effectiveness in my job.	Q10 Enhances Effectiveness	Perceived Usefulness
32. I find the EHR system to be useful in my job.	Q11 Useful	Perceived Usefulness
33. My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job.	Q12 Knowhow	Ease
34. Interacting with the EHR system does not require a lot of mental effort.	Q13 Effortless	Ease
35. I find the EHR system to be easy to use.	Q14 Ease of Use	Ease
36. I find it easy to get the EHR system to do what I want I to do.	Q15 Ease of Command	Ease
37. People who influence my behaviour think that I should use the EHR system.	Q16 Influent Peer Use Pressure	Subjective Social Norm
38. People who are important to me think that I should use the EHR system.	Q17 Important Peer Use Pressure	Subjective Social Norm
39. My use of the EHR system is voluntary.	Q18 Voluntary Use	Voluntariness
40. My supervisor does not require me to use the EHR system.	Q19 Un-requiring Supervisor	Voluntariness
41. Although it might be helpful, using the EHR system is certainly not compulsory in my job.	Q20 Non-Compulsory Use	Voluntariness

42. People in my organisation who use the EHR system have more prestige than those who do not.	Q21 User Prestige	Social Image
43. People in my organisation who use the EHR system have a high profile.	Q22 User High Profile	Social Image
44. Having the EHR system is a status symbol in my organization.	Q23 User Status	Social Image
45. In my job, the usage of the EHR system is important.	Q24 Use Importance	Job Relevance
46. In my job, the usage of the EHR system is relevant.	Q25 Use Relevance	Job Relevance
47. The quality of output I get from the EHR system is high.	Q26 High Output Quality	Output Quality
48. I have no problem with the quality of the system's output.	Q27 Problemless Output Quality	Output Quality
49. I have no difficulty telling others about the result of using the EHR system.	Q28 Easy Results Sharing	Result Demonstrability
50. I believe I could communicate to others the consequences of using the EHR system	Q29 Consequences Sharing Ability	Result Demonstrability
51. The results of using the EHR system are apparent to me.	Q30 Apparent Use Results	Result Demonstrability
52. I would have difficulty explaining why using the EHR system may or may not be beneficial.	Q31 Difficulty Explaining Benefits IQ31.Easy Explaining Benefits	Result Demonstrability

Appendix Z. **Reliability results**

Table 12.3 Reliability of Construct Scales

Constructs	Cronbach's α	Recommended for deletion[1]	Cronbach's Alpha if Item Deleted[2]
Intent	0.898	N/A	N/A
Usefulness	0.921	None	N/A
Ease	0.817	Q13	0.819
Social Norm	0.845	N/A	N/A
Voluntariness	0.797	Q18	0.810
Social Image	0.773	Q23	0.814
Job relevance	0.726	N/A	N/A
Output Quality	0.79	N/A	N/A
Result Demons-trability	0.517	Q31	0.819

1. Here, N/A was assigned to scales with two items, for which it did not make sense deleting any item to insect the correlation of the remainder.
2. Here, N/A was assigned to all of the cases identified with N/A[1], in the previous column, and to every construct or which no item was recommended for deletion.

Table 12.4 Construct-by-construct reliability comparisons

	Survey Item	Cron-bach's α	Venkatesh, & Davis' (2000) Cronbach's α
Access and In-tent	6. I have access to the EHR system and I intend to use it. 7. I have access to the EHR system and I will use it.	0.90	*"0.82 to 0.97"*
	8. Using the EHR system improves my performance in my job.	0.92	*"0.87 to 0.98"*

Perceived Usefulness	9. Using the EHR system in my job increases my productivity.		
	10. Using the EHR system enhances the effectiveness in my job.		
	11. I find the EHR system to be useful in my job.		
Ease	12. My interaction with the EHR system is clear and understandable, i.e. I know how to use it in my job.	0.82	"*0.86 to 0.98*"
	13. Interacting with the EHR system does not require a lot of mental effort.		
	14. I find the EHR system to be easy to use.		
	15. I find it easy to get the EHR system to do what I want I to do.		
Subjective Social Norm	16. People who influence my behaviour think that I should use the EHR system.	0.85	"*0.81 to 0.94*"
	17. People who are important to me think that I should use the EHR system.		
Voluntariness	18. My use of the EHR system is voluntary.	0.80	"*0.82 to 0.91*"
	19. My supervisor does not require me to use the EHR system.		
	20. Although it might be helpful, using the EHR system is certainly not compulsory in my job.		
Social Image	21. People in my organisation who use the EHR system have more prestige than those who do not.	0.77	"*0.80 to 0.93*"
	22. People in my organisation who use the EHR system have a high profile.		

	23. Having the EHR system is a status symbol in my organization.		
Job Relevance	24. In my job, the usage of the EHR system is important. 25. In my job, the usage of the EHR system is relevant.	0.73	"*0.80 to 0.95*"
Output Quality	26. The quality of output I get from the EHR system is high. 27. I have no problem with the quality of the system's output.	0.79	"*0.82 to 0.98*"
Result Demonstrability	28. I have no difficulty telling others about the result of using the EHR system. 29. I believe I could communicate to others the consequences of using the EHR system 30. The results of using the EHR system are apparent to me. 31. I would have difficulty explaining why using the EHR system may or may not be beneficial.	0.52	"*0.80 to 0.97*"
Result Demonstrability without Q31	Q28-Q30	0.82	N/A

Table 12.5 Intention to Use Inter-item correlations

Correlations

			Q6 Access and Intention to Use	Q7 Access and Will Use
Spearman's rho	Q6 Access and Intention to Use	Correlation Coefficient	1,000	,812**
		Sig. (2-tailed)	.	,000
		N	399	399
	Q7 Access and Will Use	Correlation Coefficient	,812**	1,000
		Sig. (2-tailed)	,000	.
		N	399	399

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

Table 12.6 *Perceived Usefulness* and its inter-item correlations

Correlations

			Q8 Improves Performance	Q9 Increases Productivity	Q10 Enhances Effectiveness	Q11 Useful
Spearman's rho	Q8 Improves Performance	Correlation Coefficient	1,000	,772**	,725**	,703**
		Sig. (2-tailed)	.	,000	,000	,000
		N	399	398	399	397
	Q9 Increases Productivity	Correlation Coefficient	,772**	1,000	,791**	,674**
		Sig. (2-tailed)	,000	.	,000	,000
		N	398	398	398	396
	Q10 Enhances Effectiveness	Correlation Coefficient	,725**	,791**	1,000	,701**
		Sig. (2-tailed)	,000	,000	.	,000
		N	399	398	399	397
	Q11 Useful	Correlation Coefficient	,703**	,674**	,701**	1,000
		Sig. (2-tailed)	,000	,000	,000	.
		N	397	396	397	397

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

Table 12.7 *Perceived Ease of Use* of Use and its inter-item correlations

Correlations

			Q12 Knowhow	Q13 Effortless	Q14 Perceived Ease of Use of Use	Q15 Perceived Ease of Use of Command
Spearman's rho	Q12 Knowhow	Correlation Coefficient	1,000	,432**	,640**	,535**
		Sig. (2-tailed)	.	,000	,000	,000
		N	399	399	399	399
	Q13 Effortless	Correlation Coefficient	,432**	1,000	,591**	,478**
		Sig. (2-tailed)	,000	.	,000	,000
		N	399	399	399	399
	Q14 Perceived Ease of Use of Use	Correlation Coefficient	,640**	,591**	1,000	,654**
		Sig. (2-tailed)	,000	,000	.	,000
		N	399	399	399	399
	Q15 Perceived Ease of Use of Command	Correlation Coefficient	,535**	,478**	,654**	1,000
		Sig. (2-tailed)	,000	,000	,000	.
		N	399	399	399	399

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

Table 12.8 Social Norms and its Inter-Items correlations

Correlations

			Q16 Influent Peer Use Pressure	Q17 Important Peer Use Pressure
Spearman's rho	Q16 Influent Peer Use Pressure	Correlation Coefficient	1,000	,720**
		Sig. (2-tailed)	.	,000
		N	398	398
	Q17 Important Peer Use Pressure	Correlation Coefficient	,720**	1,000
		Sig. (2-tailed)	,000	.

		N	398	399

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

Table 12.9 Voluntariness and its Inter-Item Correlations

Correlations

			Q18 Voluntary Use	Q19 Unrequiring Supervisor	Q20 NonCompulsory Use
Spearman's rho	Q18 Voluntary Use	Correlation Coefficient	1,000	,504**	,477**
		Sig. (2-tailed)	.	,000	,000
		N	397	397	397
	Q19 Unrequiring Supervisor	Correlation Coefficient	,504**	1,000	,677**
		Sig. (2-tailed)	,000	.	,000
		N	397	399	398
	Q20 NonCompulsory Use	Correlation Coefficient	,477**	,677**	1,000
		Sig. (2-tailed)	,000	,000	.
		N	397	398	398

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

Table 12.10 Social Image and its Inter-Item correlations

Correlations

			Q21 User prestige	Q22 User HighProfile	Q23 User Status
Spearman's rho	Q21 User prestige	Correlation Coefficient	1,000	,694**	,469**
		Sig. (2-tailed)	.	,000	,000
		N	398	397	398
	Q22 User HighProfile	Correlation Coefficient	,694**	1,000	,410**
		Sig. (2-tailed)	,000	.	,000
		N	397	397	397
	Q23 User Status	Correlation Coefficient	,469**	,410**	1,000

		Sig. (2-tailed)	,000	,000	.
		N	398	397	398

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

Table 12.11 Job Relevance and its inter-item correlations

Correlations

			Q24 Use Importance	Q25 Use Relevance
Spearman's rho	Q24 Use Importance	Correlation Coefficient	1,000	,642**
		Sig. (2-tailed)	.	,000
		N	398	397
	Q25 Use Relevance	Correlation Coefficient	,642**	1,000
		Sig. (2-tailed)	,000	.
		N	397	397

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

Table 12.12 Output Quality and its inter-item correlations

Correlations

			Q26 High Output Quality	Q27 Problemless Output Quality
Spearman's rho	Q26 High Output Quality	Correlation Coefficient	1,000	,652**
		Sig. (2-tailed)	.	,000
		N	396	396
	Q27 Problemless Output Quality	Correlation Coefficient	,652**	1,000
		Sig. (2-tailed)	,000	.
		N	396	397

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

Table 12.13 Demonstrability and its Inter-item correlations

Correlations

			Q28 Easy Results Sharing	Q29 Consequences Sharing Ability	Q30 Apparent Use Results	Q31 Difficulty Explaining Benefits	Inverted Q31 Easy Explaining Benefits
Spearman's rho	Q28 Easy Results Sharing	Correlation Coefficient	1,000	,609**	,627**	-,095	,095
		Sig. (2-tailed)	.	,000	,000	,058	,058
		N	397	397	397	397	397
	Q29 Consequences Sharing Ability	Correlation Coefficient	,609**	1,000	,671**	-,090	,090
		Sig. (2-tailed)	,000	.	,000	,072	,072
		N	397	398	398	398	398
	Q30 Apparent Use Results	Correlation Coefficient	,627**	,671**	1,000	-,157**	,157**
		Sig. (2-tailed)	,000	,000	.	,002	,002
		N	397	398	398	398	398
	Q31 Difficulty Explaining Benefits	Correlation Coefficient	-,095	-,090	-,157**	1,000	-1,000**
		Sig. (2-tailed)	,058	,072	,002	.	.
		N	397	398	398	399	399

Appendix BB. **Count of Other categories**

Table 12.14 Count for specified 'Other' Job Titles

Current position

		Translation Arabic-English	Frequency	Percent	Valid Percent	Cumulative Percent
Valid			314	78.7	78.7	78.7
	Clinical Pharmacist		1	.3	.3	78.9
	dietitian		1	.3	.3	79.2
	Nuclear medicine physician		1	.3	.3	79.4
	pharmacist		4	1.0	1.0	80.5
	Pharmacist		4	1.0	1.0	81.5
	pharmacist! i am not sure how this question will be analysed? how will you code technician, and other?		1	.3	.3	81.7
	Pharmacists		1	.3	.3	82.0
	Physical therapist		2	.5	.5	82.5
	Physiotherapist		3	.8	.8	83.2
	Quality nurse		1	.3	.3	83.5
	Radiographer		1	.3	.3	83.7
	Senior administrator assistant		1	.3	.3	84.0
	Senior specialist pharmacist		1	.3	.3	84.2
	Specialist physiotherapist		1	.3	.3	84.5
	Therapist		1	.3	.3	84.7
	اختصاصي	Specialist	2	.5	.5	85.2
	اختصاصي اول اشعة وطب نووي	Senior radiologist	1	.3	.3	85.5
	اختصاصي طب نووي(بكالريوس طب نووي)	Nuclear medicine specialist	1	.3	.3	85.7

	اختصاصي علاج طبيعي	Physiotherapy specialist	2	.5	.5	86.2
	اخصائي اشعة	Medical records coordinator	1	.3	.3	86.5
	اخصائي علاج طبيعي	Technical	1	.3	.3	86.7
	المسمى الوظيفي منسق اول سجلات طبيه	Pharmacist	1	.3	.3	87.0
	تقني	Head of medical laboratory specialist	1	.3	.3	87.2
	دكتوره صيدلانية	Head of medical laboratory specialist	1	.3	.3	87.5
	رئيس إختصاصي مختبر طبي	Head of the nursing staff	1	.3	.3	87.7
	رئيس اختصاصي مختبر طبي	Medical records	1	.3	.3	88.0
	رئيس هيئه تمريضيه	Administrative work	1	.3	.3	88.2
	سجلات طبيه	Pharmacist	2	.5	.5	88.7
	شغل اداري لا ينتمي لطابع العمل الفني من حيث المخاطر في العمل	Pharmacist	1	.3	.3	89.0
	صيدلاني	Pharmacist	1	.3	.3	89.2
	صيدلانية	Pharmacist	2	.5	.5	89.7
	صيدلانيه	Pharmacist	3	.8	.8	90.5
	صيدلي	Pharmacy student	5	1.3	1.3	91.7
	ضيدلي	Pharmacy technician	1	.3	.3	92.0

	طالب	Senior pharmacy technician	1	.3	.3	92.2
	طالبه صيدله بالخارج	Medical records	1	.3	.3	92.5
	فني صيدله	Nursing trainer	1	.3	.3	92.7
	فني صيدله أول	Director	1	.3	.3	93.0
	كاتبة سجلات طبية	Head of the department	1	.3	.3	93.2
	مدرب متخصص في التمريض	Head of the Department	1	.3	.3	93.5
	مدير	Head of the Department	1	.3	.3	93.7
	مدير روضه	Head of the Department	1	.3	.3	94.0
	مدير مدرسة	Assistant Head of the Department	1	.3	.3	94.2
	مدير مدرسه	Medical records	5	1.3	1.3	95.5
	مدير مساعد	Professional trainer	1	.3	.3	95.7
	مديرة مدرسة)فني واداري (	Medical laboratory practitioner	1	.3	.3	96.0
	مديرة روضه	A nurse in the quality department	1	.3	.3	96.2
	مديرة مدرسه	First medical records coordinator	1	.3	.3	96.5
	مديره روضه	Records coordinator. medical	1	.3	.3	96.7

	مديره مدرسه	Medical records co-ordinator	1	.3	.3	97.0
	مديره مساعده	Health information administration	2	.5	.5	97.5
	مساعد منسق سجلات طبيه	Specialist	3	.8	.8	98.2
	معلم تخصص تربية بدنية	Senior radiologist	1	.3	.3	98.5
	ممارس مختبر طبي	Nuclear medicine specialist	1	.3	.3	98.7
	ممرضة في إدارة الجودة والإعتراف	Physiotherapy specialist	1	.3	.3	99.0
	منسق اول سجلات طبيه و رئيس قسم السجلات الطبية	Medical records co-ordinator	1	.3	.3	99.2
	منسق سجلات خريجة جامعة الكويت طب مساعد مع الأسف	Technical	1	.3	.3	99.5
	منسق سجلات طبية بكالريوس معلوماتية وادارة معلومات صحية	Pharmacist	1	.3	.3	99.7
	منسق سجلات طبيه	Head of medical laboratory specialist	1	.3	.3	100.0
	Total		399	100.0	100.0	

Appendix CC. **Crosstabs, and Independence tests for demographic variables**

Table 12.15**, Table** 12.16**,**

Table 12.17 **Crosstabs, and Independence tests for Gender and Nationality**

Table 12.15 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Nationality	398	99.7%	1	0.3%	399	100.0%

Table 12.16 Gender * Nationality Crosstabulation

Table Gender * Nationality Crosstabulation

			Nationality		
			Kuwaiti	Non - Kuwaiti	Total
Gender		Count	2	0	2
		Expected Count	1.5	.5	2.0
	Female	Count	221	58	279
		Expected Count	204.0	75.0	279.0
	Male	Count	68	49	117
		Expected Count	85.5	31.5	117.0
Total		Count	291	107	398
		Expected Count	291.0	107.0	398.0

Table 12.17 Chi-Square Tests

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.395[a]	2	<.001
Likelihood Ratio	19.042	2	<.001
N of Valid Cases	398		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .54.

Table 12.18**, Table** 12.19**, Table** 12.20 **Crosstabs, and Independence tests for Gender and Language**

Table 12.18 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Language	399	100.0%	0	0.0%	399	100.0%

Table 12.19 Gender * Language Crosstabulation

Table Gender * Language Crosstabulation

	Language	Total

			Arabic	English	
Gender		Count	2	1	3
		Expected Count	1.9	1.1	3.0
	Female	Count	193	86	279
		Expected Count	176.9	102.1	279.0
	Male	Count	58	59	117
		Expected Count	74.2	42.8	117.0
Total		Count	253	146	399
		Expected Count	253.0	146.0	399.0

Table 12.20 Chi-Square Tests

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.666[a]	2	.001
Likelihood Ratio	13.406	2	.001
N of Valid Cases	399		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.10.

Table 12.21**, Table** 12.22**, Table** 12.23 **Crosstabs, and Independence tests for Gender and Above Forty**

Table 12.21 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Above Forty	398	99.7%	1	0.3%	399	100.0%

Table 12.22 Gender * Above Forty Crosstabulation

Table Gender * Above Forty Crosstabulation

			Above Forty		
			Forty and less	Above forty	Total
Gender		Count	0	2	2
		Expected Count	1.4	.6	2.0
	Female	Count	190	89	279
		Expected Count	188.6	90.4	279.0
	Male	Count	79	38	117
		Expected Count	79.1	37.9	117.0
Total		Count	269	129	398
		Expected Count	269.0	129.0	398.0

Table 12.23 Chi-Square Tests

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.204[a]	2	.122

Likelihood Ratio	4.540	2	.103
N of Valid Cases	398		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .65.

Table 12.24, **Table** 12.25, **Table** 12.26 **Crosstabs, and Independence tests for Language and Nationality**

Table 12.24 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Language * Nationality	398	99.7%	1	0.3%	399	100.0%

Table 12.25 Language * Nationality Crosstabulation

Table Language * Nationality Crosstabulation

			Nationality		
			Kuwaiti	Non - Kuwaiti	Total
Language	Arabic	Count	202	50	252
		Expected Count	184.3	67.7	252.0
	English	Count	89	57	146
		Expected Count	106.7	39.3	146.0
Total		Count	291	107	398
		Expected Count	291.0	107.0	398.0

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	17.336[a]	1	<.001		
Continuity Correction[b]	16.373	1	<.001		
Likelihood Ratio	16.938	1	<.001		
Fisher's Exact Test				<.001	<.001
Linear-by-Linear Association	17.293	1	<.001		
N of Valid Cases	398				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 39.25.

b. Computed only for a 2x2 table

Table 12.26 Chi-Square Tests

Table 12.27**,**

Table 12.28 **Table** 12.29**Crosstabs, and Independence tests for Language and Above Forty**

Table 12.27 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Language * Above Forty	398	99.7%	1	0.3%	399	100.0%

Table 12.28 Language * Above Forty Crosstabulation

Table Language * Above Forty Crosstabulation

			Above Forty		
			Forty and less	Above forty	Total
Language	Arabic	Count	163	89	252
		Expected Count	170.3	81.7	252.0
	English	Count	106	40	146
		Expected Count	98.7	47.3	146.0
Total		Count	269	129	398
		Expected Count	269.0	129.0	398.0

Table 12.29 Chi-Square Tests

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.647[a]	1	.104		
Continuity Correction[b]	2.298	1	.130		
Likelihood Ratio	2.683	1	.101		
Fisher's Exact Test				.120	.064
Linear-by-Linear Association	2.640	1	.104		
N of Valid Cases	398				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 47.32.

b. Computed only for a 2x2 table

Table 12.30**, Table** 12.31**, Table** 12.32 **Crosstabs, and Independence tests for Nationality and Above Forty**

Table 12.30 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Nationality * Above Forty	398	99.7%	1	0.3%	399	100.0%

Table 12.31 Nationality * Above Forty Crosstabulation

Table Nationality * Above Forty Crosstabulation

			Above Forty		Total
			Forty and less	Above forty	
Nationality	Kuwaiti	Count	203	88	291
		Expected Count	196.7	94.3	291.0
	Non - Kuwaiti	Count	66	41	107
		Expected Count	72.3	34.7	107.0
Total		Count	269	129	398
		Expected Count	269.0	129.0	398.0

Table 12.32 Chi-Square Tests

Table Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.330[a]	1	.127		
Continuity Correction[b]	1.976	1	.160		
Likelihood Ratio	2.290	1	.130		
Fisher's Exact Test				.147	.081
Linear-by-Linear Association	2.324	1	.127		
N of Valid Cases	398				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 34.68.

b. Computed only for a 2x2 table

Table 12.33**, Table** 12.34**, Table** 12.35 **Crosstabs, and Independence tests for Job Title and Gender**

Table 12.33 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Job Title * Gender	384	96.2%	15	3.8%	399	100.0%

Table 12.34 Job Title * Gender Crosstabulation

Table Job Title * Gender Crosstabulation

			Gender		
			Male	Female	Total
Job Title	Doctor	Count	40	27	67
		Expected Count	20.4	46.6	67.0
	Nurse	Count	39	50	89
		Expected Count	27.1	61.9	89.0
	Technician	Count	15	64	79
		Expected Count	24.1	54.9	79.0
	Administrator	Count	11	65	76
		Expected Count	23.2	52.8	76.0
	Other	Count	12	61	73
		Expected Count	22.2	50.8	73.0
Total		Count	117	267	384
		Expected Count	117.0	267.0	384.0

Table 12.35 Symmetric Measures

Table Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.380	<.001
	Cramer's V	.380	<.001
N of Valid Cases		384	

Table 12.36, **Table** 12.37, **Table** 12.38 **Crosstabs, and Independence tests for Job Title and Language**

Table 12.36 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Job Title * Language	386	96.7%	13	3.3%	399	100.0%

Table 12.37 Job Title * Language Crosstabulation

Table Job Title * Language Crosstabulation

			Language		
			Arabic	English	Total
Job Title	Doctor	Count	21	46	67
		Expected Count	42.2	24.8	67.0
	Nurse	Count	54	36	90
		Expected Count	56.7	33.3	90.0
	Technician	Count	57	22	79
		Expected Count	49.7	29.3	79.0
	Administrator	Count	62	14	76
		Expected Count	47.8	28.2	76.0
	Other	Count	49	25	74
		Expected Count	46.6	27.4	74.0
Total		Count	243	143	386
		Expected Count	243.0	143.0	386.0

Table 12.38 Symmetric Measures

Table Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.336	<.001
	Cramer's V	.336	<.001
N of Valid Cases		386	

Table 12.39**, Table** 12.40**, Table** 12.41 **Crosstabs, and Independence tests for Job Title and Nationality**

Table 12.39 Case Processing Summary

Table Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Job Title * Nationality	386	96.7%	13	3.3%	399	100.0%

Table 12.40 Job Title * Nationality Crosstabulation

Table Job Title * Nationality Crosstabulation

			Nationality		
			Kuwaiti	Non - Kuwaiti	Total
Job Title	Doctor	Count	50	17	67
		Expected Count	48.8	18.2	67.0

	Nurse	Count	40	50	90
		Expected Count	65.5	24.5	90.0
	Technician	Count	59	20	79
		Expected Count	57.5	21.5	79.0
	Administrator	Count	70	6	76
		Expected Count	55.3	20.7	76.0
	Other	Count	62	12	74
		Expected Count	53.9	20.1	74.0
Total		Count	281	105	386
		Expected Count	281.0	105.0	386.0

Table 12.41 Symmetric Measures

Table Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.380	<.001
	Cramer's V	.380	<.001
N of Valid Cases		386	

Table 12.42, Table 12.43 and Table 12.44**Crosstabs, and Independence tests for Job Title and Above Forty**

Table 12.42 Case Processing Summary

Table Case Processing Summary

Cases

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Job Title * Above Forty	386	96.7%	13	3.3%	399	100.0%

Table 12.43 Job Title * Above Forty Crosstabulation

Table Job Title * Above Forty Crosstabulation

			Above Forty		
			Forty and less	Above forty	Total
Job Title	Doctor	Count	45	22	67
		Expected Count	45.8	21.2	67.0
	Nurse	Count	54	36	90
		Expected Count	61.6	28.4	90.0
	Technician	Count	62	17	79
		Expected Count	54.0	25.0	79.0
	Administrator	Count	56	20	76
		Expected Count	52.0	24.0	76.0
	Other	Count	47	27	74
		Expected Count	50.6	23.4	74.0
Total		Count	264	122	386
		Expected Count	264.0	122.0	386.0

Table 12.44 Symmetric Measures

Table Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.148	.075
	Cramer's V	.148	.075
N of Valid Cases		386	

Appendix DD. **Spearman Correlation Coefficient Results**

Table 12.45 Two-Tailed Spearman's Correlation Coefficients (part 1)

Table Two-Tailed Spearman's Correlation Coefficients (part 1)

			EHR Use Frequency	Intent	Usefulness	Ease	Social Norm
Spearman's rho	EHR Use Frequency	Correlation Coefficient	1.000	.551**	.319**	.316**	.162**
		Sig. (2-tailed)	.	<.001	<.001	<.001	.001
		N	398	398	398	398	398
	Intent	Correlation Coefficient	.551**	1.000	.521**	.559**	.373**
		Sig. (2-tailed)	<.001	.	<.001	<.001	<.001
		N	398	399	399	399	399
	Usefulness	Correlation Coefficient	.319**	.521**	1.000	.594**	.462**
		Sig. (2-tailed)	<.001	<.001	.	<.001	<.001
		N	398	399	399	399	399
	Ease	Correlation Coefficient	.316**	.559**	.594**	1.000	.525**
		Sig. (2-tailed)	<.001	<.001	<.001	.	<.001
		N	398	399	399	399	399
	Social Norm	Correlation Coefficient	.162**	.373**	.462**	.525**	1.000
		Sig. (2-tailed)	.001	<.001	<.001	<.001	.
		N	398	399	399	399	399
	Voluntariness	Correlation Coefficient	-.478**	-.272**	-.075	.029	.060

		Sig. (2-tailed)	<.001	<.001	.135	.560	.234
		N	398	399	399	399	399
	Social Image	Correlation Coefficient	-.002	.157**	.379**	.346**	.389**
		Sig. (2-tailed)	.970	.002	<.001	<.001	<.001
		N	397	398	398	398	398
	Job Relevance	Correlation Coefficient	.395**	.512**	.561**	.491**	.322**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001
		N	397	398	398	398	398
	Output Quality	Correlation Coefficient	.194**	.407**	.538**	.515**	.471**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001
		N	396	397	397	397	397
	Result Demonstrability	Correlation Coefficient	.215**	.358**	.396**	.515**	.454**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001
		N	398	399	399	399	399

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

Table 12.46 Two-Tailed Spearman's Correlations (part 2 continuation)

Two-Tailed Spearman's Correlations (part 2 continuation)

			Voluntariness	Social Image	Job Relevance	Output Quality	Result Demonstrability
Spearman's rho	EHR Use Frequency	Correlation Coefficient	-.478**	-.002	.395**	.194**	.215**
		Sig. (2-tailed)	<.001	.970	<.001	<.001	<.001
		N	398	397	397	396	398
	Intent	Correlation Coefficient	-.272**	.157**	.512**	.407**	.358**
		Sig. (2-tailed)	<.001	.002	<.001	<.001	<.001
		N	399	398	398	397	399
	Usefulness	Correlation Coefficient	-.075	.379**	.561**	.538**	.396**
		Sig. (2-tailed)	.135	<.001	<.001	<.001	<.001
		N	399	398	398	397	399
	Ease	Correlation Coefficient	.029	.346**	.491**	.515**	.515**
		Sig. (2-tailed)	.560	<.001	<.001	<.001	<.001
		N	399	398	398	397	399
	Social Norm	Correlation Coefficient	.060	.389**	.322**	.471**	.454**
		Sig. (2-tailed)	.234	<.001	<.001	<.001	<.001
		N	399	398	398	397	399
	Voluntariness	Correlation Coefficient	1.000	.166**	-.253**	.061	.146**
		Sig. (2-tailed)	.	<.001	<.001	.228	.003
		N	399	398	398	397	399
	Social Image	Correlation Coefficient	.166**	1.000	.318**	.448**	.399**
		Sig. (2-tailed)	<.001	.	<.001	<.001	<.001
		N	398	398	398	397	398
	Job Relevance	Correlation Coefficient	-.253**	.318**	1.000	.484**	.416**
		Sig. (2-tailed)	<.001	<.001	.	<.001	<.001
		N	398	398	398	397	398
	Output Quality	Correlation Coefficient	.061	.448**	.484**	1.000	.590**
		Sig. (2-tailed)	.228	<.001	<.001	.	<.001
		N	397	397	397	397	397

	Result Demonstrability	Correlation Coefficient	.146**	.399**	.416**	.590**	1.000
		Sig. (2-tailed)	.003	<.001	<.001	<.001	.
		N	399	398	398	397	399

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

Appendix EE. **Linear Regression Models for TAM's hypotheses**

Table 12.47 Predicting Usefulness through Ease: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.639[a]	.408	.407	3.814	.408	273.957	1	397	<.001

a. Predictors: (Constant), Ease

Table 12.48 Predicting Usefulness through Ease: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.263	.459		2.753	.006		
	Ease	.671	.041	.639	16.552	<.001	1.000	1.000

a. Dependent Variable: Usefulness

Table 12.49 Predicting Intent through Ease and Usefulness: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.543[a]	.295	.291	2.903	.295	82.692	2	396	<.001

a. Predictors: (Constant), Ease, Usefulness

Table 12.50 Predicting Intent through Usefulness and Ease: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.940	.353		2.664	.008		
	Usefulness	.181	.038	.260	4.730	<.001	.592	1.690
	Ease	.248	.040	.339	6.177	<.001	.592	1.690

a. Dependent Variable: Intent

Table 12.51 EHR Use Frequency through Intent: Model summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.584[a]	.341	.340	1.714	.341	205.127	1	396	<.001

a. Predictors: (Constant), Intent

Table 12.52 EHR Use Frequency through Intent: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.748	.151		4.960	<.001		
	Intent	.357	.025	.584	14.322	<.001	1.000	1.000

a. Dependent Variable: EHR Use Frequency

Appendix FF. **Linear Regression Models for TAM's 2 hypotheses**

Table 12.53 Predicting Usefulness through Ease, Social Norm, Social Image, Job Relevance, Output quality and Result Demonstrability: Models Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.638[a]	.407	.406	3.823	.407	271.494	1	395	<.001
2	.714[b]	.509	.507	3.483	.102	81.770	1	394	<.001
3	.738[c]	.545	.542	3.357	.036	31.214	1	393	<.001
4	.748[d]	.560	.555	3.307	.015	12.987	1	392	<.001

a. Predictors: (Constant), Ease
b. Predictors: (Constant), Ease, Job Relevance
c. Predictors: (Constant), Ease, Job Relevance ,Output Quality
d. Predictors: (Constant), Ease, Job Relevance, Output Quality, Social Norm

Table 12.54 Predicting Usefulness through Ease, Social Norm, Social Image, Job Relevance, Output quality and Result Demonstrability: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.268	.461		2.750	.006		
	Ease	.671	.041	.638	16.477	<.001	1.000	1.000
2	(Constant)	.022	.442		.049	.961		
	Ease	.471	.043	.448	10.911	<.001	.738	1.355
	Job Relevance	.778	.086	.371	9.043	<.001	.738	1.355
3	(Constant)	-.785	.450		-1.744	.082		
	Ease	.386	.044	.367	8.707	<.001	.651	1.537
	Job Relevance	.629	.087	.300	7.227	<.001	.669	1.494
	Output Quality	.428	.077	.232	5.587	<.001	.674	1.485
4	(Constant)	-1.239	.461		-2.689	.007		
	Ease	.322	.047	.306	6.823	<.001	.558	1.792
	Job Relevance	.617	.086	.294	7.182	<.001	.668	1.497
	Output Quality	.362	.078	.196	4.658	<.001	.636	1.573
	Social Norm	.270	.075	.150	3.604	<.001	.650	1.539

a. Dependent Variable: Usefulness

Table 12.55 Predicting Intent through Ease, Usefulness, and the interaction between Social Norm and Voluntariness: Models Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.505[a]	.255	.253	2.981	.255	135.711	1	397	<.001
2	.543[b]	.295	.291	2.903	.040	22.368	1	396	<.001
3	.544[c]	.296	.291	2.904	.001	.761	1	395	.383

a. Predictors: (Constant), Ease
b. Predictors: (Constant), Ease, Usefulness
c. Predictors: (Constant), Ease, Usefulness, Interaction Norm and Voluntariness

Table 12.56 Predicting Intent through Ease, Usefulness, and the interaction between Social Norm and Voluntariness: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.168	.359		3.257	.001		
	Ease	.369	.032	.505	11.649	<.001	1.000	1.000
2	(Constant)	.940	.353		2.664	.008		
	Ease	.248	.040	.339	6.177	<.001	.592	1.690
	Usefulness	.181	.038	.260	4.730	<.001	.592	1.690
3	(Constant)	.948	.353		2.687	.008		
	Ease	.245	.040	.335	6.086	<.001	.588	1.701
	Usefulness	.184	.038	.264	4.790	<.001	.586	1.706
	Interaction Norm and Voluntariness	-.108	.124	-.037	-.873	.383	.990	1.010

a. Dependent Variable: Intent

Table 12.57 Predicting Social Image through Social Norm: Models Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.385[a]	.149	.146	3.887	.149	69.068	1	396	<.001

a. Predictors: (Constant), Social Norm

Table 12.58 Predicting Social Image through Social Norm and Voluntariness: Coefficients and Collinearity Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	5.350	.445		12.019	<.001		
	Social Norm	.588	.071	.385	8.311	<.001	1.000	1.000

a. Dependent Variable: Social Image