Towards a better understanding of the intention to use eHealth services by medical professionals: the case of developing countries.

A thesis submitted in partial fulfilment
of the requirements for the degree of

Doctor of Business Administration

By

Patrice Anne Nuq

University of Newcastle   Grenoble Ecole de Management

School of Management

January 2012

Abstract

Healthcare services are a necessity for every country, and particularly in developing countries, where the shortage of medical professionals is greatest. To resolve this issue, it requires substantial resources that are not available. Therefore, the recent advancement in Information and Communication Technology (ICT) provides the platform for innovative eHealth services and the opportunity for improving access to medical services.

Despite Governments, International Organisations, and companies' growing interest in eHealth Services for enabling access to medical treatment using ICT, research in developing countries related to user behavioural intention of these services remains relatively scarce.

This is a research study to identify and measure the motivational factors that would expedite the introduction and widespread use of eHealth services in developing countries. More specifically, it endeavours to understand what factors would motivate medical professionals to successfully adopt eHealth Services. The study aims to identify and measure the determinants that would lead to successful adoption of eHealth services. This thesis is, thus, a services marketing study.
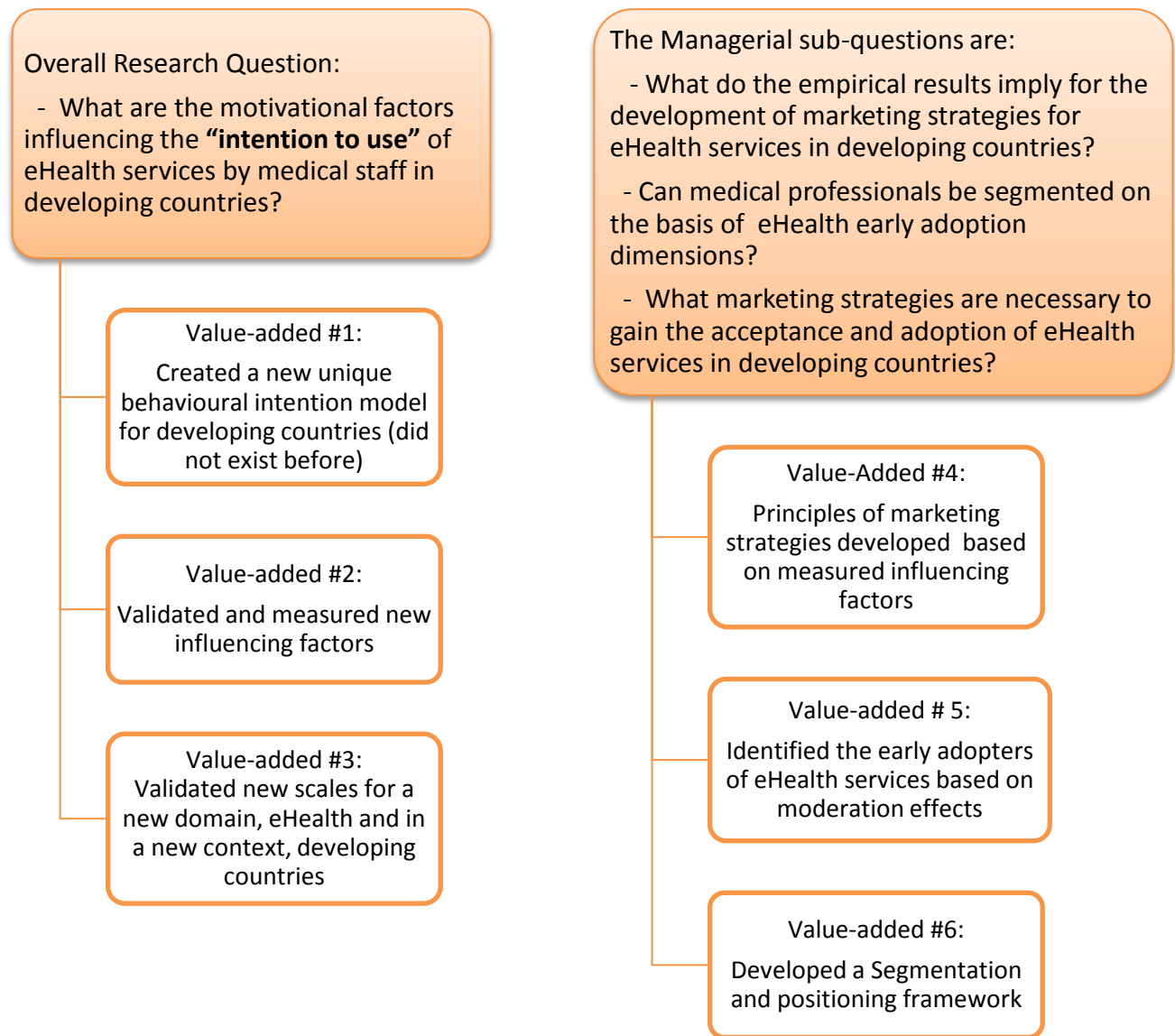
To achieve this goal, a literature review was conducted in order to develop an original conceptual model of eHealth services in developing countries. Based on the literature review, an exploratory qualitative study was undertaken to assess awareness and gain insight into specific motivational factors which are incorporated into the original conceptual behavioural model. A reliable and valid model to measure behavioural intention to use eHealth services in developing countries was developed. This model incorporates several influencing factors determining usage intention and the analysis also tests a set of hypotheses covering moderating effects. The experimental fieldwork was conducted in cooperation with the International Telecommunications Union Study Group on eHealth and with local medical institutions in several developing countries having formalized cooperation agreements with the University where the researcher works. The study draws on responses from a sample of 549 medical professionals from ten developing countries. As the nature of this study is exploratory, factor and multiple regression analysis were used to test the hypotheses.

The results of the research were two-fold. First, unique, new constructs based on The Unified Theory of Acceptance and Use of Technology (UTAUT) model to measure behavioural intention by medical professionals in developing countries were developed. Second, a model which details relationships between motivational factors and behavioural intention was proposed and validated based on the specific domain of eHealth services.

This thesis answered the research questions, "What are the motivational factors influencing the **"intention to use"** of eHealth services by medical staff in developing countries", and the managerial sub-questions, "What do the empirical results imply for the development of marketing strategies for eHealth services in developing countries? Can medical professionals be segmented on the basis of eHealth early adoption dimensions? What marketing strategies are necessary to gain the acceptance and adoption of eHealth services in developing countries?"

The main contributions of this thesis to theory and practice are as follows:

Figure 1: Main contributions to Theory and Practice

Overall Research Question:

- What are the motivational factors influencing the **"intention to use"** of eHealth services by medical staff in developing countries?

The Managerial sub-questions are:

- What do the empirical results imply for the development of marketing strategies for eHealth services in developing countries?

- Can medical professionals be segmented on the basis of eHealth early adoption dimensions?

- What marketing strategies are necessary to gain the acceptance and adoption of eHealth services in developing countries?

Value-added #1:

Created a new unique behavioural intention model for developing countries (did not exist before)

Value-added #2:

Validated and measured new influencing factors

Value-added #3:

Validated new scales for a new domain, eHealth and in a new context, developing countries

Value-Added #4:

Principles of marketing strategies developed based on measured influencing factors

Value-added # 5:

Identified the early adopters of eHealth services based on moderation effects

Value-added #6:

Developed a Segmentation and positioning framework

This study contributes to academic theory through the creation of a behavioural intention model for eHealth services in developing countries, and by extending and modifying the UTAUT model to a new service (eHealth) and a new environment (developing countries). eHealth has not reached critical mass and this research study aims to move this new innovative service from pilot to full-scaled schemes. The study contributes to management practice by providing a new

understanding of the factors that would encourage medical professionals and medical administration to use eHealth Services. These results can be used to develop principles for a marketing strategy framework aimed at providers of eHealth services in the private sector. Specifically, this thesis identifies the early adopters of these services and proposes a market segmentation and positioning strategy focused on the key stakeholders in this field. The results of this study can also inform international bodies tasked with promoting eHealth solutions in developing countries, such as the International Telecommunications Union Development Sector to help in the progression of eHealth services in developing countries.

eHealth is an important international topic and is on the agenda of international and governmental organisations, such as: the International Telecommunications Union (ITU), the World Health Organisation (WHO), the European Union (EU), and others for more than ten years. However, the diffusion of eHealth services is rather slow and for this reason it is important to understand the main obstacles and user influencing factors for developing an applied marketing strategy.

Acknowledgements

This part of the thesis is dedicated to those who have inspired and supported me throughout the duration of this study. First, I would like to thank Dr. Leonid Androuchko. Dr. Androuchko shared with me his vast knowledge of the subject and never tired to discuss the interworking of this domain through his involvement with the ITU Study Group 2, Question 14 on eHealth services.

I am also grateful for the great advice and support that I received from both supervisors, Dr. Benoit Aubert and Dr. Matthew Gorton. I benefited from their expert knowledge in research, theories, and data analysis which helped to facilitate this study.

I would also like to acknowledge the support that I received from Ms. Cheryl Arndt who spent many hours assisting me during the data collection stage.

I would like to thank Mr. Eric Willumsen, Director of the International University in Geneva who gave me both institutional and personal support for this study.

Finally, I would like to thank my family who gave me constant support and encouragement as I spent much mental time away from them during this research journey, Thank you Didier and Viviane.

I would also like to thank Mrs. Gloria Jones and Mrs. Mary Lolli who has always been there for me in my life and gave me continuous support throughout this study.

Table of Contents

VIII

List of Figures

List of Tables

Introduction

Research Background

This thesis considers an innovative new electronic service in healthcare, eHealth, focusing on innovation adoption, specifically the factors determining usage intention. This is a research study to identify and measure the motivational factors that would expedite the introduction and widespread use of eHealth services in developing countries.

eHealth is the use of electronic information and communication technologies (ICT) in the domain of healthcare. It allows physicians and healthcare specialists to diagnose and provide advice for the treatment of patients at a distance using ICT technologies. The physician can also access by using the Internet, up-to-date medical data or gain expert advice from other medical professionals and therefore, obtain more accurate solutions for diagnosis and treatment of patients.

The World Telecommunication Development Conference convened by the International Telecommunication Union (ITU) in Buenos Aires, Argentina on March 1994, recommended that the ITU study the potential of eHealth to meet some of the needs of developing countries (Wright and Androuchko, 1996).

The application of eHealth services has different goals in developed and developing countries. For developed countries, the main goals are to reduce healthcare budgets and to find solutions for an aging population (European Commission, 2010). For developing countries, the main goals are to provide and/or improve access to medical services for populations living in rural and remote areas, and to more efficiently use limited healthcare resources (Bordé *et al.*, 2010).

The most acute needs are in developing countries where, according to the World Health Report 2006 "Working together for Health" there is an estimated shortage of almost 4.3 million doctors, midwives, nurses and support workers worldwide. The poorest countries are worst hit, especially those in Africa with 24% of the global burden of diseases but only 3% of health workers commanding less than 1% of world health expenditure (WHO, 2006, p.1).

The dramatic shortage of healthcare workers in developing countries has been aggravated by the migration of skilled professionals to developed countries (Mathauer and Imhoff, 2006).

Africa thus finds itself at the epicentre of the global health workforce crisis. However, the problem is not confined to a specific continent - a recent survey by the Indian Medical society (Ministry of Communications and Information Technology, 2003) found 75% of qualified consulting doctors practice in urban centres, 23% in semi-urban areas, and only 2% in rural areas whereas the majority of the population live in rural areas.

The driving forces behind the introduction of eHealth services are the high costs of traditional healthcare services, the shortage of medical staff in developing countries, the lack of qualified staff in developing countries, and the advancements of IT and telecommunications (Wootton, 2005).

Due to the advancement of telecommunications in developing countries, cost-effective, efficient and fast transmission of medical data is becoming more feasible. For example, the proliferation of mobile communications enables countries that have weak fixed infrastructures to develop faster and more efficient communications, such as the case in India where eHealth is developing at a rapid pace compared to other developing countries due to an improved communications' infrastructure (Ghosh *et al.,* 2009).

Some early pilot projects that were implemented in developing countries had limited success. This was due to a lack of external financing and the fact that it was not fully integrated into existing health care systems (Macduff *et al.,* 2001). Other pilot projects failed due to ICT issues where connections were too slow or did not work consistently. With the advancement of Internet connectivity using mobile technology, developing countries are now at a stage where eHealth can start to be realized. This study is now at a point where marketing is critical to eHealth adoption, i.e. intention to use and implementation of eHealth services.

This thesis is linked to the work of the International Telecommunications Union (ITU). In accordance with the decisions of two World Telecommunication Development Conferences (Buenos Aires (1994) and Valletta (1998)), the Telecommunications Development Bureau

(BDT) of the ITU has undertaken various activities related to the study of the potential benefit of eHealth applications in developing countries as well as the demonstration of these applications in implementing eHealth pilot projects in selected countries. The question about eHealth was raised for the first time in March 1994 by representatives of several developing countries in Buenos Aires (Argentina) where the BDT convened the First World Telecommunication Development Conference (WTDC).

The Conference recommended that the BDT study the potential of eHealth to meet some of the needs of developing countries for the improvement of access to healthcare services. The 1994 Conference approved Question 6 (in 1998 it was re-numbered as Question 14) on eHealth which was assigned to Study Group 2 of the ITU Development Sector; as well as Recommendation No. 1 on the Application of Telecommunications to Health and other Social Services. The Conference noted that "…the widespread use of eHealth services could allow universal health access and consequently facilitate the solution of the principal health problems connected with infectious disease, paediatrics, cardiology, etc., particularly in areas where medical structures are inadequate or non-existing" (WTDC, 1994, p.911).

The working method of any Study Group in the ITU is to study a Question by a team of volunteers from different countries, classified as Member States and Sector Members. Therefore, the ITU Study Group is able to present a worldwide experience and to share the information on best practice among countries. Each Question has its own Plan of Action.

The ITU eHealth Study Group is unique in the world dealing with the needs of developing countries and it consists of experts from developed and developing countries. The International University in Geneva has two representatives in this eHealth group. It is Professor, Dr. Leonid Androuchko and Associate Professor, Patrice Anne Nuq. Dr. Androuchko is also the Chairman of this group for many years and a well-known international expert who has participated in the implementation of several eHealth projects in developing countries working for the ITU, the

World Bank, United Nations Industrial Development Organization (UNIDO), the Ministry of Health in Oman, etc.[1]

The work done by the ITU indicated clearly that developing countries have an overwhelming need for the provision of medical and health care services, especially in non-urban and rural areas where eHealth could be an economic means of achieving national health policy objectives with regard to improvement and/or extension of medical and health care (Second World Telecommunication Development Conference, 1998).

The third World Telecommunication Development Conference (WTDC-02) which was in Istanbul, Turkey in March 2002 approved Resolution 41 on eHealth. This Resolution is the background document for the development of eHealth policy. The Resolution requested the ITU "… to continue its effort to raise the awareness of decision-makers and other key players about the benefit of telecommunications for eHealth applications". This Resolution also instructed the members of the ITU eHealth Study Group to actively promote the adoption of eHealth services in developing countries and to check the awareness of medical staff in developing countries concerning these innovative services. Therefore, this thesis is in line with the ITU Resolution 41. Moreover, this study went deeper to better understand user motivational factors for the adoption of eHealth services and to collect the opinions and suggestions of medical staff in developing countries in order to be able to develop the principles for a marketing strategy.

The latest Resolution in Telecommunication/ICT applications for e-Health, Resolution 65 (Hyderabad, 2010) was highlighted at the Plenipotentiary Conference of the International Telecommunication Union (Guadalajara, 2010). This resolution also works on improving access to healthcare services by using ICTs. User intentions and behaviour are not addressed in the latest resolution which gives credence to this thesis.

Governments in most developing countries are looking to improve their health care systems. However, they have difficulty due to the chronic lack of resources. For this reason, there is a

---

[1] There are two meetings of the ITU eHealth study group every year. One meeting is a small expert meeting to discuss progress achieved in the study and to clarify new fields for study. The second meeting is the annual meeting of the ITU-D Study Group 2 where more than 50 countries attend and review all member contributions.

worldwide trend to utilize the private healthcare sector in the delivery of healthcare services. Marketing is becoming an important element in healthcare services as a way to assist and direct private sector investment in this field. However, the private sector, before entering developing countries, need to understand the market potential through studying medical professionals' attitudes and intention towards these new services in eHealth. ICT advancements have extended the reach of these services to remote areas which is a further attraction to private sector companies. This bridge between the public and private sectors is referred to as private-public partnership (PPP) (ITU, 2010).

Governments and International Organizations are therefore looking to the private sector to provide financial investment, marketing, and offer new medical services in developing countries.

Overview of research problem

Due to the newness of eHealth services, particularly in the environment of developing countries, there is limited previous academic research. Where it does exist, the majority of the research published relates to developed countries (Chau and Hu, 2002). The literature also identifies that the healthcare industry lags behind other industries in the utilization of ICT applications (Schaper and Pervan, 2007). This thesis focuses on a key gap in the literature, medical professionals' attitudes and intention to use eHealth services in developing countries from a marketing perspective.

This thesis is based on the need for scientific research and managerial understanding in the area of eHealth services, focusing on the behavioural intentions of medical staff in developing countries. The majority of current implementation schemes for eHealth services do not adequately address the motivational drivers of users, i.e. the healthcare professionals in developing countries. The literature and management practice is primarily focused on technology acceptance and lacks scientific evidence in the marketing discipline, and specifically, how to market eHealth services in developing countries from a user (the medical professional and administration) behavioural perspective.

Therefore, this study aims to identify those factors from a user behaviour standpoint. The literature points out that the intention-behaviour relationship is well documented and has been found to be conclusive when applied to industry and health-care contexts (Davis *et al.,*1989; Chau and Hu, 2001; Chismar and Wiley-Patton, 2003; Sheppard *et al.,*1988; Venkatesh *et al*., 2003).

According to innovation diffusion theories (Rogers, 1983), a critical mass is required in order for an innovation to become successful. Critical mass is reached at the point where there are enough adopters that further diffusion becomes sustainable (Rogers, 2003).

The factors that can influence the adoption of innovations, which are relevant to eHealth technology, are explored further in the literature review.

Research Objectives

The research objective is to **identify** and **measure** the motivational factors that would influence medical staff in developing countries to adopt eHealth services and make the transition to critical mass status. This is achieved through the creation of a new, unique research model for eHealth services in developing countries, derived from the UTAUT literature. Specific influencing factors for eHealth in the environment of developing countries are identified and measured. As part of this new research model, modified and new scales are defined and validated.

The research outcome is to provide the basis for global marketing strategies and a marketing approach for eHealth services in developing countries based on the factors that underpin the behavioural intentions of medical staff. The principles for marketing strategies are presented in Chapter 6 within the section on managerial contributions. Included in this marketing principles' framework is the identification of early adopters, the development of a segmentation and positioning strategy, and a stakeholders' framework.

As eHealth covers a wide spectrum of healthcare applications, for the purpose of this research, this study focuses on clinical aspects; diagnoses and treatment solutions of eHealth performed

with the help of ICTs by doctors and medical staff. This will be further explained in Chapter 1 under eHealth definitions. In the literature review, it is stated that eHealth can impact both patients and doctors. This thesis studies eHealth from the perspective of medical staff's attitudes and intention to use this new eService. Consumer behaviour and innovation adoption models are applied in this context.

Research Question

Based on the research objectives as stated above, the overall research question is:

What are the motivational factors influencing the **"intention to use"** eHealth services by medical staff in developing countries?

The Managerial sub-questions are: What do the empirical results imply for the development of marketing strategies for eHealth services in developing countries?

What marketing strategies are necessary to gain the acceptance and adoption of eHealth services in developing countries?

Can medical professionals be segmented on the basis of eHealth early adoption dimensions?

The key factors influencing behavioural intention are described in the research model (described later) as perceived drivers of intention to use eHealth services in developing countries. The literature clearly explains the positive relationship between attitude, intention, and use (Chau and Hu, 2001; Davis *et al.,* 1989; Venkatesh *et al*., 2003).

Expected Contribution of Research

Theoretical Contribution

The expected contribution of this research is to extend and modify the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh *et al*., 2003) to fit the environment of healthcare in developing countries. This model is frequently applied for studies of user acceptance within developed countries and specifically, the United States of America. This thesis is the first scholarly research study using this model for behavioural intention in the

context of clinical eHealth services in several developing countries. Other studies on user intentions were conducted using the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB) (Chau and Hu, 2002; Kifle *et al.*, 2008). The Chau and Hu (2002) study was also conducted in one country, Hong Kong, which is not considered a developing country.

The research model in this thesis tests the constructs of the UTAUT model adapted for eHealth services in developing countries and adds some new constructs that fit specifically with eHealth services in the environment of developing countries. This extension assumes that UTAUT holds in developing countries, however, the model requires adaptation for these different markets.

Since the start of the research project, a new study on eHealth services in Thailand was conducted using the UTAUT model (Kijsanayotin and Pannarunothai, 2009). The latter study is one of the first ones to use UTAUT in a developing country context; however, it was conducted for only one country and was done in the context of predicted IT use for administrative, rather than clinical purposes. This thesis addresses access to clinical applications.

This research also considers more than one developing country, specifically ten countries, which enhances the contribution to knowledge and to practice.

Managerial Contribution

The managerial contribution will be the identification of the verified influencing factors for eHealth services adoption and the development of marketing principles for eHealth services in developing countries. The results of the literature review, the qualitative exploratory study, the quantitative pilot, and the quantitative final study will form the framework for management practice. The managerial contribution will help both the private and public sectors in the advancement of eHealth services in developing countries. The marketing approach will address segmentation, targeting and positioning strategies.

This contribution can be used by many private companies providing eHealth services as well as International Organizations to expedite the adoption of eHealth services in developing countries and especially, help advance the work of the ITU Study Group 2 on eHealth.

Scope of the research

To accurately answer the research questions and in order to meet the objectives, the scope of this thesis is limited. Factors identified from the literature review, the qualitative study, and the quantitative pilot are included in the conceptual research model. Within a specific research context, the behavioural intention relationship and eight influencing factors (performance, support/infrastructure and social factors) are chosen.

Conceptually, this thesis is positioned within the domain of services marketing as an innovative eService.

More precisely, it is in the user behaviour or consumer behaviour part of services marketing.

From a context point of view, the study is concerned with developing countries. As for management implications, the scope of this study is focused on the ITU, as the author of this research is a member of the ITU study group on eHealth as explained above.

The scope of this thesis is the **"intention to use"** eHealth services by medical professionals in developing countries. Identifying the influencing factors underpinning behavioural intention is a necessary step for moving eHealth services from pilot projects to the full implementation stage. As these new services have not even reached general user awareness in most developing countries, therefore, studying attitudes and intention as a way to gain acceptance is an important step prior to the realisation of full-scale eHealth implementations. This study is consistent with other marketing studies where intention to use and attitudes are studied as a positive predictor of future use (Ajzen, 1991). Thus, as mentioned throughout this introduction, the scope of this thesis is to scientifically validate and measure the key user motivators for eHealth services adoption in developing countries.

Research Methodology and Data Collection

This research study used mixed methods for primary research. The study commenced with a thorough review of the literature which identified the gaps which are discussed in Chapter 2. Based on these gaps, an exploratory qualitative study was undertaken. The objective of this study was to explore the field of eHealth in the environment of developing countries. Once this was undertaken, a better picture of this subject within developing countries was understood. This

discovery was used in the formulation of the hypotheses testing for the quantitative study. Mixed methods are used to extend the breadth of the subject under investigation (Greene *et al*., 1989).

An initial exploratory qualitative survey to assess awareness and attitudes was conducted in five developing countries: Malaysia, Uganda, Pakistan, Mexico, and Bhutan.
This qualitative study also helped frame the research model and hypotheses for testing. Results show that the countries are at different levels of awareness.

Quantitative research followed qualitative research through hypothesis testing to validate and measure the effects of user motivational factors for eHealth adoption in developing countries. The hypotheses were based partially on constructs from a proven behavioural intention model, the UTAUT model, and by adding new constructs formulated from the qualitative study. The research was conducted in six developing countries: Malaysia, Mongolia, Sri Lanka, Saudi Arabia, Argentina and Kazakhstan. All of the countries used in both the qualitative and quantitative studies are from a pool of developing countries who are actively participating in the ITU's study group 2, Question 14 "Telecommunication for eHealth" and also with local medical institutions in developing countries having formalized cooperation agreements with the International University in Geneva where the author of this research works. As the objective of this study is to measure influencing factors for behavioural intention in developing countries, it was deemed important to conduct the research in a range of developing countries, thus the reason for including different countries in the two studies. The exception was Malaysia, which was used in both the qualitative and quantitative studies. This broad base of developing countries adds to the knowledge in the field of eHealth behavioural intention as no study to the best of my knowledge covers such an expansive number of developing countries.

Data Collection

This thesis draws on two channels for the collection of data. One channel is the author's membership in a special international study group of the ITU dealing with the promotion and implementation of pilot eHealth projects for many years in developing countries. The second channel is through several cooperation agreements signed by the International University in

Geneva where the author works with medical organizations in developing countries. These agreements are in relation with the University research projects in the field of eHealth solutions and services. The University has signed agreements with the following countries: Malaysia, Sri Lanka, Tanzania and Mongolia. The author is the leader of the project "Marketing of new innovative services in developed and developing countries" and Professor Dr. Leonid Androuchko is the leader of the project "Telecommunications and Information Technologies in health care (eHealth) – innovative areas of business" at the International University in Geneva. The main goal of the thesis is ambitious as it was necessary to study the situation in multiple developing countries in order to better understand and measure all main obstacles delaying the widespread introduction of eHealth services in developing countries.

The selection of developing countries for this study was done on the basis of the research objectives and taking into account the real motivation of some countries to participate in this research. This was possible to check through the author's participation in the ITU study group and meeting members of this group which is a mixture of telecommunication and medical experts from many developed and developing countries. It is important to note that it is difficult to obtain good, reliable information from developing countries. It is also not possible to rely on the simple distribution of a questionnaire in a selected group and wait for their reply. It does not work in the environment of developing countries. This is in line with Eisenhart and Howe's (1990) standards. One of the main advantages to be associated with this group of experts from many countries is that they know the subject. They are also interested to benefit from the results of this study. It was easy to brief them and explain the main objectives of the research. For each country participating in the research, there was a contact person. Some of them were even co-authors of publications with the author of this thesis. The list of experts is presented below.

Table 1: List of Experts

Country	Name of contact person	Contact details
Pakistan	Dr. Asif Zafar Malik,	Professor of Surgery at Rawalpindi Medical College and Director of Holy Family Hospital in Rawalpindi, Pakistan
Uganda	Dr. Catherine Omaswa	Mulago Hospital, Kampala, Uganda, and Chairperson of the Telemedicine Association in Uganda
Bhutan	Ms.L. Lungten	ICT Officer in the Ministry of Health in Bhutan
Malaysia	Dr. Nathan Vytialingam	Faculty of Medicine and Health Sciences, University Putra, Malaysia

These participants in the data collection process will be referred to as the "data collection network" throughout this thesis. This approach to data collection is consistent with other studies (Raimondo *et al*., 2008).

Publications and Conferences

The major contributions of the thesis are theory extensions, the development of a specific behavioural intention model for developing countries, and marketing strategies' principles for management practice. During the course of this research, articles were published in relation to this study. Other papers were presented at Med-e-Tel, an International Conference on eHealth in Luxembourg.

Table 2: Publications

Nuq, P.A. (2011). Market Study of Innovative Services in Health Care: Towards A Better Understanding of Medical Staff Acceptance in Two Case Studies. Proceedings of the Conference Med-e-Tel, Luxembourg, April 6-8, 2011.

Nuq, P.A. (2010). How Medical Staff in Developing Countries is ready to accept eHealth Solutions. A Research Study made in Developing Countries. Proceedings of the Conference Med-e-Tel, Luxembourg, April 13-15, 2010.

Nuq, P.A. & Androuchko, V. (2009). Medical Professionals' Behavioural Intention to Use eHealth Services in Developing Countries: A Conceptual Model. Journal of eHealth Technology and Application, Volume 7, Number 2.

Nuq, P.A. (2009). eHealth Services Marketing in Developing Countries: A Conceptual Model for Understanding Behavioural Intention to Use eHealth Services in Developing Countries, Proceedings of the Conference Med-e-Tel, Luxembourg, April 1-3, 2009.

Nuq, P.A. (2009). IUG Business Review, May 2009.

Nuq, P.A. (2008). eHealth Market Segmentation Framework in Developing Countries. Global Telemedicine and eHealth Updates, Volume 1.

Nuq, P.A., Androuchko, V., Malik, A., Omaswa, C., & Lungten, L. (2008). The role of Education for the Introduction of eHealth services in Developing Countries. Global Telemedicine and eHealth Updates, Volume 1.

Nuq, P.A., & Androuchko, V. (2007). Global Marketing Strategies for eHealth services in Developing Countries. Journal of eHealth Technology and Application, Volume 5, Number 2.

Nuq, P.A., & Androuchko, V. (2007). Role of International Organization in the Promotion and Marketing of eHealth Services for Developing Countries. Proceedings of the Conference Med-e-Tel, Luxembourg, April 18-20, 2007.

Overview of the Study

Figure 2 summarises the structure of the thesis.

Chapter 1 identifies the definitions of eHealth used in the literature and reviews important developments in the field of eHealth. This chapter also identifies case studies in the field of eHealth within the context of developing countries, so that past experience informs the study.

Chapter 2 analyses and debates the merits of classical innovation theories, product diffusion theories and models, and technology acceptance models. These theories and models are analyzed in relation to their application to this research study. This chapter of the literature review also identifies and analyses specific innovation and diffusion theories as applied to the field of Healthcare and/or eHealth. The outcome of the literature review identifies the most appropriate innovation diffusion model used as a blueprint for further behavioural intention factors and moderating effects within the environment of developing countries.

Chapter 3 presents the methodology and results of the qualitative study conducted to assess the general eHealth situation in selected developing countries. The results of this study identify specific motivational factors specific to the environment of developing countries for inclusion within the conceptual research model. The results of the literature review and the qualitative study form the basis of a unique research model for eHealth services in developing countries.

Chapter 4 presents the quantitative pilot study and its outcome. Based on these results, the definitive questionnaire and final research model is presented.

Chapter 5 presents the final quantitative study and hypotheses tested. The results of the hypotheses testing are presented, discussed, and analyzed linking to the literature review and the qualitative study.

Finally, chapter 6 discusses the research results from both a theoretical and managerial standpoint. It outlines the principles for a marketing strategy regarding eHealth services in developing countries. Two case studies from developing countries are presented based on the results of this study and their contribution to management practice is discussed. Figure 2 shows the organisation of this thesis.

Figure 2: Research Organisation

eHealth Services Research Study

Literature Review
Chapters 1 and 2

Ehealth
Definitions and eHealth
Case Studies

Innovation Diffusion and
Acceptance Models
Influencing Factors

Innovation Diffusion and
Acceptance Models applied
to eHealth: Influencing
Factors

Qualitative Study
Chapter 3

Qualitative Research Study
and Conceptual Research
Model

Quantitative Pilot Study
Chapter 4

Instrument
Construction, Pilot, Study
and
Final Research Model

Final Quantitative Study
Chapter 5

Design and Data
Collection

Hypotheses
Results

Interpret Result

Managerial Implications
Chapter 6

Result and
Discussion

Managerial
Contribution

Future Research
Limitations and
Conclusions

Literature Review

Introduction

The purpose of the literature review is to understand the current knowledge in the field of eHealth. The literature review is organised around the research question: what are the key factors influencing the intention to use eHealth services by medical staff in developing countries?

The aim of the first part (Literature review-part 1) is to select the most appropriate definition for this research study in order to delimit the scope of this thesis, and thus clearly position the thesis as to what aspects of eHealth are considered.

The second part (Literature review-part 2) of the literature review identifies generic user behavioural intention models. These models are theoretically validated for gaining user acceptance of new innovative products and services based on ICT. These models are important for this study as it concerns a new innovative service based on ICT. This section of the literature review identified user influencing factors for this study.

The third part (Literature review-part 3) of the literature review identified relevant models for introducing new innovative products and services in order to answer the managerial sub-questions. A review of key theories and models, such as Roger's (1983) diffusion of innovation model guides the principles for marketing strategies.

The fourth part (Literature review-part 4) further looks at product diffusion models, innovation adoption models, intention-behavioural models, and technology acceptance models applied specifically to eHealth services and where applicable to developing countries. This is relevant to see how applicable these models for a new eService (eHealth) are and if these models can be applied to developing countries as they originate from the developed world, specifically the United States of America. The results of these specific eHealth studies are analysed and assessed as to their contribution to this research study. Therefore, the main contributions of knowledge in the literature will be extended to an eHealth context in developing countries. This literature will help form the constructs in the research model and provide guidance for the principles of marketing strategies in Chapter 6.

Figure 3: Organisation and contributions of the literature review
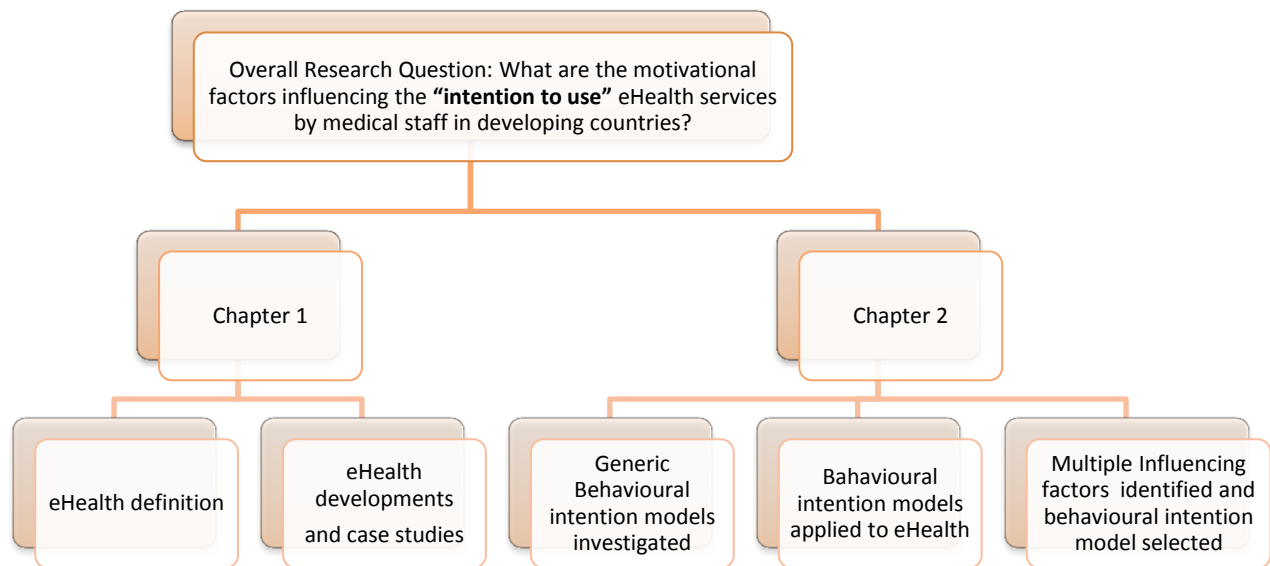
The contributions of chapter 1 include the definition of eHealth and its importance while one definition is selected. Additionally, case studies on eHealth in developing countries are discussed.

The limitations of chapter 1 show that eHealth is limited to pilot schemes.

The contributions of chapter 2 include the definition of performance expectancy, effort expectancy, social influence, and facilitating conditions and their effect on eHealth behavioural intention. The identification and selection of a Behavioural Intention Model (UTAUT) for this study was undertaken.

The limitations of chapter 2 show that behavioural intention models are non-existent for developing countries.

Literature Review - Part 1

Chapter 1: eHealth

1.1 eHealth definitions

This chapter details the definitions from the literature which were the most relevant for this study and best fit the research project both from a theoretical basis and in terms of managerial contribution.

At the end of this section, one definition is presented as the most appropriate basis for this doctoral study. Some of the key definitions of eHealth will be cited in order to present the scope of this subject. Table 3 presents the most important eHealth definitions for this study.

1.1.1 Origins of eHealth

The term eHealth has been in use since the year 1999 and there is no universally accepted or applied definition in the literature. The term eHealth, e-Health, or e-health encompasses medical informatics, but tends to prioritise the delivery of clinical information, care and services rather than the functions of technologies (Wooton *et al.,* 2009).

eHealth evolved from the term Telemedicine and Telehealth. Telemedicine can be traced as early as the 1800's with the introduction of telegraph and telephone services. Telemedicine is defined as the use of ICT to transfer medical information for diagnoses, therapy, and education at a distance (Norris, 2002). The term Telemedicine has a narrow focus concentrating on the clinical aspects of delivering medical services at a distance. Telemedicine is a component of Telehealth which is the generic term for healthcare delivered via telecommunications, such as low- speed, dial-up connections. eHealth followed telehealth and telemedicine and came about due to the eCommerce revolution. It came much later, around 1999, and was enlarged to include additional medical services, such as administrative and educational applications. Regarding the definition of the concept, existing literature shows the absence of a universally accepted or applied definition. This fact has been confirmed by Dr Leonid Androuchko, Chairperson of Study Group 2, ITU (2010), who is worldwide expert in eHealth, explained that currently there is still no single, agreed definition of eHealth and there should be another revision from the term eHealth,

to new labels, such as: Digital Health or Electronic Health. The definitions in the literature follow a path of technological advancements, from simple telegraph and telephone communications, to the use of the Internet, and now towards a definition using broader multi-media applications.

Oh, *et al.* (2005) conducted a systematic review of peer reviewed literature which showed there are 51 definitions of eHealth. The definitions are presented in Appendix 1. Since 2005, the WHO adopted a more consistent definition based on the original definition of Mitchell (1999). All of the definitions had health in them and technology was stated explicitly or implicitly. Some definitions included commercial terms. Most commonly, the term eHealth is associated with services or health care delivery and not with the well-being of patients. While most of the definitions concentrated on the process of care, about one quarter of them focused on the outcomes to be expected. These definitions mentioned improving and increasing the cost-effectiveness of health care and making processes more efficient. Others suggested that eHealth could solve problems related to access to care, cost, quality, and portability of health care services (Oh *et al.*, 2005).

Oh *et al.* (2005) show that the most frequently used definition is:

"e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology" (Eysenbach, 2001, p.20).

The second most cited definition according to Oh *et al.* (2005) is:
"e-health is a new term used to describe the combined use of electronic communication and information technology in the health sector, OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance" (Mitchell, 1999).

The definitions of eHealth are concerned with delivering healthcare using ICT for educational, informational, clinical, and / or administrative purposes.

The following definitions specifically highlight the use of the Internet as a way to make healthcare more efficient. They are:

"eHealth includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. Simply stated, eHealth is making healthcare more efficient, while allowing patients and professionals to do the previously impossible" (Mclendon, 2000, p.22-23).

1.1.2 Selection of eHealth definition

As demonstrated, there is not one standard definition of eHealth. The aim of this study is to adopt a definition which closely aligns to the objective and scope of this doctoral thesis. Therefore, this thesis adopts Mitchell's (1999) definition, *"e-health is a new term used to describe the combined use of electronic communication and information technology in the health sector, OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance"* (Mitchell, 1999).

This definition is adopted because it aligns with the scope of this research which is the use of eHealth services for clinical purposes; the diagnoses and treatment of patients both locally and at a distance (telemedicine) which is included in Mitchell's definition (Mitchell, 1999). This is also the basis for the definition that the World Health Organization adopted.

An important subset of eHealth is telemedicine. Telemedicine is defined as eHealth at a distance. For the purpose of this study, eHealth will be referred to as the subject area with telemedicine as a subset of it. This study comprises both eHealth and Telemedicine for clinical applications.

Table 3: Key eHealth Definitions from Scientific Sources

A new term needed to describe the combined use of electronic communication and information technology in the health sector. The use in the health sector of digital data – transmitted, stored and retrieved electronically – for clinical, educational and administrative purposes, both at the local site and at a distance .	Mitchell 1999
Ehealth refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves. Ehealth includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. Simply stated, Ehealth is making healthcare more efficient, while allowing patients and professionals to do the previously impossible.	McLendon 2000
e-health is the embryonic convergence of wide-reaching technologies like the Internet, computer telephony/interactive voice response, wireless communications,	DeLuca, Enmark 2000
E-health is the process of providing health care via electronic means, in particular over the Internet. It can include teaching, monitoring (e.g. physiologic data), and interaction with health care providers, as well as interaction with other patients afflicted with the same con	Pretlow 2000
The use of the Internet and related information systems and technology in all aspects of health care.	Orlikoff & Totten 2001
e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology	Eysenbach 2001
The combined use of electronic communication and information technology in	Blake 2001

the health sector. It is important to note that e-health is much more than business transactions. It encompasses everything from digital data transmission to purchase orders, lab reports, patient histories and insurance claims.	
E-health is all that's digital or electronic in the healthcare industry	Tieman 2001
The use of electronic information and communications technologies to provide and support health care wherever the participants are located	Brommey 2003
The use of internet technology by the public, health workers, and others to access health and lifestyle information, services and support; it encompasses telemedicine, telecare.	Wyatt and Liu 2002
New business models using technology to assist healthcare providers in caring for patients and providing services.	Sternberg 2004
The integration of the internet into health care	Watson 2004

The numerous definitions in the literature and hundreds of other definitions on the Internet (not included above due to being from non-academic sources) on the subject indicates the importance of eHealth in both academic and managerial circles.

1.2 eHealth Developments

An important development in the diffusion of eHealth services was overseen by the WHO, which initiated an action plan for developing countries. The meeting took place in Cairo, Egypt, in May 2001. The meeting was attended by seventeen countries: Bahrain, Cyprus, Egypt, Islamic Republic of Iran, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia and the Republic of Yemen. The meeting made a number of recommendations addressed to the WHO and to its Member States.

Based on these recommendations a plan of action was developed, at both the regional and the country level. These recommendations included: the provision and development of ICT capabilities for medical professionals in rural settings, a medical health curriculum in universities and for on-going education, and instructions on how to set up health records, health statistics and library databases.

Another important event conducted by the WHO was a first world-wide survey on eHealth as part of the work of the WHO Global Observatory for eHealth (GOe). It was established in early 2005 to provide Member States with strategic information and guidance on effective practices, policies and standards in eHealth. The GOe secretariat is based at the WHO headquarters in Geneva and the networked operation is planned to grow rapidly to include research centres and collaborating partners across the globe.

The 2005 eHealth survey was distributed to all 192 WHO Member States and the outcome was disseminated through a report of the WHO Global Observatory for eHealth, entitled "eHealth tools and services: Needs of the Member States". The report identifies key eHealth action items (WHO, 2005).

The WHO programme on eHealth aims to support countries in further developing their health systems by improving access, quality and efficiency, through the use of ICT. However, these organizations do not consider *user acceptance variables* in their initiatives and therefore, this thesis helps to fill this management gap.

These developments demonstrate the salience of the topic.

1.2.1 eHealth in practice

While there are no consolidated figures available, several eHealth projects have registered with the Telemedicine Information Exchange (TIE) which maintains a database. In developing countries, eHealth projects did not begin until the late 1990s, because of the generally poor telecommunications infrastructure. By the end of 2007 there were about 213 eHealth projects registered with the TIE spread across North America (156 projects), Europe (21), Australia and New Zealand (19), Asia (10), South Americas (4) and Africa (3). As per this database, with 151 registered implementations, United States has the largest number of projects in the world. However, this database only contains projects registered with TIE and there is an underestimation of the extent of eHealth activity around the world. The extent of eHealth projects can be more extensively seen from the proceedings of the 2010 International Med-e-Tel Conference held in Luxembourg and its respective publications.

1.2.2 eHealth Pilot Initiatives (Case Studies)

Following Mitchell's (1991) definition, there are examples of pilot eHealth and telemedicine projects for clinical, educational, and administrative purposes in practice within the developing world. The case studies are consistent with the evolution of eHealth, where early pilot initiatives are based on older technologies in telecommunications, such as low-speed dial-up connections. Whereas, later pilot programmes started to include the Internet and PDA access to medical databases.

A telemedicine pilot project in Cambodia began in February 2001. The project involved a partnership between the non-profit organization, American Assistance for Cambodia (AafC) and Harvard Medical School in Boston, Massachusetts. The aim of the project was to provide remote medical consultancy in rural areas in Cambodia between medical specialists in Boston and medical staff in an urban Cambodian hospital, the Sihanouk hospital centre in Phnom Penh. The lessons learnt after seven years of operation was that sustainable operations must include technology, human, and economic advancements. In the case of Cambodia, a more sophisticated information management system is required, greater physician participation is required, a stronger relationship with the Ministry of Health is needed, skills training in the use of computers, project management, and increased clinical education are also required. Very importantly, local doctors who participated in the project did so on a voluntary basis. For these projects to continue, volunteers and donations from International Organizations and government-sponsored funding are necessary (Heinzelmann *et al.*, 2009).

A telemedicine project started in Uganda during the year 2000. It was funded by the International Development Research Centre (IDRC) in Canada. The project received €327,262 in funding. It focused on health problems such as cholera, malaria, and HIV/AIDS. Telemedicine centres were set up in Mulago and Butabika to conduct online consultations with rural centres and to start a continuing medical education programme. The results were mixed. As was typical of early telemedicine projects in Africa, there were difficulties with the infrastructure and communications. Therefore, no online consultations actually took place between Kampala and the rural health centres. However, it helped to focus government attention on rural health

problems. Lessons learnt were to ensure that a good infrastructure exists and therefore, a country must be suitably equipped in terms of ICT capabilities, and measures of cost-benefit need to be employed (Elder and Clark, 2009).

Apollo Hospitals in India has set up primary healthcare clinics, called Apollo Clinics, in urban areas. These clinics are staffed by medical doctors to attend to basic health needs of the patient. However, these clinics can be tele-networked to a secondary / tertiary care hospital for specialist services. By 2007, Apollo had about 54 clinics with plans to grow to 250 clinics. Recently, Apollo has partnered with ITC Limited to provide health services through their e-network (Apollo, 2007).

Among the case study sites where research was done, mobile telemedicine has been widely practiced in India by both Sankara Nethralaya (SN) and Aravind Eye Hospitals (AEH) in the field of ophthalmology. The vans are typically used for comprehensive eye examinations and provide screening for diabetic retinopathy. The van of the health provider goes to remote places, and takes images of known diabetic patients. Digital case sheets of diabetic patients are sent from the mobile terminal through specialised software to the reading and grading centre at a hospital where all the digital images and information are graded and the opinion is relayed back to the mobile terminal in the van and real time consultation is carried out if necessary.

A pilot project in Kenya conducted at the Kijabe Hospital, serving a rural community, gives medical workers access to an information database. This web-based tool enables medical professionals to have up-to-date information on diagnosis and treatments for medical illnesses. Doctors who participated in the pilot scheme received PDA's and access to data on HIV, malaria, and other illnesses. Initial results are promising as the hospital staff reported that this project has led to greater efficiency by allowing more time with patients and reduced administrative costs (Cisco Internet Business Solutions Group, 2006).

1.2.3 Characteristics of developing countries

It is important to define private versus public providers of health care in the context of developing countries as this will be used throughout this thesis. Therefore, it is conventional to define private providers of health care as those who fall outside the direct control of government (Bennett, 1992). Private ownership includes both for-profit and non-profit providers. For example, private ownership would include health care facilities owned by individuals who seek to earn profits, clinics and hospitals owned by private employers, and those operated by religious missions and other non-governmental organizations (NGO's).

Healthcare services differ greatly between rural and urban areas. Private healthcare providers are more present in urban areas due to the higher income levels of citizens in cities. Patients tend to pay out of pocket expenses for private healthcare services.

One of the critical determinants of geographical imbalances is the availability of qualified personnel (Dussault and Franceschini, 2006). There are many examples of poor countries with adequate infrastructure but lack qualified personnel to operate it. Unbalanced distribution of health workers is a worldwide and longstanding issue. All countries, developed or developing, report a higher proportion of health personnel in urban regions. This imbalanced distribution of health personnel contributed to great disparities in health outcomes between the rural and urban population. In Mexico, life expectancy for the rural areas is 55 years of age, and 71 years in urban areas. Urban environments are more attractive to medical professionals for their comparative social, economic, and professional advantages. Urban regions offer more career opportunities for medical professionals and their families, better services, education, and lifestyle- related services than rural areas. Additionally, medical-related positions are considered more prestigious in urban settings than working in rural or remote areas.

While health problems are more prevalent in rural and remote areas, particularly in developing countries, urban areas report an excess of medical staff. However, staff would prefer to leave the country than to re-locate to rural and remote areas due to the disadvantages that these regions present (Dussault and Franceschini, 2006).

The above case studies were conducted in rural areas having the greatest shortage of qualified medical professionals. More than 2.5 billion people or over 40% of the world's population live in rural areas of developing countries, and therefore, the needs are greater for improved healthcare with the infrastructure requiring a different mix of services.

The case studies also demonstrate that eReadiness is a requirement for the adoption of eHealth services in developing countries. Without access to the Internet, eHealth services' adoption cannot be realised. A country's eReadiness can be benchmarked against other countries in terms of how ready they are to access and use the Internet and Internet-based systems.

Appendix 2 gives an indication of the eReadiness situation of developing countries and specifically the eReadiness of the countries included in this study. The countries that are part of this study are at various levels of eReadiness. This aspect will be taken in consideration as part of the broader marketing strategies.

1.3 Conclusion and Implications for the Research Question

The literature review begins by looking at the subject in a broad sense; covering publications in eHealth for both developed and developing countries. After examining the main definitions of eHealth and telemedicine, the researcher was able to retain a key definition of eHealth and telemedicine, i.e. the clinical aspects of eHealth for this research study. As stated in section 1.1.2, this thesis uses Mitchell's (1999) definition, *"e-health is a new term used to describe the combined use of electronic communication and information technology in the health sector, OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance"* (Mitchell, 1999).

Additionally, Chapter 1 provides a review of the subject including important decisions that were undertaken by an internationally recognized organization (WHO).

The last part of the chapter evaluated some pilot implementation projects in developing countries to help assess the current situation. These case studies demonstrate that eHealth requires research

related to the motivational factors for eHealth adoption by medical professionals. The slow diffusion of eHealth services as evidenced in these case studies gives credence to this study. The case studies identified several obstacles to eHealth adoption which therefore, requires further research. This research study will investigate deeper the obstacles and the factors that would aid in the diffusion of these innovative services.

The lessons learnt from these case studies show the importance of having a working IT infrastructure (measured as the eReadiness of a country). The case studies show that there is a real opportunity for eHealth to improve medical professionals' productivity and enable patients in rural environments where there is a shortage of doctors the opportunity to gain expert advice from medical experts in urban centres without having to physically travel to these hospitals. Additionally, the case studies reported that it is not always easy to get doctors to use eHealth as it is currently utilised by eHealth volunteers or enthusiasts. The case studies indicate that eHealth has not reached critical mass which is a requirement for widespread adoption of a new innovative service. This is in line with the objective of this thesis to understand the influencing factors that would motivate medical professionals to use eHealth on a broader scale. In concluding, eHealth behavioural intention is studied.

Literature Review-Part 2

CONTENTS:

Innovation and Behavioural Intention Models

Chapter 2: Innovation and Behavioural Intention Models: Influencing Factors

The goal of this chapter is to examine theories of innovation and the factors that determine the adoption and diffusion of new products and services. This analysis enables the researcher to ascertain the extent of existing published research in the field of new services innovation adoption, their influencing factors, and to critique its value for the study as it applies to eHealth and developing countries. The latter part of this chapter is dedicated to research studies on behavioural intention as applied to eHealth and telemedicine. The ultimate goal of the literature review is to select the most relevant behavioural intention model and to build upon established theories for this research study. As eHealth is an innovative new service, this chapter will commence with definitions of innovativeness and the steps for getting users to adopt new innovative services. This general understanding of adoption of new innovative services will help in the construction of the research model and in the implications for management. Specifically, Section 2.1 discusses the concept of innovativeness and its relevance and identifies multiple influencing factors for adopting innovative products and services. Section 2.2 presents the most frequently used theoretical models for predicting behavioural intention. Section 2.3 identifies multiple influencing factors from a specific model, the UTAUT, and section 2.4 discusses the selection of the UTAUT model for this research study.

2.1 Innovativeness in new services adoption

Innovativeness is the degree to which an individual adopts an innovation earlier than other members in the system. A goal of marketing strategies is to understand innovativeness to better target activities (Engel *et al.* 1995). The construct of innovativeness is typically measured in one of two ways in market studies. The first measure is based on time of adoption. The second measure is a count of how many of a pre-specified list of new products a particular individual has purchased at the time of the study. This theory in the marketing literature is relevant to this study as eHealth is an innovative service.

Hirshman (1980 pp. 283-295) argues that "Few concepts in the behavioural sciences have as much immediate relevance to consumer behaviour as innovativeness. The propensities of

consumers to adopt novel products, whether they are ideas, goods, or services, can play an important role in theories of brand loyalty, decision making, preference, and communication."

Variations in the adoption and diffusion of new products and services may be due to the perceptions of consumers. For example, the most common adopted topology is Rogers and Shoemakers (1971), who propose five elements for adopting innovations. They are: relative advantage which is the degree to which an innovation is perceived to be superior to prior ones, compatibility which is the extent to which the new product is consistent with existing values and past experiences of the adopter, complexity in terms of the degree to which the innovation is difficult to understand and use, trial ability which is the degree the innovation is tried by consumers on a limited basis, and observability which the innovation is visible to others to see. These adopter-related variables are frequently used in predicting the uptake of new innovative products and services. Ostlund (1974) was able to correctly classify innovators 79 percent of the time using these five characteristics.

Novelty sources, according to Flavell (1977) are the propensity to search for new information as it serves some constructive purpose to the individual such as improved problem-solving skills. Therefore, the consumer may seek information in an effort to improve his or her performance. Relative advantage as defined by Rogers and Shoemakers (1971, p.212) is the "degree to which an innovation is perceived as being better than the idea it supersedes". The product must have benefits that other products do not have. Compatibility or fit with users' work styles is another attribute that is discussed in many publications (Gatignon and Robertson, 1985). Innovation adoption according to Rogers (1983) requires a fit with current work practices. As stated in Chapter 1, the lessons learnt from case studies showed some negative aspects of eHealth adoption regarding the lack of integration within their present working environment, demonstrating a link between Roger's theory and practice as evidenced in the case studies.

Throughout the literature review and discussed in marketing theory (Davis, 1989), technology must be easy to understand and use. This is sometimes moderated by the age and the gender of the user, where younger users and men tend to be more open to new technology (Venkatesh *et al.,* 2003).

Trial ability is an important factor in innovation diffusion as the more people try it and like it, the greater the chance they will continue to use the new technology. Rogers (1983) defines "trial ability" as the degree to which the innovation may be trialled and modified.

Observability is also important as it enables others to see the product or service in use, and therefore, speed up the diffusion process. Rogers (1983) describes observability as the degree to which the results of the innovation are visible to others. If medical staff witness others using it, it should create interest in the new product or service which will lead to a quicker diffusion process.

According to Rogers (1996), diffusion theory became more widely accepted after Coleman *et al*. (1996) conducted a study on the diffusion of a new medical drug, tetracycline. One of the most important findings of this study was that doctors who had more interpersonal networks adopted the new medical drug more quickly than those that did not. This means that interpersonal communication channels with peers have a strong influence on the adoption process. Rogers (1996, p. 419) stated that this study is *"one of the most influential diffusion studies in showing that the diffusion of innovation is essentially a social process that occurs through interpersonal networks"* (Coleman *et al.*1996).

To summarise, this section on innovativeness identified multiple influencing factors for adopting new innovative products and services. They are: relative advantage based on performance, compatibility with current work practices, ease of use of the technology, the ability to make trials and to observe them. These five factors are built into the author's research model (discussed in chapter 3).

2.2 Behavioural Intention and Technology Acceptance Models

The aim of this section is to present the most frequently used theoretical models in the literature which focus specifically on predicting behavioural intention as this is the goal of this doctoral study. In order to answer the theoretical research question regarding the identification of

influencing factors that motivate medical professionals to use eHealth services, the author of this research felt it was necessary to search the literature for behavioural intention models relating to innovation. These behavioural intention models will help identify factors for the author's research design and also aid in the selection of a behavioural intention model for the conceptual research model for this particular study.

The literature explains technology acceptance as an individual's intentional or voluntary use of a technology (Davis, Bagozzi, and Warshaw, 1989). The most widely recognized model of behavioural intention in the literature is the Technology Acceptance Model (TAM) (Ma and Liu, 2004). The original TAM suggests that an intention to accept technology is determined directly by attitude, perceived usefulness, and perceived ease of use. TAM adds one other influencing factor, attitude, to Rogers and Shoemaker's (1971) topology.[2]

Behavioural Intention is widely used in the literature as a predictor of future use (Fishbein and Ajzen, 1975). Therefore, most models incorporate both intention to use and actual use within them.

Figure 4: Original TAM Model
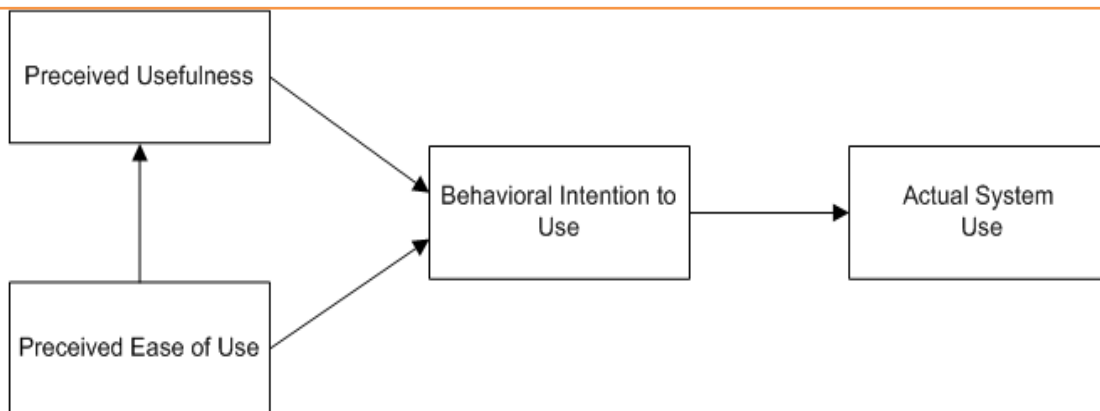
Source: Davis et. al. (1989), Venkatesh et. al. (2003)

---

[2] Perceived usefulness and perceived ease of use are labelled relative advantage and complexity respectively in Roger's and Shoemaker's (1971) topology.

TAM is quite uncomplicated, simple model with two influencing factors: perceived usefulness and perceived ease of use.

Another model widely used to predict innovation adoption is the Theory of Planned Behavior (TPB) (Ajzen, 1988, 1991). The TPB uses behavioural, normative, and control beliefs in addition to attitudes, subjective norms, and perceived control to predict behavioural intentions and in turn to predict behaviour (Ajzen and Fishbein, 1975). This theory postulates three conceptually independent determinants of intention. The first is the attitude toward the behaviour and refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question. The second predictor is a social factor termed subjective norm; it refers to the perceived social pressure to perform or not to perform the behaviour. The third determinant of intention is the degree of perceived behavioural control which refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles. As a general rule, the more favourable the attitude and subjective norm with respect to behaviour, and the greater the perceived behavioural control, the stronger should be an individual's intention to perform the behaviour under consideration. However, in comparisons between the TAM and the TPB as predictors of IT adoption, the TAM is a more parsimonious predictive model (Venkatesh *et al*., 2003). The TPB model is more general than the TAM, and each construct in the TPB has to be reoperationalized when tested in a new setting (Mathieson, Peacock, and Chin, 2001). Therefore, according to Mathieson, Peacock, and Chin (2001), TAM is the better choice when performing an approximate analysis of technology adoption.

An extended technology acceptance model, called TAM2 was introduced by Verkatesh and Davis (2000). This extended model incorporates two additional theoretical constructs: cognitive instrumental processes and social influence processes. The model conceptualises that four cognitive factors influence perceived usefulness: job relevance, output quality, demonstration of results, and perceived ease of use. The three social influences added to TAM are: subjective norm, image, and voluntariness. Therefore, Verkatesh and Davis (2000) define job relevance as an individual's perception of the degree to which the technology is applicable to his or her job. Output quality is an individual's perception of how well a system performs tasks necessary to his

or her job. Being able to demonstrate the results of the tasks in terms of tangibility are also behavioural intention drivers. Perceived ease of use both directly and indirectly impacts on perceived usefulness. The social influential factors are defined as: subjective norm is a person's perception that people who are important to him or her think he or she should or should not use the technology.

Image is the degree to which one perceives the use of technology as a means of enhancing one's status within a social group. Lastly, voluntariness is the extent to which one perceives the adoption decision as non-mandatory.

Figure 5: Extended TAM Model
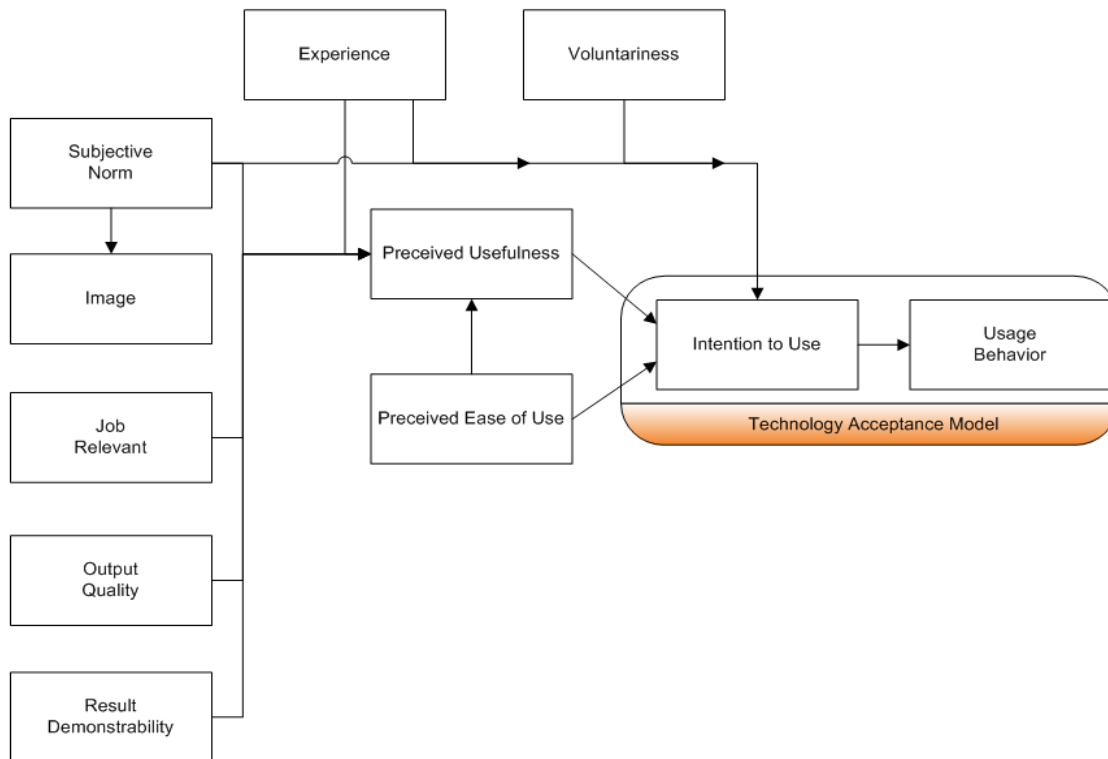
Another user behavioural intention model combined TAM and TPB (Taylor and Todd, 1995). It is a hybrid model of the factors of the TPB (Ajzen, 1991) and the TAM model (Davis, 1989) as described above. This hybrid model uses attitude as a behavioural factor, subjective norm, behavioural control, and perceived usefulness to assess user acceptance.

The Model of PC Utilization (MPCU) (Thompson, Higgins and Howell, 1991; Triandis, 1977 is derived mainly from Triandis' (1977) model of human behaviour. This model was adapted by Thompson *et al.,* (1991) to predict PC utilization. The new constructs added to existing technology acceptance models were: job fit, complexity, social factors, and facilitating conditions.

The motivational model (MM) in psychology was adapted to user acceptance by Davis et al. (1992). The model employs two key constructs: extrinsic motivation and intrinsic motivation. The model uses intrinsic and extrinsic motivations to use computers in the workplace. Intrinsic motivation is defined as the process of performing some behaviour for the purpose of just doing it for yourself. Extrinsic motivation is the process of performing an action based on obtaining external rewards, such as: promotions, increased pay, or improved job performance.

The Social Cognitive Theory (Bandura 1986; Compeau and Higgins 1995a; Compeau and Higgins 1995b; Compeau, Higgins and Huff 1999) is one of the most powerful theories in human behaviour. Compeau and Higgins (1995) applied this model to computer utilization. The core constructs of this model of technology acceptance are: performance expectation, personal outcome expectation such as a sense of accomplishment and individual esteem, self-efficacy as to one's perception of how to use a computer, affect in relation to their liking of the technology, and anxiety whereby exhibiting anxious or emotional reactions when using the computer.

All of the above user acceptance models build upon the original TAM model. These models were then extended with some general psychology theories in human behaviour whereby behavioural intention has been assessed using motivational factors, such as: intrinsic and extrinsic motivation.

The latest and richest behavioural intention and acceptance model is The Unified Theory of Acceptance and Use of Technology (UTAUT) (Figure 6). This model was formulated by leading innovation acceptance researchers and published in the MIS Quarterly (Venkatesh *et al*., 2003). The model was formulated based on conceptual and empirical similarities across eight prominent competing technology acceptance models: Davis' Technology Acceptance Model (TAM) (Davis

1989; Davis, Bagozzi and Warshaw, 1989), Rogers' Innovation Diffusion Theory (IDT) (Rogers, 1995), the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), the Motivation Model (MM) (Davis, Bagozzi and Warshaw, 1992) , the Theory of Planned Behavior (TPB) (Ajzen, 1991), the Combined TAM and TPB (Taylor and Todd, 1995), the Model of PC Utilization (MPCU) (Thompson, Higgins and Howell, 1991; Triandis, 1977, and the Social Cognitive Theory (Bandura, 1986; Compeau and Higgins, 1995a; Compeau and Higgins, 1995b; Compeau, Higgins and Huff, 1999). All of these individual acceptance models are outlined above.

Figure 6: UTAUT Model
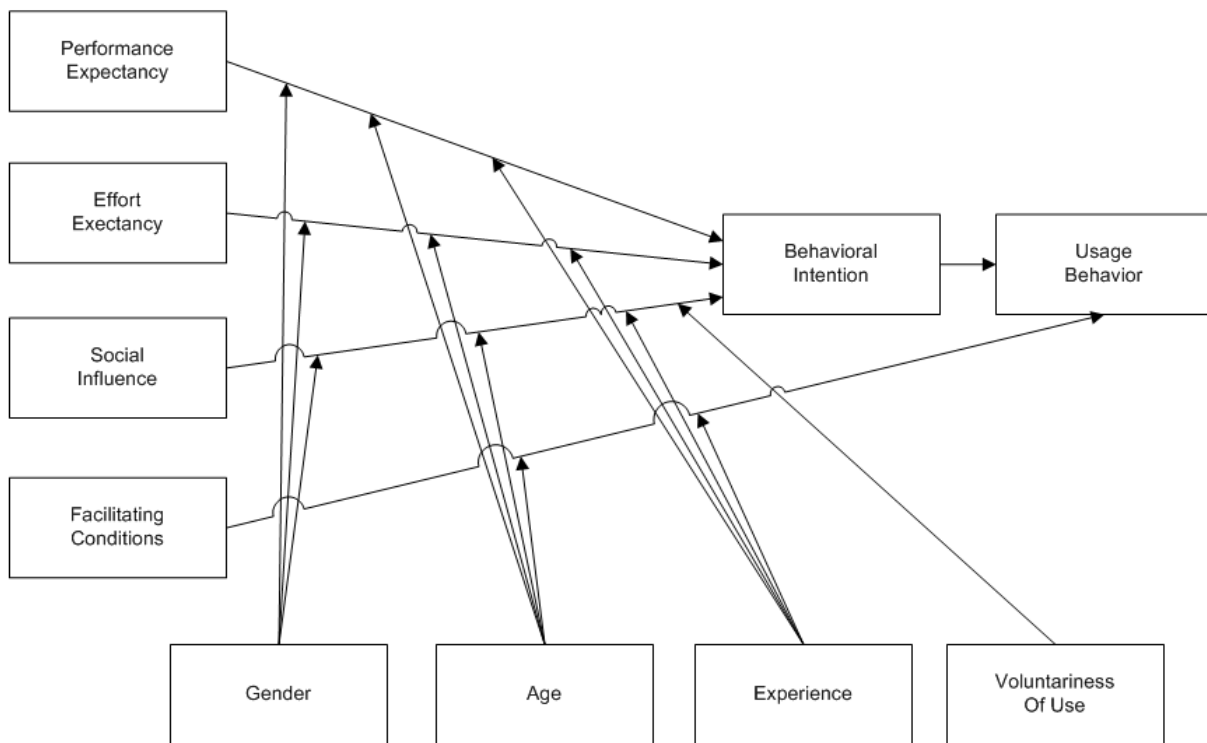
The UTAUT contains four core determinants of user intention and usage, performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh *et al*., 2003).

The variables of gender, age, experience and voluntariness of use moderate the key relationships in the model (Venkatesh *et al*., 2003). The main elements of the model are discussed below.

2.3 Multiple Influencing Factors from UTAUT

The UTAUT model validated and measured four influencing factors and four moderating effects for innovation adoption. The influencing factors are as follows:

2.3.1 Performance Expectancy

According to the UTAUT model, performance expectancy is defined as the degree to which an individual believes that using ICT will help him or her to attain gains in job performance (Venkatesh *et al.,* 2003). In previous acceptance studies, the performance expectancy construct was found to be consistently a strong predictor of intention (Davis, Bagozzi and Warshaw, 1992; Taylor and Todd, 1995; Venkatesh and Davis, 2000; Venkatesh *et al*., 2003).

In a healthcare context, performance expectancy is important to technology acceptance decision-making and may influence behavioural intention both directly and indirectly through the determinant of attitude (Chau and Hu, 2002a). The significance of performance expectancy to health professionals has been consistently shown in those studies that have examined technology acceptance in the sector (Chau and Hu, 2002b; Chismar and Wiley-Patton, 2003; Hu *et al*., 1999; Jayasuriya, 1998).

2.3.2 Effort Expectancy

Effort expectancy is defined as the degree of ease associated with the use of the system (Venkatesh *et al*., 2003).

In stark contrast to technology acceptance studies in other environments, studies completed in the health sector suggest that effort expectancy is not supported in the health professional context (Chau and Hu, 2002b; Chismar and Wiley-Patton, 2003; Hu *et al*., 1999; Jayasuriya, 1998). In all of these studies, effort expectancy (operationalised as 'ease of use') was found to have no significant influence on behavioural intention as medical professionals in those studies were regarded as highly intelligent and also had access to IT support services. However, perceived ease of use is still theorized in this research model as healthcare professionals in developing

countries have significantly less experience with technology and the Internet and therefore, this factor could contribute to behavioural intention.

2.3.3 Organizational Facilitating Conditions

Organizational facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh *et al*., 2003). This incorporates objective factors in the implementation context such as management support, training, and the provision of computer support.

The UTAUT model revealed the insignificance of facilitating conditions in predicting behavioural intention when both performance expectancy and effort expectancy constructs are present in the model (Venkatesh *et al*., 2003). However, the latter's' findings indicate the influence of organizational facilitating conditions on actual usage and not on behavioural intention.

Facilitating factors may be an important factor in developing countries for behavioural intention in developing countries as less support resources are available in this environment.

2.3.4 Compatibility

The UTAUT model does not contain a separate determinant for compatibility and instead combines this construct into facilitating conditions (Venkatesh *et al*., 2003). In this research model, compatibility is defined, as the degree to which an innovation is perceived as being consistent with the existing practices, values, and needs.

In a health care context, compatibility of a technology with existing work practices, values, needs and experiences of the user becomes a crucial determinant for adoption (Rogers, 1995; Taylor and Todd, 1995). This is evidenced in the case studies in Chapter 1 which indicate that the lack of integration with current work practices negatively impacted on the performance of the pilot schemes.

Compatibility may also influence behavioural intention indirectly through performance expectancy and effort expectancy. Chau and Hu (2002a) found support for compatibility of telemedicine technology exerting a significant effect on perceived usefulness. It is feasible that compatibility will directly affect both performance expectancy and effort expectancy, as a medical professional is likely to perceive technology as being useful to their practice, if it is compatible with it; and is likely to believe the technology as easy to use if they view it as compatible with their work practices (Schaper and Pervan, 2007).

2.3.5 Moderators

The UTAUT model incorporates four key moderating variables that were found to significantly influence intention and/or usage behaviour: gender, age, experience and voluntaries of use (Venkatesh *et al.*, 2003).

Venkatesh *et al.* (2003) found that age, experience and voluntariness are likely to exert moderating effects. The effect of gender is more complex and may differ from previous research on technology acceptance. The subjects of prior technology acceptance research have been predominantly male. However, in developing countries many medical services are performed by nurses and midwives and these professions are predominately female. Thus, behavioural intention to use eHealth services in developing countries may not be moderated by gender.

2.4 Conclusion and Implications for the Research Question

Chapter 2 identified the most important theoretical models for predicting behavioural intention. These models were compared and contrasted for their contribution of predicting intention to use for innovative services. The chapter identified the most recent and richest model for the purpose of predicting adoption (UTUAT). This model was selected as the theoretical basis for this research study. In concluding, this section demonstrated the evolution of influencing factors for predicting behavioural intention for new innovations based on Information Technology.

Literature Review- Part 3

Adoption of innovative services: state of the literature for managerial sub-questions

2.5 Innovation Adoption Process

In order to answer the managerial questions, the author of this research felt it was necessary to explore previous research by marketing scholars on the adoption process for innovative services. The marketing literature (Rogers, 1995; Lewis, 1898; Lavidge and Steiner, 1961) presents several models that consider innovation from a consumer perspective. Some of the key models in this area are: the hierarchy of effects model (Lavidge and Steiner, 1961) which identifies the steps that users must go through prior to adopting an innovation. Firstly, the user must be aware of the new product or service, afterwards the user must learn about the innovation and its benefits, secondly, the user must like the offering, thirdly the user must have a conviction about the benefits of this new service and lastly, the user will adopt the new innovation. A second model used in marketing is the AIDA model (Lewis, 1898). This model describes a set of stages that have to be completed for a new product or service to be adopted. These models are summarised and evaluated in Table 4.

Robertson (1989) argues that a user must start by first recognizing the problem. Once a user realizes that he or she has a problem, then the producer of the innovation must ensure that the user knows about the service, understands what it can do for the user, create a favourable attitude of the innovation, set up trials of it and the user should then adopt it. This model seeks to capture the internal workings of the adopter's mind, rather than simply describing behaviour.
Rogers' model (1995) has five elements: knowledge, persuasion, decision, implementation, confirmation. This model acknowledges that persuasion does not necessarily come from the outside such as marketing factors, but from other social factors such as peer pressure. Peer pressure is operationalized in the research model as social influence.

These models seek to identify the factors governing adoption of an innovation. The first step is awareness of the new service or product. This is one of the reasons for performing an exploratory

qualitative study as explained in Chapter 3; to assess the awareness of eHealth services in developing countries. The state and level of awareness will enable an understanding of the process required for the intention of medical staff to use eHealth services. If there is a lack of awareness in eHealth services, then the first step in management practice (principles for marketing strategy) is to develop strategies for creating awareness of eHealth services. In chapter 3, the exploratory qualitative study shows that in general there is limited awareness of eHealth (however, the term is known but the actual benefit and service is understood in only vague terms). Most of the respondents said they would like to know more about eHealth services in terms of what it can do for their medical practice according to the qualitative study as described in Chapter 3.

2.5.1 Characteristics of innovation adopters

Rogers (1983) stated that product diffusion relates to which consumers are most likely to buy new products. There is an assumption that innovation is diffused by word of mouth or that innovators are likely to influence others to buy new products. This is implicit in the product life cycle, and in Roger's observability criterion (Rogers, 1983).

Rogers (1983) classified consumers as innovators, early adopters, early majority, late majority, and laggards (Figure 7).

Figure 7: Diffusion of innovation model
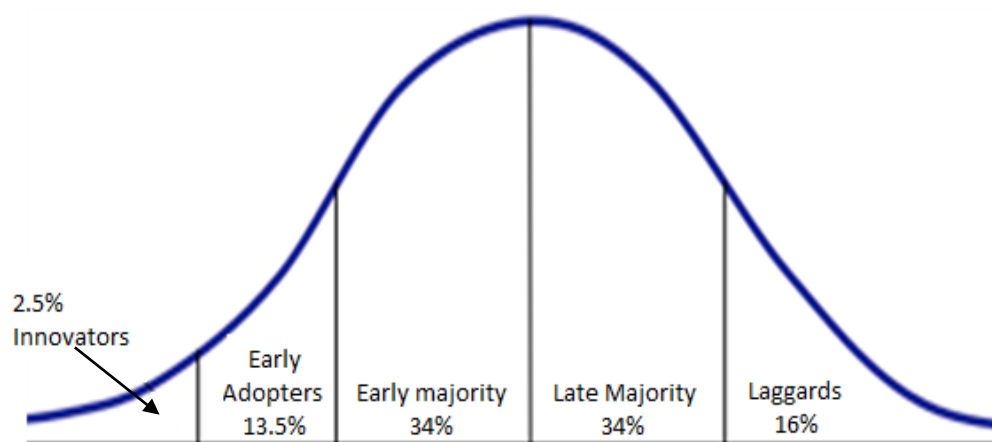
Source: Rogers (1995)

This theory is central to eHealth intention to use by medical staff as it is critical to know who are the likely early adopters of such services, particularly in developing countries as this is one of the managerial sub-questions in this thesis.

Research on this topic helps frame the principles for marketing strategies. Specifically, it is important to see the role of early adopters in developing countries and who they might be. For instance, certain medical experts, government officials, and the experience and age of the doctor might play a role in willingness to adopt eHealth services. These factors are operationalized in the research model.

Feick and Price (1987) identified a group of influencers they call 'market mavens'. A market maven is someone who has an intense interest in, and a good level of general knowledge about the market aspects of a product category. They are motivated by the desire to share information, look like experts, show off their knowledge, and to help others in reaching a decision (Walsh, Gwinner, and Swanson, 2004). This is an interesting aspect of eHealth as some medical staff might be motivated by their desire to look like experts and to 'show off' their knowledge.

eHealth is a new eService that will dynamically affect the core functioning of clinical medicine. This is not seen as a complete replacement of current medical practice but as a service or tool that helps medical staff to make better diagnoses and treatment decisions, both on-site and on a remote basis. However, it will change the lifestyles of medical professionals and patients. As Clarke (2007) notes, eHealth is not an alternative to conventional medical practice, but it has great potential to emerge as a facilitator to conventional healthcare through the provision of services to locations where conventional systems do not reach. For example, the management and follow-up of the patients through video conferencing is a potential application of ICT, which can enable doctors to remotely monitor their patients. Internet-based webcam monitoring applications is also an interesting application.

In innovation adoption research, diffusion modellers (Gatignon and Robertson, 1985) tend to focus their investigations at the aggregate level, and produce models capable of predicting sales of new products. Hence, innovation adoption research is primarily concerned with examining

how an innovation is accepted by the total population in the adoption process, without taking into consideration behavioural and perceptual characteristics of the individual consumer. Innovation adoption studies focus on the identification of who would or would not adopt an innovation, without the support of a theoretical framework outlining how the decision to adopt is arrived at. As envisaged by Gatignon and Robertson (1985), there is a need to combine the theoretical foundations and behavioural verifications available in existing diffusion research into an integrated framework. A output of this research is such a model developed specifically for eHealth adoption in developing countries.

2.5.2 Resistance to innovation acceptance

Resistance to innovation can come from channels of communication. These channels can create a barrier. Communications received from respected opinion leaders will be taken seriously and acted upon, whereas communication from a dissociative group are more likely to be ignored such as a company trying to sell their products or services (Rogers and Shoemaker, 1971).

 Poorly executed advertising can create negative attitudes about the product, as can bad salespeople, over-persuasive mail shots or negative press coverage. However, some forms of communication can aid diffusion such as Internet chat rooms or on-line forums which have enabled fast dissemination of innovations. Therefore, the source of the communication channel is part of innovation acceptance.
 The social system can also create a barrier. The social system is the physical, cultural, and social environment within which decisions are made: for marketers, it usually corresponds to the market segment (or target market). For example, there is a social system which functions in most professions; lawyers discussing cases and doctors discussing with patients or with other doctors cases concerning patients. These social systems may have traditional values, in which case innovation is likely to be hindered, or conversely, the outlook of the social system may stimulate innovation (Rogers and Shoemaker, 1971).

Swick (1998) states that the medical profession has traditional values and Rogers and Shoemaker (1971) indicate that adoption is likely to be hindered. This could explain one of the reasons for the slow diffusion of eHealth services. Hence, this study aims to understand better medical professionals' behavioural intention factors.

The above theories are summarized in Table 4 and evaluated regarding their impact for answering the research questions.

Table 4: Behavioural Intention Theories and Models

Theory	Description	Application to e-Health study
Rogers' Theory of Innovation Adoption (Rogers,1995)	Products would be adopted if products possess the following attributes: Relative Advantage: the product must have some benefits that other products do not have. Compatibility: The product must fit in with the consumer's lifestyle Complexity: The product must not be too complex to understand and use. Trial ability: Products that can be tried out are more likely to succeed. Observability: The more observable the product is, the quicker the diffusion process. If other users are able to see the product in action, this is bound to raise interest in the product.	Is this Theory appropriate for development of the research question: yes Reasons: Relative advantage, compatibility, complexity, trial ability, and observability are built into the research model as performance expectancy, social influence, and medical knowledge constructs. Managerial Implications: If supported in hypotheses testing, these factors will be part of the principles of marketing strategies. Supporting arguments: Qualitative study in Chapter 3

Theory	Description	Application to e-Health study
		shows that opinion leaders are a factor in motivating medical professionals to use eHealth services in developing countries.

Qualitative study in Chapter 3 demonstrates that medical professionals turn to medical experts (opinion leaders) for advice and verification.

Qualitative study in Chapter 3 shows that observability by other medical experts through pilot implementations would be important in eHealth behavioural intention. |
| **Rogers' Model- Knowledge Persuasion, Decision, Implementati on, Conformation (Rogers,1995)** | According to Rogers (1995), innovation is a process of actions and choices that are in progress more or less at once, but an individual always passes through a chronological sequence of five stages as he or she adopts new ideas, practices or objects.

The five stages:

    The knowledge stage involves learning about the innovation.
    The persuasion stage involves the individual forming positive or negative attitudes to the | Is this Theory appropriate for development of the research question: yes

Reasons: These five stages are critical to innovation adoption. Primary research will be conducted to assess awareness of eHealth.

Managerial Implications: The assessment of awareness of eHealth will determine which stage |

Theory	Description	Application to e-Health study
	innovation. The decision stage, the individual then tests the acceptability of the innovation, a decision that may be characterized by some degree of instability. This is done in the individual's thoughts. The implementation stage occurs when an individual decides whether or not to put an innovation into practice. This stage involves a behavioural change. The confirmation stage, involves confirmation or discontinuance of the innovation, where the individual seeks validation to support his\her decision.	medical professionals are in the process of adoption. This will help build the principles for marketing strategies in the final chapter.
AIDA Model **Lewis (1898)**	AIDA model, describes the impact on consumers as beginning with attention, then moving to interest, then desire, and finally action. Or AIDA model is defined as an acronym used in marketing that describes a common list of events that are very often undergone when a person is selling a product or service: A - Attention (Awareness): attract the attention of the customer. I - Interest: raise customer interest by demonstrating features, advantages, and benefits. D - Desire: convince customers that they want and desire the product or service and that it will satisfy their needs. A - Action: lead customers towards taking	Is this Theory appropriate for development of the research question: yes Reasons: These four stages are critical to innovation adoption. Primary research will be conducted to assess awareness, interest and desire of eHealth. Managerial Implications: The AIDA model will be part of the principles for marketing strategies, i.e. the promotion part of the marketing

Theory	Description	Application to e-Health study
	action and/or purchasing. Nowadays some have added another letter to form AIDA(S): S - Satisfaction - satisfies the customer so they become a repeat customer and give referrals to a product.	mix. This will help build the principles for marketing strategies in the final chapter.
Hierarchy of Effects Model Lavidge and Steiner (1961)	A model of the process by which advertising works that assumes a consumer must pass through a sequence of steps from initial awareness to eventual action. The stages include awareness, interest, evaluation, trial, and adoption. A concept related to the manner in which advertising supposedly works; it is based on the premise that advertising moves individuals systematically through a series of psychological stages such as awareness, interest, desire, conviction, and action. An early model that depicted consumer purchasing as a series of stages including awareness, knowledge, liking, preference, conviction, and purchase.	This model is similar to the AIDA model and will be applied and adapted in Chapter 6 under the managerial implications' section.
Rogers' Theory (1983)	The theory of Rogers (1983) is named "The Diffusion of Innovations (DOI)". He proposed that adopters of any new innovation or idea could be categorized as innovators (2.5%), early adopters	Is this Theory appropriate for development of the research question: yes

Theory	Description	Application to e-Health study
	(13.5%), early majority (34%), late majority (34%) and laggards (16%), based on Bell curve mathematic division. These categories, based on standard deviations from the mean of the normal curve, provided a common language for innovation researchers. Each adopter's willingness and ability to adopt an innovation would depend on their awareness, interest, evaluation, trial, and adoption. People could fall into different categories for different innovations, i.e. a farmer might be an early adopter of hybrid corn, but a late majority adopter of VCRs. When graphed, the rate of adoption formed what came to typify the DOI model, an "s shaped curve." (S curve) The graph essentially shows a cumulative percentage of adopters over time – slow at the start, more rapid as adoption increases, then levelling off until only a small percentage of laggards have not adopted. His research and work became widely accepted in communications and technology adoption studies, and also found its way into a variety of other social science studies. Rogers was also able to relate his communications research to practical health problems, including hygiene, family planning, cancer prevention, and drunk driving.	Reasons: Does this theory hold in eHealth services and specifically developing countries? If so, which doctors and /or medical staff are innovators, early adopters, etc? Managerial Implications: This theory will form the basis for a market segmentation in developing countries and as part of the broader principles for marketing strategies.
Feick + Price (1987)	Feick and Price (1987) analyzed some facts about Market Mavens (Propensity to provide market place and shopping information). The market	Is this Theory appropriate for development of the research question: yes

Theory	Description	Application to e-Health study
	maven refers to individual consumers with a propensity to provide general shopping and marketplace information. Market mavens are defined formally as individuals who have information about many kinds of products, places to shop, and other facets of markets and initiate discussions with consumer and respond to requests from consumers for market information.	Reasons: This theory is related to defining doctors and /or medical staff who have a propensity to show-off their knowledge to other colleagues. This is a construct formulated in this study's research model. Managerial Implications: This theory as tested within the social influence construct will enable some principles for marketing strategies. Profiling these medical professionals will help speed up the adoption of eHealth services.
Robertson (1981)	Problem recognition, awareness, comprehension, attitude, legitimation, trial, adoption, and dissonance. This model gets more into the internal workings of the adopter's mind, rather than simply describing behaviour.	Is this Theory appropriate for development of the research question: yes Reasons: This model can be related to medical professionals' attitudes towards eHealth services. Medical professionals' attitudes are tested in my model. Managerial Implications: This model can be used in the

Theory	Description	Application to e-Health study
		principles for marketing strategies.
Gatignon and Robertson (1985)	As envisaged by Gatignon and Robertson (1985), there is a need to combine the theoretical foundations and behavioural verifications available in existing diffusion research into an integrated framework. Gatignon and Robertson (1985) propose that the adoption of an innovation should depend on its fit within the existing consumption system and its ability to compete for scarce resources in order to achieve a position in the consumer's priority acquisition pattern.	Is this Theory appropriate for development of the research question: yes Reasons: This theory is part of performance expectancy construct and is tested in the research model. Compatibility or fit is included in the research model. Managerial Implications: This theory will be part of the principles for marketing strategies. This theory supports the negative aspects of compatibility or fit within the existing system as evidenced in the earlier case studies.

Theory	Description	Application to e-Health study
Fishbein and Ajzen (1975) – TRA and TPB	This theory is about an individual's positive or negative feeling associated with performing a specific behaviour. According to Ajzen and Fishbein (1975), an individual will hold a favourable attitude toward a given behaviour if he/she believes that the performance of the behaviour will lead to mostly positive outcomes; on the contrary, if the individual believes that negative outcomes will result from the behaviour, he/she will hold a negative attitude toward it. The Theory of Reasoned Action of Fishbein and Ajzen assert that intention is the best predictor of behaviour and attitude. The behaviour is made as a rational decision by the individual under the volitional condition and the situation that an individual is in makes a difference in whether the attitude or the subjective norms plays greater role in forming the intention. Ajzen (1987) refined the TRA to include perceived behavioural control as a construct with the revised model labelled the theory of planned behaviour.	Is this Theory appropriate for development of the research question: yes Reasons: This theory is built into the research model. It is essential in answering the research question. This theory where intention is the best predictor of behaviour will help speed up the adoption of eHealth services through the identification of behavioural intention factors. Managerial Implications: This theory will be included in the principles for marketing strategies in Chapter 6.
Davis' Technology Acceptance Model (TAM) (Davis 1989; Davis, Bagozzi and Warshaw 1989).	Model looks at important aspects of technology acceptance in terms of usage benefits and ease of use.	Is this Theory appropriate for development of the research question: yes As eHealth is a new service based on Internet technology, TAM is a key model for predicting doctors' acceptance and usage. The constructs from this model,

Theory	Description	Application to e-Health study
		performance expectancy and ease of use are used in this research study.
The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003)	The Unified Theory of Acceptance and Use of Technology contain four core determinants of intention and usage – performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh, et al., 2003). The variables of gender, age, experience and voluntariness of use moderate the key relationships in the model (Venkatesh, et al., 2003).	Is this Theory appropriate for development of the research question: yes This theory is key to answering the research question as it is the richest model in user intention as it combines 8 competing individual acceptance theories. This combination of individual acceptance theories has the highest explained variance as compared to the individual theories.
Rogers (1995); Taylor and Todd (1995)	In a health care context, compatibility of a technology with the work practices, values, needs and experiences of the user becomes a crucial determinant in acceptance decision-making.	Is this Theory appropriate for development of the research question: yes Pilot implementation case studies in Chapter 1 discussed the importance of compatibility in user adoption.

2.6 Conclusion and Implications for the Research Question

The underlying conceptual approach to this research is the application of innovation adoption and intention to use models that will be the basis for the conceptual research model.

This chapter evaluated the pertinent and most important diffusion and innovation models for the study (Rogers, 1995; Ajzen and Fishbein, 1975; Davis, 1989; Venkatesh *et al.,* 2003). Consumer behaviour adoption marketing process theories and models were analysed (Rogers, 1995; Lewis, 1898; Lavidge and Steiner, 1961).
These generic theories provide the foundation for both the theoretical framework of this study and developing principles for an applied marketing strategy.

Literature Review-Part 4

Intention to Use eHealth services: state of the literature for the overall research question

This part of the literature review is dedicated to research studies conducted in the field of eHealth using behavioural intention models as described in Part 2. Part 2 of the literature review identified and analysed generic behavioural intention models used in the diffusion of innovative products and services. This section of the literature review seeks to deepen the understanding of existing studies using behavioural intention models in the domain of eHealth. As explained throughout this thesis, academic research is sparse in the area of user behaviour, and therefore, these few studies will be analysed with the objective of finding and confirming multiple influencing factors to be used in the conceptual research model as applied to eHealth in developing countries. Finally, the selection of the most relevant behavioural intention model for this empirical study will be undertaken.

2.7 Behavioural Intention Models using eHealth

Schaper and Pervan (2007) state that healthcare lags behind other industries in the use of ICT. Nonetheless, the use of ICT in health is increasing and administration in many hospitals is computerized. Applications, such as: Clinical Information Systems, the Internet, Telemedicine, Personal Digital Assistants, Electronic Patient Records and others will eventually become commonplace in health (Schaper and Pervan, 2007). However, individual medical professionals have not fully embraced ICT (Chismar Wiley-Patton, 2003; Dearne, 2003; Murray, 2002; Wenn *et al*., 2002; Western *et al*., 2001). This reluctance to use ICT applications by medical professionals justifies the need for further research on eHealth user behavioural intention factors.

Although research has listed the reasons for barriers to using ICT within health (Kaplan and Shaw, 2002), there is a "paucity of scientifically rigorous research on acceptance and utilization of ICT within the healthcare industry" (Schaper and Pervan, 2007, p.2). The barriers to ICT use lie in the reluctance of users to accept ICT. This is due to user issues such as: time, training, compatibility within their work practice, roles and responsibilities, and others. A study by Shaw *et al.* (2008) found that ICT implementations must address different user needs in terms of

education and training. Therefore, user acceptance issues will gain increasing importance as the use of ICT continues to penetrate the health sector. In a recent report on Australia's proposed national health information network, HealthConnect, user acceptance issues were discussed as a barrier to successful implementation of the project. This report provided further evidence of the need to increase understanding of user acceptance in order to overcome issues of non-acceptance hindering ICT adoption and successful utilization (Fitzgerald *et al.,* 2003).

Technology acceptance research is a mature field in information systems research (Venkatesh *et al.*, 2003), with many models and theories developed and tested. However, despite the large volume of work in this area, very little research has been conducted in a healthcare context, representing a significant gap in knowledge (Schaper and Pervan, 2007).

2.7.1 Schaper and Pervan study

A research study analyzing the current state of behavioural intention of healthcare acceptance and use of ICT was conducted in Australia with Occupational Therapists (Schaper and Pervan, 2007). The Schaper and Pervan (2007) study used the UTAUT model which is the same behavioural intention and use model selected for this doctoral study. The study provided information on how technology acceptance and utilization of ICT by occupational therapists can be influenced and improved. The study surveyed 600 occupational therapists in Australia to identify the factors that would motivate them to use eHealth applications within their work. The interest of this study is testing behavioural intention using the UTAUT model which is the basis for this research. The key results of this study are the influence of effort expectancy and compatibility on usage intention. There was an absence of effect for social influence, performance expectancy, and attitudes towards computers. However, this study is based on a developed country.

2.7.2 Kijsanayotin *et al.* study

Another recent study using the UTAUT model (Venkatesh *et al.*, 2003) was a study conducted in Thailand (Kijsanayotin *et al.,* 2009). This study surveyed the personnel of community health centres in Thailand for administrative uses of healthcare IT. The findings of the study demonstrated the effect of performance expectancy, effort expectancy, social influence and

voluntariness. The results of this study showed that intention to use health information technology is a function of the perception that health IT is useful, that it is easy to use, that important others believe he or she should use it, and the perception that one has the choice to use IT. All of these factors had predictive power of IT healthcare behavioural intention with performance expectancy having the strongest effect. This is consistent with prior studies (Chau and Hu, 2002; Chismar and Wiley-Patton, 2002; Jayasuriya, 1998). The study validated the UTAUT model in the field of healthcare administrative activities within the context of a single developing country.

2.7.3 Chismar and Wiley-Patton study

Chismar and Wiley-Patton (2002) conducted a study in the healthcare field using the extended Technology Acceptance Model (TAM2). The study was conducted in the United States of America in the context of physician's intention to adopt Internet-based health applications, such as: medical records, e-billing and patient scheduling. Regression analysis was used to explain behavioural intention. The study showed that perceived usefulness was a strong determinant of intention to use. The effects of perceived usefulness and output quality explained 59% of the variance of usage intention by paediatricians. Whereas perceived usefulness had a significant effect on behavioural intention, perceived ease of use and the social processes of subjective norm and image did not.

2.7.4 Jayasuriya study

A study by Jayasuriya (1998) used the TAM model to identify the factors that determine computer acceptance among occupational groups in community health. The study took place in New South Wales, Australia. The study used the constructs from the TAM model, perceived usefulness and perceived ease of use. The results showed that perceived usefulness was the only significant predictor of computer use. The level of education and prior computer use were not significant predictors of intention to use. Therefore, the use of computers does not seem to be related to prior formal or informal training. The implication for health professionals is that health professionals would use computers when they perceive it as improving their job performance. This is consistent with other studies (Chau and Hu, 2002; Kifle *et al.*, 2008; Chismar and Wiley-Patton, 2002; Kijsanayotin *et al.,* 2009).

2.7.5 Kifle et al. study

A study by Kifle *et al.* (2008) on telemedicine transfer in Sub-Saharan Africa explores key factors influencing the transfer of telemedicine technology. The model has three predictor constructs: ICT policies, ICT Infrastructure, and the capabilities of the health sector institutions. The study examines ICT capabilities from an infrastructure standpoint as a motivator for telemedicine transfer. The study revealed that having a good infrastructure is important in telemedicine transfer and showed the link between ICT infrastructure capabilities and government attitude and policies. This result is particularly relevant to this research study as it was undertaken in a developing country. This study also highlights the need for specific policies regarding eHealth and data security, rather than general ICT policies. The result confirms that reducing technical and infrastructure barriers improves practical knowledge, and enhances telemedicine and traditional medicine outcomes. The key variables identified in the Kifle *et al.* (2008) study will also be included in this study's research model to assess the degree of consistency in findings.

2.7.6 Conclusion and Implications for Research Question

These few research studies in the field of eHealth examined the influencing factors for behavioural intention. They all used various generic behavioural intention models and only one study used the UTAUT model in a developing country context. However, none of the studies examined the clinical aspects of eHealth in developing countries in line with Mitchell's definition (1999) and the objectives of this doctoral thesis. Therefore, the need to create a specific model to answer the research questions for this study was necessary.

2.8 Factors affecting usage intention

This section is built upon the Chau and Hu (2002b) study. This research study is the only major study to date in the area of clinical uses, i.e. telemedicine, and from a user perspective which is matching the scope of this research study.

Chau and Hu (2002a) investigated acceptance of telemedicine technology amongst 408 physicians, using TAM (Davis *et al.*, 1989). This is the most important study related to the research objectives of this thesis as it is based on telemedicine which is an eHealth clinical application. This is one of the few studies to research individual acceptance of clinical eHealth. However, it is based on a developed country context and used a different behavioural intention model than the one used for this doctoral study. In addition, this study is deemed important by the author of this thesis as it is published in one of the three top-ranked journals in the field of Information Systems.

Figure 8: Chau and Hu (2002a) model
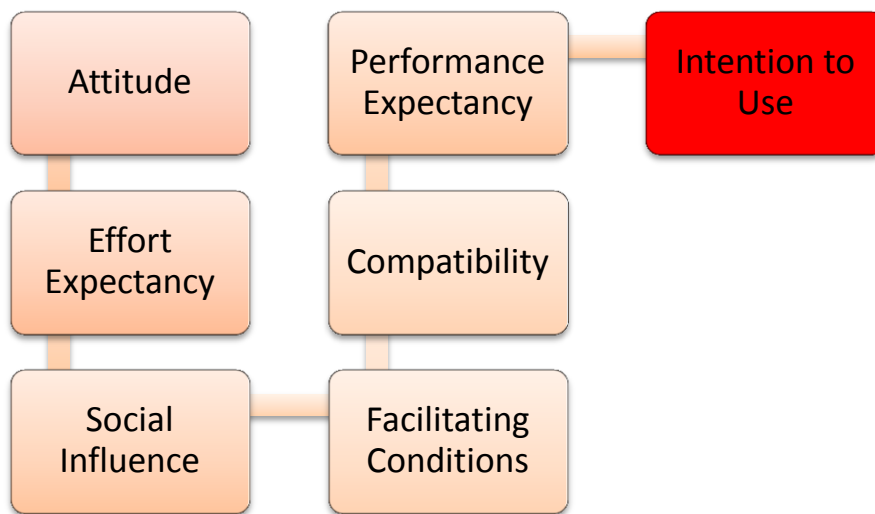
2.8.1 Performance Expectancy

Chau and Hu (2002) used Davis' Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB) to investigate the acceptance of telemedicine. The study targeted physicians who practiced at public acute-care tertiary hospitals in Hong Kong. The physicians represented ten medical specialty or subspecialty areas. Several implications can be readily obtained from the study results. "Perceived usefulness appeared to be the most significant factor affecting physicians' acceptance of telemedicine technology. The effects from perceived usefulness to both attitude and behavioural intention were consistently the highest. Evidenced by

the observed strong direct and indirect effect (via attitude) on behavioural intention, perceived usefulness is likely to insert great influences on a physicians' intention to use telemedicine technology in Hong Kong" (Chau and Hu, 2002, p.21).

This finding indicates that for technology acceptance decisions, usefulness is paramount in technology procurement. Therefore, a physician is likely to accept (or use) a technology when it is considered to be useful to his or her practice (Chau and Hu, 2002).

Perceived usefulness was a critical determinant, showing tremendous influence on individual attitudes. This finding is consistent with the results from many prior studies that examined TAM (Chau and Hu, 2002; Chismar and Wiley-Patton, 2002; Keil *et al*., 1998). As Keil *et al*. (1998) concluded, in determining whether or not to use a technology, usefulness is more important than ease of use. In this context, an essential factor for a physicians' acceptance of telemedicine technology is whether the technology fills his or her service needs. Therefore, perceived usefulness as a factor can also be applied to the healthcare sector.

2.8.2 Effort Expectancy

In Chau and Hu's (2002b) study, perceived ease of use which is the other TAM variable, appeared to have no significant effects on either perceived usefulness or attitude. This is inconsistent with the results of prior studies (Davis, 1989; Moore, 1991; Chang *et al.*, 2007), but consistent with studies conducted in the healthcare sector (Chismar and Wiley-Patton, 2002; Kijsanayotin *et al.,* 2009; Keil *et al*., 1998). The inconsistency is worth noting, because it might signify fundamental differences between medical professionals and the typical technology users commonly examined in previous research. Physicians have relatively high competence and cognitive capacity and thus may comprehend the use of a technology quickly; and become familiar with its operations without going through intense training that might be necessary among other user populations (Chau and Hu, 2002b). However, in the context of developing countries, this non-effect could have a different outcome.

2.8.3 Facilitating Conditions

Physicians in many instances have a strong supporting staff for operating medical equipment and related technologies in developed countries. In addition, per the eReadiness Table in Appendix I, Hong Kong ranks second in eReadiness and therefore, users have experience with the Internet. These factors might have contributed to physicians' placing less weight on perceived ease of use. Keil *et al*. (1998) said that no amount of ease of use will compensate for low usefulness. In this regard, the explanatory power of TAM might weaken in a professional context characterized by high user competency or strong staff support as in the case of medical professionals in Hong Kong.

In developing countries, facilitating conditions may play a more important role, as medical staff in developing countries will not have the experience in ICT, infrastructure support, and resources available as compared to medical staff in developed countries. Facilitating conditions is therefore included as a variable in the research.

2.8.4 Social Influence

The variable of subjective norms (social influence) in this study appeared to have no significant effects on behavioural intention (Chau and Hu, 2002b). Physicians may develop independent evaluations and consequently may place less weight on others' opinions. This finding and the one that highlights the insignificance of perceived ease of use suggests another interesting dimension on which technology acceptance decisions might differ between individual medical professionals in an advanced eReady state. However, developing countries are not in an advanced eReady state.

2.9 Conclusion of Chau and Hu's study

The findings of Chau and Hu's (2002) study suggest several potential areas where healthcare professionals might differ significantly in technology acceptance decision-making, compared with the user populations (not from the healthcare sectors) commonly examined in prior

research. Firstly, when making a decision to accept versus to reject a technology, healthcare professionals in developed countries appear to be fairly pragmatic, concentrating on the technology's usefulness rather than on its ease of use. Furthermore, these professionals seem to be relatively independent in making technology acceptance decisions, e.g. not attaching much weight to suggestions or opinions from others.

Caution needs to be taken when generalizing the findings and discussion to other technologies or professional groups. Measurement items or scales for the constructs specified by the investigated models exhibited reasonable but not highly satisfactory reliability. This is probably due to the early stages of telemedicine. Despite its limitations, results from the study have some interesting implications. First, the study generates empirical evidence that highlights some limitations of TAM and TPB in explaining or predicting technology acceptance by healthcare and possibly other professionals. Their study did not support these generic models entirely in the situation of healthcare in medical professionals as explained above. The fact that none of the investigated models were able to explain half of the behavioural intention variance may signify the need for a broader group of factors beyond TAM and TPB. This fact gives credence to developing an augmented model.

Chau and Hu's (2002) study reveals the importance of attitude cultivation and management. To foster individual acceptance of a newly adopted technology, management and in the case of healthcare, health administration and important others, such as: opinion leaders (medical experts) in a professional organization need to devise strategies for cultivating positive attitudes toward using the technology. This is an important finding for management practice.

In this regard, favourable perception of the technology's usefulness is crucial, whereas the technology's ease of use might be of secondary importance. Findings to date suggest that upon deciding to adopt telemedicine technology, management or other significant medical experts should strongly emphasize, demonstrate and communicate the technology's usefulness to the routine tasks and services of individual physicians.

Therefore, initial information sessions and training programs should focus on benefits of how the technology can improve the efficiency or effectiveness of individual physicians' patient care and

services rather than on familiarization with the detailed procedures for operating the technology (Chau and Hu, 2002).

The slight significance of facilitating conditions on intention, though weaker than that of attitude, suggests that adequate support resources remain important in shaping an individual's intention toward adopting technology. The medical organizations in Hong Kong have a fairly sophisticated in-house technology base and reasonable access to various resources. Thus, convenient technology access and in-house training and support are usually available and consequently may not constitute, in this particular case, central concerns in physicians' technology acceptance decisions. When introducing telemedicine technology and promoting its acceptance among physicians, management nevertheless needs to evaluate these facilitating conditions, e.g. access and training. This situation of sophisticated in-house technology and excellent resources in Hong Kong is not common to most developing countries. Therefore, facilitating conditions should be considered in behavioural intention to use eHealth services in developing countries.

2.10 Key technology acceptance research studies in eHealth

In the literature review, some key studies in eHealth and Telemedicine were discovered as discussed above. Table 5 summarises these studies, their findings, and the relevance to this study.

Table 5: eHealth and Telemedicine Research Studies

Research Study	Description	Relevance to this study
Chau and Hu (2002b)	A research model for telemedicine technology acceptance by physicians was developed. The research model was then empirically examined, using data collected from more than 400 physicians practicing in public tertiary hospitals in Hong Kong.	Chau & Hu applied two key models: the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). These models have proven significant in understanding behavioural intention. Even more significant for this study, is the fact that these models were applied to

Research Study	Description	Relevance to this study
	Because of its behavioural intention orientation and technology control consideration, the model had its theoretical premise established around the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). Used Technology Acceptance model (TAM) and the Theory of Planned Behavior (TPB).	telemedicine, a remote eHealth clinical application.
		The results of the study show that perceived usefulness was the most significant factor for behavioural intention.
	Constructs used: Perceived Usefulness Perceived ease of use Compatibility Peer Influence Perceived technology Control	Perceived ease of use was not a significant determinant on behavioural intention and this is probably due to the experience of the doctors in ICT in Hong Kong. Their facilitating conditions are quite good. In developing countries, perceived ease of use may be a significant determinant for behavioural intention as the medical staff is not experienced in ICT applications and their facilitating conditions are not good.
	Study location: Hong Kong	
	Results: The study showed that perceived usefulness was the most significant determinant of doctor's acceptance of telemedicine. However, perceived ease of use was not considered to have an effect on acceptance.	Peer influence did not have an effect on behavioural intention. This could be due to the relatively high autonomy over their practices, including the use of a technology.
	Compatibility and attitude toward telemedicine had an effect on doctors' behavioural intention of telemedicine.	
	Peer influence was not a significant	

Research Study	Description	Relevance to this study
	determinant of behavioural intention.	
Kifle *et al*.(2008)	This study examines the factors that contribute to the successful transfer of telemedicine in Sub-Saharan Africa.	This study is relevant to this research since it is in the eHealth area (telemedicine) and in a developing region, Africa.
	The model proposed by Kifle et al. (2008) has three predictor constructs that postulate to influence telemedicine outcomes on the national level in the Sub-Saharan Africa. They are: – ICT policies, ICT Infrastructure, and the capabilities of the health sector institutions.	This study per the authors state that their theoretical model is not exhaustive, particularly in the area of the impact of organization and individual telemedicine capabilities; these issues suggest the need for additional research, incorporating other variables not measured in this study, such as healthcare organizational and physician acceptance of telemedicine technology (Venkatesh et al., 2003; Chau and Hu, 2002).
	"National ICT polices have three dimensions: (1) general ICT policies (the government's objective to prioritize ICTs for national development) (Courtright, 2004; Chechi et al., 2002; Gurbaxani, et al., 1990; Rigby,1999; Straub, et al., 2001; Wild and McCube 1996); (2) e-health policies (the government's attitude and commitment to improve healthcare development through ICT (Anderson, 2000; Fujimoto et al., 2000; Jennett and Siedlecki, 2001; Jennett et al., 2004; Scott	The authors believe that TAM or UTAUT (Venkatesh et al., 2003) questionnaires could be included in a modified or revised version of this instrument. The importance of ICT infrastructure was examined and validated.

Research Study	Description	Relevance to this study
	et al., 2002; Vargneses and Scotte, 2004; WHO, 2000); and (3) data security policies (the government's awareness and support of setup standards and procedures for telemedicine communication improvement (Blobel, 2000; Gilbert, 1997; Janczewski and Shi, 2002; Kumekawa, 1997; Sandberg, 1995; Stanberry, 2000; Tulu, 2003; Wachter, 2000)".	
Schaper and Pervan (2007)	This research study outlines a project that examines ICT acceptance and utilization by Australian occupational therapists. The research model which has been developed and tested in this study draws on findings from relevant prior research and is primarily based on the UTAUT model and on the generic framework for technology acceptance proposed by Chau and Hu.	This model is interesting for this study as it is based on the UTAUT model and used in the healthcare industry with occupational therapists. They added some unique constructs to the original UTAUT model such as: Compatibility, computer anxiety, and self-efficacy. They also added some new moderators such as: Clinical specialty, clinical workload, setting type, and geographic area. The study was conducted in Australia which is not considered a developing country.
Kijsanayotin et al. (2009)	The research looked at ICT healthcare applications in rural Thailand. The results of this study showed that intention to use health information technology is a function of the perception that health IT is useful, that it is easy to use, that important others believe he or she should use it, and the	The research study used the UTAUT model in a developing country rural setting. Applied a modified UTAUT model to healthcare and to one developing country. The research was for intention and use of health information technology for administrative purposes and not for clinical

Research Study	Description	Relevance to this study
	perception that one has the choice to use IT.	purposes. Relevant to this study as it was in the field of healthcare and research done in a developing country context.
Jayasuriya (1998)	The study used the constructs from the TAM model, perceived usefulness and perceived ease of use. The results showed that perceived usefulness was the only significant predictor of computer use as it explained 53% of the variation	The study was conducted in the healthcare industry.
Chismar and Wiley-Patton (2002)	Chismar and Wiley-Patton (2002) conducted a study in the healthcare field using the extended Technology Acceptance Model (TAM2). The study was conducted in the context of physician's intention to adopt Internet-based health applications, such as: medical records, e-billing and patient scheduling.	Whereas perceived usefulness had a significant effect on behavioural intention, perceived ease of use and the social processes of subjective norm and image did not.

2.11 Conclusion and Implications for the Research Model

Chapter 2 surveys existing published research in the field of eHealth adoption and assesses its value as applied to eHealth and developing countries. Table 6 summarizes the results of these particular studies for development of the research model for this thesis.

Table 6: Theoretical conclusions of eHealth and Telemedicine Research Studies

Study	Theoretical Framework	Results: Influencing Factors
Chau and Hu, 2002	TAM and TPB applied to a developed country	Constructs supported: Perceived usefulness, Compatibility of work, attitude, and perceived technology control.
Kifle, 2002	Created own model applied to a developing country	Constructs supported: ICT infrastructure, and Government policy.
Schaper and Pervan, 2007	UTAUT applied to a developed country	Constructs supported: Effort and work compatibility.
Kijsanayotin et al., 2009	UTAUT applied to a developing country	Constructs supported: performance expectancy, ease of use, social influence and voluntariness.
Chismar and Wiley-Patton, 2002	TAM2 applied to a developed country	Constructs supported: performance expectancy and output quality.
Jayasuriya, 1998	TAM applied to a developed country.	Construct supported: Perceived usefulness

2.12 Literature Review Conclusions and identification of influencing factors

The starting point for the empirical research is the UTAUT model, as it draws on the eight prominent innovation acceptance models. Venkatesh *et al.* (2003) demonstrated that the incorporation of these eight models led to a better prediction of intention to use an innovation

than the individual models themselves. Its relevance to the healthcare sector is evidenced in the studies conducted by Schaper and Pervan (2007) and Kijsanayotin *et al.* (2009).

The literature review demonstrated that there is no existing study that directly matches the objective and scope of this doctoral study. It showed that there are some studies in eHealth adoption (Chau and Hu, 2002; Kifle, 2002; Schaper and Pervan, 2007; and Kijsanayotin *et al*., 2009). However, overall the body of evidence is very limited and there is a need for more scientific research in this field, specifically in developing countries. The few studies related to eHealth provide some guidance as to the possible influencing factors for this research study.

The identification of influencing factors as validated by the UTAUT model are described and discussed below.

Figure 9: UTAUT Model from Venkatesh et al. / User Acceptance
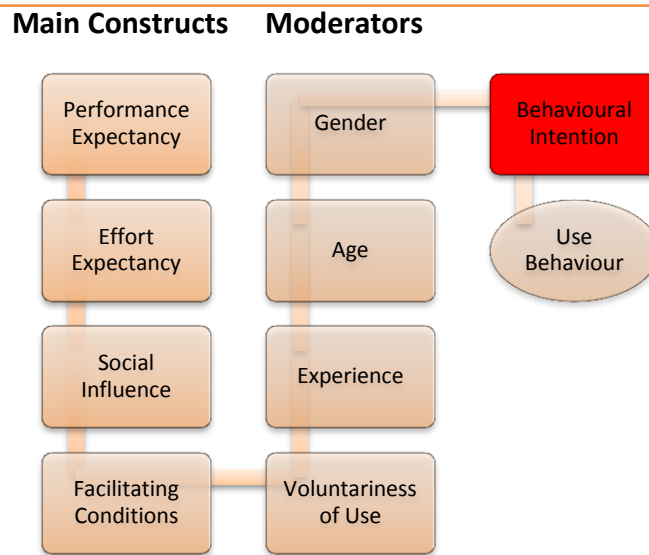
Source: UTAUT Model from Venkatesh *et al.* (2003)

The UTAUT unifies these eight individual models and was empirically tested using original data from four organizations (not healthcare) and then cross-validated using new data from an additional two organizations.

This research provided strong empirical support for UTAUT, which supports three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence) and two direct determinants of usage behaviour (intention and facilitating conditions).

As intention had direct effects on usage behaviour, intention as the variable for determining eHealth adoption will be used.

Significant moderating influences of experience, voluntariness, gender, and age were confirmed as integral features of UTAUT. UTAUT was able to account for 70 percent of the variance (adjusted R^2) in usage intention which is a substantial improvement over any of the individual models and their extensions. Further, UTAUT was successful in integrating key elements from among the initial set of 32 main effects and four moderators as determinants of intention and behaviour collectively made by the individual eight models into a unified model that incorporates four main effects and four moderators. Therefore, UTAUT provides a solid foundation to guide future research in user intention and behaviour.

The UTAUT model advances theory by encompassing the combined explanatory power of the individual models and key moderating influences. While each of the existing models in the domain are quite successful in predicting behavioural intention, it is only when one considers the moderating factors that a more complete picture of individual perceptions about innovation begins to develop.

Despite the ability of the existing models to predict intention and usage, current theoretical perspectives on individual acceptance are notably general. For example, applying any of the models presented here might indicate that some set of individuals might find a new system difficult to use. Therefore, the identification of relevant moderators gives researchers more precise data as to individual groups. This point is taken into consideration within the author's research model, as specific moderators applied to developing countries are added. These moderators are taken from the literature review and the qualitative study.

By applying the UTAUT model to eHealth in developing countries, this model is extended to a new application (eHealth), a new professional domain (healthcare) and a new market (developing countries). This extension of the model contributes to knowledge.
It should be noted that performance expectancy appears to be a determinant of intention in most situations: the strength of the relationship varies with gender and age such that it is more

significant for men and younger workers in the original model. The effect of effort expectancy on intention is also moderated by gender and age such that it is more significant for women and older workers, and those effects decrease with experience. The effect of social influence on intention is contingent on all four moderators included here such that the researchers found it to be nonsignificant when the data were analyzed without the inclusion of moderators. Finally, the effect of facilitating conditions on usage was only significant when examined in conjunction with the moderating effects of age and experience, i.e. they only matter for older workers.

It is important to note that none of the models presented in the literature review were conceived for developing countries. Therefore, it is important to assess their applicability to developing countries. This is the justification for performing an exploratory qualitative study to identify the most appropriate constructs for this environment in formulating and finalising the conceptual research model.

Research and Findings

77

Chapter 3: Qualitative Study and Research Model Development

The researcher undertook an exploratory study as little is known about the factors influencing intention to use eHealth services in developing countries. Exploratory studies are appropriate for any problem about which little is known and is the foundation for a good study (Churchill and Iacobucci, 2005). The classical approach to research is to start with an exploratory study. Qualitative research is conducted prior to quantitative methods for the purpose of identifying the issues that should be surveyed (McDaniel and Gates, 2006).

There are two major classifications of qualitative research (Kerlinger, 1986). The first type can be classified as "exploratory" and the aim is to become more familiar with a topic. There is usually no model in exploratory research and the concepts of interest need to be better understood. Another type of exploratory survey research is referred to as "descriptive." This type of study has been described as indispensable in the early stages of studying a phenomenon (Dubin, 1978) as it develops the constructs or variables that comprise theories. Hypothesis could be formulated and tested.

The author of this research respected the pedagogical requirements for conducting a qualitative research study. The author developed an interviewer-based survey with open, unstructured questions using no theoretical model. The process used was exploratory to understand better the situation in developing countries. Once undertaken, the results were used to identify new, precise constructs and to develop an initial conceptual research model including the development of specific hypotheses.

3.1 Objectives and Methodology

3.1.1 The decision to perform a qualitative study

As explained throughout this thesis, there is a lack of scientifically proven research in the behavioural intention of eHealth services, and notably in the environment of developing countries. This was confirmed in the literature review. Therefore, in order to customize the

research model and to ensure that it covers all of the important elements of eHealth in developing countries, an exploratory qualitative study was undertaken in 2008.

The objectives of this study were to assess the awareness, attitudes, and intention to use of eHealth services in developing countries. The study also gives direction to new specific constructs for the research model.

3.1.2 Methodology

Smith (1987) categorized qualitative research into one of four approaches: interpretive, artistic, systematic, and theory-driven. The researcher attempted to derive a theory through the refinement and interrelationships of categories of information (Strauss and Corbin, 1990). Two primary characteristics of this design are the constant comparison of data with emerging categories, and theoretical sampling of different groups to maximize the similarities and the differences of information. This is classified as grounded theory.

The logic of the design of this study is inductive, developing a story or patterns from detailed themes. This study respected this principle by using an interviewer-based questionnaire with open, unstructured questions. This enabled the researcher to develop the information during the study, instead of having a pre-determined design. This follows qualitative paradigms (Creswell, 1994).

Therefore, the purpose of this study was to understand and develop eHealth motivational factors for medical professionals in developing countries using a grounded theory design to identify variables for inclusion in the behavioural intention research model. The researcher was able to build hypotheses and theories from the results of this study. Therefore, this study met the assumptions of a qualitative mode of inquiry differentiating it from quantitative research.

3.1.2.1 Data Collection Procedures

An important part of conducting research is to gain access to informants (Marshall and Rossman, 1989). Gaining access to informants is critical in this study as it was conducted on-site within their natural setting in developing countries. The idea in qualitative research is to purposefully

select informants that will best answer the research question. There are four parameters to consider in conducting qualitative research, the setting, the actors, the events of the interview, and the process (Miles and Huberman, 1984). Data collection procedures involve four basic types: observations, interviews, documents, and visual images. Interviews were used in this study.

As the setting for this study is developing countries, access to them is very difficult for any researcher. Due to the researcher's participation with the members of the ITU eHealth study group in Geneva, Switzerland, the researcher was able to overcome this obstacle. Without this network, this research would have been impossible. The countries selected for this qualitative study were: Malaysia, Pakistan, Uganda, Bhutan, and Mexico. The five countries generated 220 interviews. These countries all met the criteria of a developing country. The research was organized by leading medical and ICT professionals who participate in the ITU study group as described in Table 1. The interviews were conducted in medical settings from both urban and rural environments. These relevant parties work and live in their respective developing country and have access and/or work in medical hospitals and government health agencies. Therefore, they meet the parameters as stated by Miles and Huberman (1984).

Data collection was carried out through semi-structured interviews. The interviewers ensured that all informants understood the purpose of the research and questions asked. The interview-questionnaires were sent to the researcher in Geneva, Switzerland for interpretation. The interview-questionnaire is shown in Appendix 4.

3.1.2.2 Data Analysis Procedures

The process of data analysis is eclectic; there is no "right way" (Tesch, 1990). The data were interpreted and the information was made into a story with written qualitative text. Certain questions were turned into data-generated frequency percentages. As the qualitative analysis was based on interpretation, the researcher was able to reduce the information into certain patterns. Teshe (1990) called this process de-contextualization and re-contextualization. While

much work in the analysis process consists of consolidating the data into smaller pieces, the final goal is the emergence of a larger, consolidated picture (Tesch, 1990). The information was consolidated and certain patterns appeared. The patterns that emerged from this consolidated picture enabled the researcher to identify new variables for the research model.

-**Verification Steps**

According to Eisenhart and Howe (1990), data collection techniques in qualitative research should have the best fit to match the research questions for obtaining the answers. The data collection network fits the environment of medical professionals in developing countries. The method used in this research study permits direct investigation of the question.

Early qualitative researchers felt compelled to relate traditional notions of validity and reliability to the procedures in qualitative research (Goetz and LeCompte, 1984). Later qualitative writers established quality criteria as "trustworthiness" and "authenticity" (Erlandson, Harris, Skipper, and Allen, 1993). These are viable stances on the question of validity and reliability. This verification was done through the selection of trustworthy informants.

The advantage of using members of the ITU eHealth study group in data collection is their understanding of the subject, access to the appropriate medical professionals, and their knowledge of the local environment. Creswell (1994) says a factor is the audience for the research. The choice of paradigm must be sensitive to the audience, i.e. medical professionals. The data collection network that was conducting the interviews was credible with the informants.

The selection of these countries is based on target audience characteristics (medical professionals in developing countries) and through accessibility to local medical staff in developing countries. Research conducted in developing countries is different from developed countries as access to the selected sample usually requires government and/or permission from local hospitals and medical centres in order to conduct the survey. Without appropriate contacts and approvals, this study in developing countries is not possible. Therefore, it was mandatory for the researcher to work in conjunction with the ITU eHealth study group for the purpose of data collection.

To conduct the interview, a description of eHealth services was prepared and an information sheet was included. The interviewer-administered questionnaire was divided into three parts: the first part was to understand eHealth awareness, the second part was to comprehend their attitudes toward eHealth, and the final part considered intention to use this new service.

3.1.2.3 Profile of respondents

The countries used in this study are representative of developing countries which have a shortage of doctors and where healthcare as a percentage of GDP is very low. Most of their healthcare systems are public, with private medical institutions starting to emerge. Appendix 3 shows the details of these statistics. Health care systems in developing countries lack the necessary resources to cope with the high demand of medical services. This is especially true for rural areas and most of the resources and investment lies in urban centres. In general, most health care systems in developing countries are government- run with the establishment of private hospitals and clinics beginning to emerge. Public medical services are financed through tax revenues. Interestingly, private health care is also important in rural regions and for low income groups as well. Although the WHO publishes annual figures on physicians, nurses, paramedics, hospitals, and beds for most countries of the world (Appendix 3), there are no figures for the public and private components of this supply. In the developing world, Africa and Asia have the lowest number of hospital beds, with Latin America having the most with Brazil and Argentina having the highest number of hospital beds in this region (Hanson and Berman, n.d.).

The ten developing countries in this study exhibit similar characteristics in that all have predominantly government-based healthcare with a smaller proportion of private providers. All of the countries studied have medical services and resources concentrated in urban settings.

The respondents who participated in the study were a broad mixture of medical professionals. Specifically, respondents included: medical doctors, radiologists, health administration, nurses, specialists, and medical students. This composition gives a good cross-section of medical professionals which is the aim of this study.

Table 7 profiles the respondents.

Table 7: Overview of the Interviewees

Descriptors	Medical staff
Experience	
Under 5 years	51.4%
6-10 years	14.1%
11-25 years	20.9%
More than 25	13.6%
Total	100%
Environment	
Urban	85%
Rural	12%
Both urban and rural	3%
Total	100%
Occupation	
Doctor	60%
Radiologist	6%
Head of Clinic	2.3%
Medical Students	26%
Other	5.7%
Total	100%

3.2 Outcomes of the Qualitative study

The analysis of the qualitative study showed the homogeneity of the results across the different countries considered. All of the countries stated that education is key to the diffusion of eHealth services. The results also support Roger's Innovator Theory (Rogers, 1983) as to innovation diffusion where other medical doctors act as opinion leaders. The study also supports the findings of Kijsanayotin (2009) in relation to performance expectancy and social influence. The specific results are detailed below in sections 3.2. Even though the countries are at different levels of eHealth awareness, their responses were similar.

3.2.1 Country Results: Exploratory Study

Table 8 summarises the findings of the qualitative study for each country. The country results are grouped around influencing factors that would motivate medical professionals to use eHealth services. Based on grounded theory, the researcher was able to synthesise the interviews and develop categories of items based on these interviews. The top columns indicate the factors that were important in the intention to use eHealth services. As the objectives of the qualitative study were to understand eHealth awareness levels, to identify influencing factors, and to assess user intention, the table summarises findings accordingly. If the factor was deemed important, a positive (+) symbol was written, if it was a neutral stance, a neutral (0) symbol was inserted, and if it had a lower impact on intention, a negative (-) symbol was inscribed.

The findings indicate that all of the countries interviewed perceive education, having a supporting government policy and increased medical knowledge as important factors. The influence of 'opinion leaders' was cited by all countries except Mexico which was somewhat neutral.

Table 8: eHealth Qualitative Study Comparison Table

Countries/ Influencing Factors	Awareness	Medical School	Continuous Education	Opinion Leaders- Medical Experts	Government Policy	Medical Knowledge	Attitude	Obstacle for Adoption
Bhutan	-	+	+	+	+	+	+	Training and evidence of successful eHealth projects
Malaysia	+	+	+	+	+	+	+	Goodwill of hospital administration and training

Mexico	-	+	+	o	+	+	+	Evidence of successful eHealth projects, government support and training
Uganda	+	+	+	+	+	+	+	Evidence of successful eHealth projects and training
Pakistan	+	+	+	+	+	+	+	Training and evidence of successful projects

Legend
(+) Positive
(o) Neutral
(-) Negative

3.2.1.1 eHealth Awareness

Among the different findings that helped to define the items of the different scales used in the quantitative phase, it emerged that the concept of eHealth services has a relatively low level of awareness due to its newness. This factor is addressed in the final quantitative study. Due to this low level of awareness, education was seen as an important construct by the researcher.

Doctors that were aware of eHealth heard about it at medical conferences and specialized journals. None of the doctors interviewed are using eHealth but expressed a keen interest in knowing more about the use of this service.

The study showed overall awareness of almost six out of ten respondents, except for Mexico and Bhutan which were below the mean.

3.2.1.2 Attitudes toward eHealth

The countries surveyed indicated that doctors and healthcare practitioners would like to hear about eHealth at medical conferences and seminars, continuous medical training, and at medical universities and colleges. eHealth education is an important topic in doctors' on-going medical training. Many doctors and medical experts think that eHealth is useful for developing countries.

In response to the question "What is your opinion about eHealth services in developing countries?" 8 out of 10 doctors answered that it is useful in general, useful for hospitals and healthcare organizations, and useful for medical practice as well.

3.2.1.3 Influencing Factors

Many doctors stated that the introduction of eHealth services and their continued usage will depend on a service that will provide more accurate diagnoses, self-education, better treatments and a service that enables doctors to save more lives. This is consistent with the general literature where innovation acceptance models incorporate relative advantage, operationalized as performance expectancy. In order to introduce eHealth services in medical practice, according to the doctors surveyed, it would be necessary to have more training, more information on successful eHealth projects, and the support of health administration and government. The majority of respondents said that eHealth would be useful with training being one of the most important conditions to eHealth usage. The doctors' stated that their patient's most common illnesses are tuberculosis and diarrhoea. For additional expert advice, many doctors prefer to speak with other doctors, to read medical literature from libraries, and to search the Internet.

3.2.1.4 Intention to use eHealth

The most important question on intention to use was, "If an eHealth service was available addressing the aspects you are most interested in, how likely is it that you would buy this eHealth service?" 9 out of 10 of the respondents stated they have an intention to use eHealth services.

Thus, the doctors and other medical professionals who completed the interviews, think that eHealth services in developing countries are useful in general, useful for medical practice and useful for hospitals and healthcare organizations.

It is very important to have the recommendation of other doctors, famous medical experts, and government in order to buy eHealth services. In answer to the question "Whose recommendation is important to you in buying an eHealth service?" the respondents said in order of importance, Doctors, Famous Medical Experts, and Government.

The answer to the question, "If an eHealth service was available addressing the aspects you are most interested in, how likely is it that you would buy this eHealth service?" The majority of respondents were most likely (range= extremely likely to somewhat likely) to buy eHealth services.

Some free-form comments from the study were: *eHealth is vital in Mulago Hospital and we need to address the gaps to enhance usability (Uganda, urban, doctor).*

eHealth must be sensitized to the various stakeholders (Uganda, urban, administration).

More awareness about eHealth should be created (Uganda, urban, doctor).

It's a great idea, innovation is everything (Pakistan, urban, doctor).

eHealth would be useful in upgrading the health service, the concept is not very well known (Pakistan, urban, medical student).

3.3 Qualitative Research Conclusions and Implications

Table 8 shows the homogeneity of the responses across the country. The categories of items were developed in line with the qualitative paradigm (Creswell, 1994). The analysis of data focused on factors influencing behavioural intentions, detailed as columns in Table 8. These groupings or patterns form the basis of the new variables within the eHealth research model. The table also shows the main obstacles for adoption.

The exploratory qualitative research study enabled the researcher to answer the following questions:

1. Is there interest and intention to use eHealth in developing countries?
2. What are the specific constructs that should be extended to the UTAUT model for the main study?

The qualitative research demonstrated that this study is feasible where there is an overwhelming interest in the subject as the respondents feel that eHealth is useful (8 out of 10) and likewise, have the intention to use eHealth services (9 out of 10). This study generated both qualitative data and quantitative information which aids in the development of the research model.

It contributed to the identification of new constructs to be included in the research model. They are: medical education, government policy, and medical knowledge. eHealth education in medical schools and on-going education was identified as the most important element to eHealth adoption. This was the view in all countries and from all types of medical professionals who participated.

The lack of supporting government policy was cited as a potential obstacle to eHealth adoption. This was indicated by many medical professionals as the majority of healthcare institutions in developing countries are government-run and therefore, public institutions. Government recommendation was cited as an important motivator for purchasing eHealth services. For instance, one medical professional remarked, *"sometimes information on ehealth is not valid. It*

needs to be proven by the ministry of health itself". Therefore, government policy is viewed as a behavioural intention factor in developing countries and is built into the research model.

Interviews with medical professionals also showed that eHealth adoption would give them a positive image as evidenced with the quotation from one of the respondents: "*eHealth is beneficial for all doctors, especially for new ones, so while they are under training, they get to know more about the new advancements and researches going on in the medical field, so that even being part of a developing country, we can come well up to the standards of developed countries and then better management of patients and abilities".* Medical knowledge is viewed as a behavioural intention factor in developing countries, and is built into the research model.

The findings of the qualitative research are:

1) Similar results across the countries in terms of patterns, attitudes and intention.

2) Specific findings of the identification of education, government, and medical knowledge as factors affecting the intention to use eHealth, which are incorporated as new predictor variables in the research model.

The qualitative study also supported some of the constructs in the original UTAUT model as follows: performance expectancy (the literature and the qualitative study shows the importance of improved diagnoses and treatments), and social influence in terms of whose recommendations are important in making decisions (from the literature and supported in the qualitative study). However, it did not support effort expectancy or facilitating conditions (comes from the literature and did not emerge from the qualitative study except for the importance of having a positive attitude of hospital administration). These were discussed in section 3.2.1.

3.4 Model Development and Hypotheses Formulation

Building from the above-mentioned exploratory research and the literature review, a newly conceived conceptual research model to answer the research questions was created. The model is based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model and is discussed in the section below.

3.4.1 Research Model Extended based on Literature Review and Qualitative Study in Developing Countries:

Figure 10: Researcher's Model for eHealth in Developing Countries
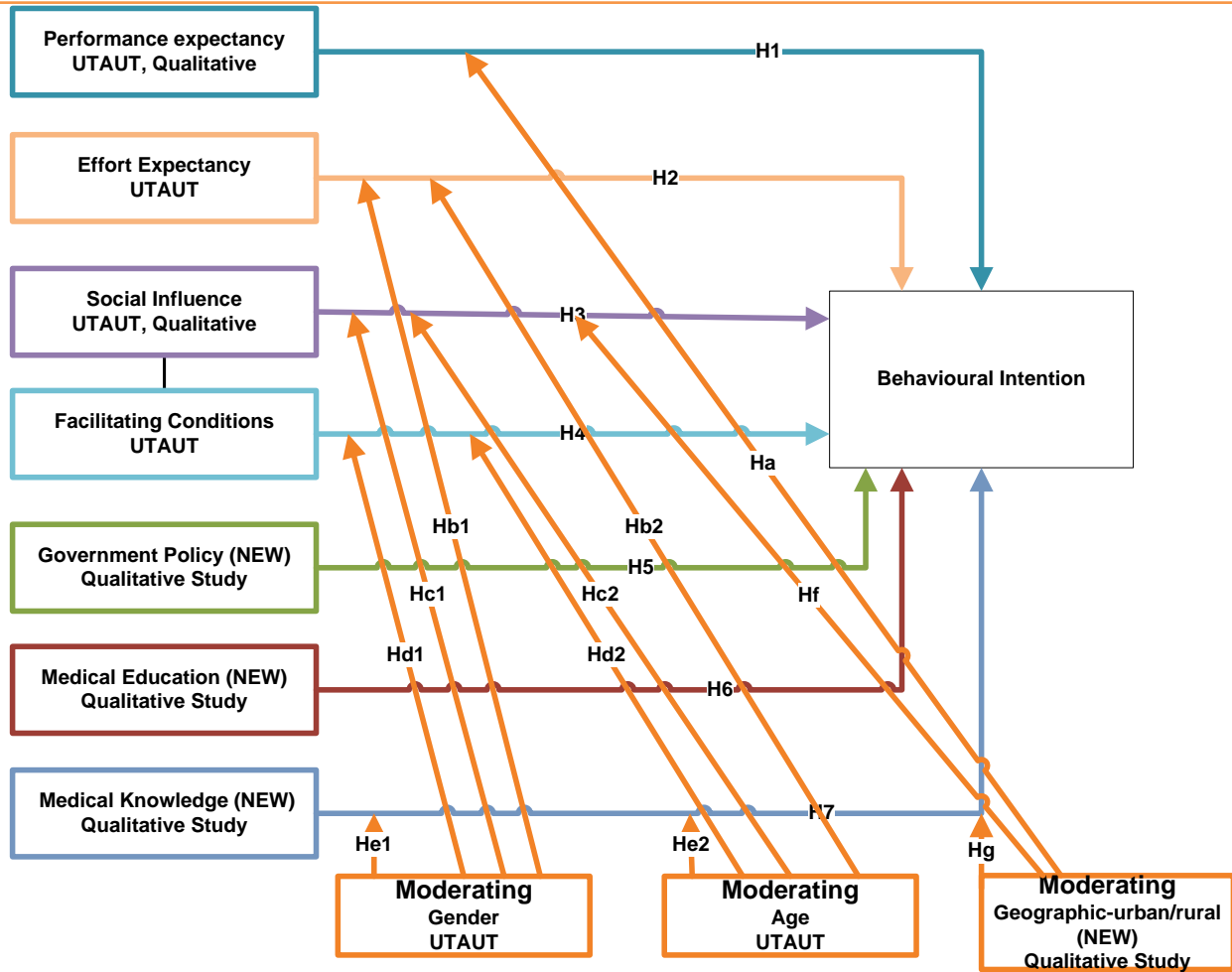
3.4.2 Research hypotheses

The model (Figure 10) is developed from the UTAUT model and new hypotheses based on the qualitative study conducted in developing countries. Therefore, this research model is derived

from the literature review and the original qualitative exploratory research which was necessary to identify specific variables in the context of eHealth in developing countries. The adapted UTAUT model tests clinical applications in line with Mitchell's definition of eHealth (Mitchell, 1999).

The hypotheses are based on eHealth behavioural "intention to use" factors in developing countries as follows:

3.4.2.1: Perceived benefits (usefulness) of eHealth by medical professionals are positively related to eHealth behavioural intention.

This hypothesis is taken directly from the UTAUT model and supported in the qualitative study regarding performance expectancy. In the literature, performance expectancy is one of the most important factors affecting ICT (Davis, 1989; Verkakesh *et al.,* 2003) and in eHealth adoption (Chau and Hu, 2002; Chismar and Wiley-Patton, 2003; Hu, *et al*., 1999; Jayasuriya, 1998).

This hypothesis is related to performance expectancy and is applied specifically to eHealth in developing countries. The adaptation from UTAUT is the original contribution, i.e. eHealth specific and new context for developing countries. In line with Mitchell's definition (1999), the model is testing clinical uses. The following two subsets of performance expectancy were included in the qualitative study, i.e. performance expectancy includes improved medical diagnoses and productivity improvements. The modified scales in the research model include both subsets. Increased productivity is an essential adoption factor in developing countries if doctors will be able to treat more patients and therefore, make more income. Income is a motivating factor in developing countries (Zurn *et al.,* 2004) as many public employees seek supplementary income in private clinics (Zurn, 2002). The exploratory qualitative study supported this UTAUT hypothesis. Income as a motivating factor is operationalised within performance expectancy within the research model.

Thus, the higher the perceived performance expectancy, the higher the intention to use eHealth services.

H1: The higher perceived performance expectancy, the higher the intention to use eHealth services.

3.4.2.2: Effort expectancy toward eHealth services is positively related to eHealth behavioural intention.

This hypothesis uses the construct from the original UTAUT model and modified scales to reflect eHealth in developing countries. Effort Expectancy was proven as a key behavioural adoption factor in the Schapen and Pervan (2007) study in Australia. However, it had no effect on behavioural intention in Chau and Hu's (2002) study in Hong Kong. However, in developing countries, effort expectancy could be a factor in intention to use eHealth services as they have relatively little or no experience with ICT (Chetley, 2006). Kifle (2002) also cited the lack of experience with ICT as an obstacle to telemedicine diffusion in developing countries. Therefore, effort expectancy (ease of use) is a factor that is important to measure in the context of developing countries.

Thus, the lower the effort expectancy, the higher the intention to use eHealth services.

H2: The lower effort expectancy, the higher the intention to use eHealth services

3.4.2.3: The endorsement of medical experts as opinion leaders is positively related to eHealth behavioural intention.

Social Influence is a key construct in the UTAUT model and also based on the results of the qualitative study where the respondents stated that the opinions of expert medical professionals' are an important factor in eHealth acceptance. In developing countries, status and image are very important motivators as evidenced in the literature (Walsh, Gwinner, and Swanson, 2004) and in the exploratory research detailed previously in this chapter where medical experts are key role models. This is in line with the role of opinion leaders in Rogers' (1995) theory regarding the diffusion of Innovations.

Included in this hypothesis is the role of medical professionals who are classified as eHealth champions or volunteers in the promotion of eHealth services within their local medical environments. The intention to use eHealth services by medical professionals in developing countries will be stronger when there are volunteers or champions within the country, or within their hospital, clinic, etc. who take a pro-active interest in promoting, using, and educating other

medical professionals as to the benefits of eHealth services. The case studies that were mentioned in Chapter 1 showed that medical professionals that were involved in the pilot initiatives were volunteers. These individuals will be involved in eHealth projects, conferences, and usage of eHealth services. Countries which have these individuals should increase the intensity of behavioural intention of medical professionals in developing countries. Therefore, this theoretical construct will be measured.

Thus, the higher the social influence, the higher the intention to use eHealth services.

H3: The higher the social influence, the higher the behavioural intention to use eHealth services.

3.4.2.4: Facilitating conditions will have a significant influence on behavioural intention.

Facilitating Conditions is one of the constructs in the original UTAUT model. In developing countries, it is important to build facilitating conditions into the model even though two studies (Venkatesh *et al*., 2003) and (Chau and Hu, 2002) showed that facilitating conditions did not have a significant influence on behavioural intention when performance expectancy and perceived ease of efforts are included in the model because of the autonomous nature of the individual users when they are physicians. In developing countries, facilitating conditions may impact on intention more significantly than in developed countries due to the lack of computer and Internet skills and their accessibility. Therefore, technical training of eHealth services, tools, and on-going support are assessed in terms of their relationship with intention to use eHealth services in developing countries.

Thus, the more the medical centre has ICT assistance, the stronger the intention to use eHealth services by medical professionals in developing countries.

H4: The more the medical centre (is perceived as) having adequate assistance with eHealth technology, the stronger the intention to use eHealth services by medical staff in developing countries.

3.4.2.5: Government support is positively related to eHealth behavioural intention in developing countries.

(New hypothesis)

This hypothesis is related to government policy and support. A supportive government policy is cited in the qualitative study as a motivating factor for user intention as the majority of health care institutions are government run and the interviewees mentioned the importance of a positive government policy. This is a new finding by the author of this research study as none of the generic user behavioural intention models include this construct. The qualitative study indicated that a positive government attitude and support in terms of ICT infrastructure is important for eHealth acceptance. In fact, government policy was shown to be the third most important criteria in determining purchase of eHealth services according to the exploratory qualitative study as discussed above. Thus, this factor is built into the research model.

Thus, the more the medical professional perceives strong government policy and support, the stronger the intention to use eHealth services.

H5: The more the doctor (medical staff) perceives strong government policy and support, the stronger the intention to use eHealth services.

3.4.2.6: Medical Knowledge of eHealth services increases behavioural intention of eHealth in practice.

(New hypothesis).

This hypothesis concerns the importance of eHealth education in medical schools and for on-going medical education. It is hypothesized that if eHealth is included in the curriculum at medical schools, there is a positive relationship to attitude and behavioural intention in everyday medical practice. Education was cited as an important motivator in the exploratory qualitative research. The qualitative study showed that eHealth would be useful with training being one of the most important conditions to eHealth usage. The respondents stated that eHealth should be learned at Medical University/colleges, through continuous medical training, and at Medical conferences/seminars.

Thus, the more the medical professional perceives he/she is knowledgeable and skilled on eHealth services, the stronger the intention to use eHealth services.

H6: The more the doctor (medical staff) perceives he/she is knowledgeable and skilled on eHealth services, the stronger the intention to use eHealth services.

3.4.2.7: Perceived inadequate medical knowledge by doctors is negatively related to behavioural intention to use eHealth services.

(New hypothesis).

The qualitative study identified that eHealth must not be perceived as an indicator of weakness in medical professionals' abilities. Developing nations have been plagued with the third world mentality whereby their self-esteem has given way to inferiority complex. Umez (2011) discusses the low esteem that Africans have towards themselves. Comments from respondents were concerned that the use of eHealth services would indicate that they lack medical knowledge. Referring to this idea, one respondent commented that "*eHealth is beneficial for all doctors, especially for new ones, so while they are under training, they get to know more about the new advancements and researches going on in the medical field, so that even being part of a developing country, we can come well up to the standards of developed countries and then better management of patients and abilities*".

Doctors will not want to look like they have inadequate medical knowledge through the use of eHealth services. The hypothesis is attempting to measure the opposite effect where the acceptance of eHealth services will be perceived by others as having adequate and/or advanced medical skills. Therefore, the use of eHealth services will effectively help medical professionals to enhance their medical knowledge. Thus, this new construct will be measured in the research model.

Thus, the more the medical professional perceives eHealth services as an indication that they have low medical knowledge, the lower the intention to use eHealth services.

H7: The more the doctor (medical staff) perceives eHealth services as an indication that they have low medical knowledge, the lower the intention to use eHealth services.

3.4.2.8 Moderators

A moderator is an effect in which the third independent variable causes the relationship between a dependent/independent variable pair to change. A moderator can change the relationship between the dependent and independent variables.

3.4.2.8.1: The impact of Performance Expectancy on eHealth services' behavioural intention will be moderated by geographic location (urban vs. rural areas)

(New hypothesis)

Geographic location is added as an important moderator to the model as there are distinct differences in healthcare services between urban and rural areas. Geographical imbalances in the distribution of healthcare workers is significant as most medical professionals prefer to work in urban areas due to economic and social advantages. This imbalance of workers requires a different mix of services to fulfill the needs of patients. The hypothesis is that performance of eHealth services is stronger for medical professionals from urban areas as they are currently better equipped and have the necessary quantity of healthcare professionals. Since they are better equipped and skilled in making medical diagnostics and treatments, medical professionals will require that eHealth makes productivity improvements over current practices. Since rural regions are so understaffed and lack qualified personnel, they will probably be less demanding regarding the performance of eHealth services as these services will compensate for the lack of qualified staff and therefore, they will be less demanding in performance expectancy.

The differences between urban and rural areas are well documented in healthcare (Jannett, Gagnonb, and Brandstadt, 2005), and especially in developing countries where the majority of the population lives with the greatest shortage of doctors. As urban medical centres are better resourced and equipped, the premise is that urban areas will have a greater performance expectancy for eHealth service, and therefore, perceived performance expectancy will be more significant in urban areas. Thus, perceived performance expectancy will be moderated by geographic location in developing countries, i.e. urban versus rural areas and is measured in the research model.

Ha: The impact of performance expectancy on behavioural intentions is higher for doctors and medical staff from urban areas than from rural areas

3.4.2.8.2: The impact of effort expectancy on behavioural intention will be moderated by age and gender.

This hypothesis was part of the original UTAUT model. The hypothesis states that perceived effort expectancy will be moderated by age and gender such that lower effort expectancy will be stronger for older doctors than younger doctors and will be stronger for female doctors than male doctors. The theory is that older doctors have lower IT skills and therefore, if the new technology appears too difficult to use, older doctors will resist the adoption of a new innovation. As more females enter the medical profession, the need to understand gender differences become increasingly important. Gender imbalances exist in many sectors of the workforce, with some occupations dominated by females. In Sri Lanka for example, women comprise 80% of the nursing workforce, in Bangladesh, women account for only one/fifth of the health services and are mostly nurses. As women in developing countries typically possess less advanced qualifications than their male counterparts, their knowledge of ICT applications is limited. Therefore, female medical professionals may avoid eHealth if the effort expectancy is perceived as high. The UTAUT model suggests that women will resist a new innovation if there is a lot of effort required in order to adopt it. In developing countries, this theory will be tested to see if the classical theory from developed countries holds. This construct will be included in the research model. Thus, the impact of effort expectancy on intention to use is stronger for female medical professionals than male medical professionals and intention to use is stronger for older medical professionals than younger medical professionals.

Hb1: The impact of effort expectancy on behavioural intention is stronger for female medical professionals than male doctors.

Hb2: The impact of effort expectancy on behavioural intention is stronger for older medical professionals than younger medical professionals.

3.4.2.8.3: The impact of social influence on behavioural intention will be moderated by age and gender.

The original UTAUT model uses gender and age as moderators for social influence. Theory suggests that women tend to be more sensitive to others' opinions and therefore find social influence to be more salient when forming an intention to use new technology (Miller 1976; Venkatesh *et al.* 2000), with the effect declining with experience (Venkatesh and Morris, 2000). As in the case of performance and effort expectancies, gender effects may be driven by psychological phenomena embodied within socially constructed gender roles (Lubinski *et al.* 1983).

Social influence appears to have more effect in the early stages of experience, therefore, for younger medical professionals and the role of significant others declining over time (Venkatesh and Davis, 2000).

Therefore, these moderators are used in the research model for eHealth services. As the UTAUT model is being extended to eHealth services in developing countries, it is assumed that social influence will be moderated by gender and age as in the original UTAUT study. This theory states that women and younger people will be more affected by social influence.

It is assumed that the impact of social influence on intention to use is stronger for female medical professionals than male medical professionals and intention to use is stronger for younger medical professionals than older medical professionals.

Hc1: The impact of social influence on behavioural intention is stronger for female medical professionals than male medical professionals.

Hc2: The impact of social influence on behavioural intention is stronger for younger medical professionals than older medical professionals.

3.4.2.8.4: The impact of facilitating conditions will have a significant influence on behavioural intention and will be moderated by gender and age.

Facilitating conditions is a construct in the UTAUT model. Organizational psychologists have noted that older workers attach more importance to help and assistance on the job (Hall and

Mansfield, 1975). This is further highlighted in the context of complex IT use given the increasing cognitive and physical limitations associated with age. These arguments are in line with empirical evidence from Morris and Venkatesh (2000). Thus, when moderated by experience and age, facilitating conditions will have a significant influence on usage behavior. Nurses are mainly female and it is important to test if they exhibit a difference in intention to use eHealth services. In developing countries, they usually are responsible for pre-diagnostics and to implement the treatment prescribed by doctors. Therefore, the researcher felt it was useful to see if a difference in behavioural intention exists as nurses will use eHealth as a pre-diagnostic tool.

Facilitating conditions was tested twice in the original Venkatesh *et al*. (2003) study. Behavioural intention was measured as one dependent variable and usage was measured as another dependent variable. Using behavioural intention as the dependent variable, facilitating conditions had no effect due to the effect being captured by effort expectancy. Usage, however, was moderated by age and experience where facilitating conditions are more significant for older persons and at later stages of experience. Thus, as this study tests behavioural intention factors, there should be no moderation effect for eHealth services in developing countries. As this hypothesis was in the UTAUT model, this moderation will be tested to see if it applies to developing countries and to medical professionals. Thus, the impact of facilitating conditions on intention to use is stronger for female medical professionals than male medical professionals and intention to use is stronger for older medical professionals than younger medical professionals.

Hd1: The impact of facilitating conditions on behavioural intention is stronger for female medical professionals than male medical professionals.

Hd2: The impact of facilitating conditions on behavioural intention is stronger for older medical professionals than younger medical professionals.

3.4.2.8.5: Perceived inadequate medical knowledge by doctors is negatively related to behavioural intention to use eHealth services and will be moderated by gender and age.

(New hypothesis).

Perceived inadequate medical knowledge by doctors considers the impact of behavioural intention to use eHealth services due to the perception that eHealth will highlight a doctor's lack of medical knowledge. In developing countries, it is important that eHealth is not perceived as a

service for those who lack medical knowledge as the level of skilled healthcare workers is lower in developing countries than in developed countries.

Throughout recorded history, and in most cultures throughout Europe, the Middle East and Asia, there has been a massive gap between men and women. They have had a very different social status and men also seem to have a stronger need for power and status than women (Taylor, 2011).

As explained in section 3.4.2.8.4,, older doctors are less comfortable with IT as compared to their younger counterparts, therefore, this hypothesis could vary based on this moderator.

Doctors' behavioural intention towards eHealth will be more strongly influenced if doctors do not perceived themselves as having inadequate medical knowledge due to their stronger need for status, i.e. doctors will have more behavioural intent if eHealth is not associated with insufficient medical knowledge and will be stronger for male doctors than female doctors and behavioural intention will be stronger for older doctors than younger doctors in line with the UTAUT moderators.

Thus, the impact of medical knowledge on intention to use is stronger for male medical professionals than female medical professionals and intention to use is stronger for older medical professionals than younger medical professionals.

He1: The impact on behavioural intention of being perceived as having inadequate medical knowledge is stronger for male medical professionals than female medical professionals.

He2: The impact on behavioural intention of being perceived as having inadequate medical knowledge is stronger for older medical professionals than younger professionals.

Using the UTAUT model as the basis for this research, it is extended in the following ways: the UTAUT model with new constructs related to eHealth services in developing countries, the addition of new moderating influences specific to the environment of developing countries, applied to a relatively new electronic service (eHealth), applied to individuals in a different user group (medical practitioners), and applied to a different environment (developing countries).

Hypotheses testing proceeds by integrating four adapted hypotheses from the original UTAUT model with the addition of three new hypotheses based on the qualitative study on eHealth in developing countries. The research model also includes new moderators.

Table 9 summarises the specific hypotheses.

Table 9: Hypotheses Formulation and Explanation

Hypotheses	Relationship studied in the hypothesis	Formulation of the hypothesis
H1	Impact of the level of perceived benefits (Performance Expectancy) on the intention to use eHealth services by medical professionals in developing countries.	The higher perceived performance expectancy, the higher the Intention to use eHealth services.
H2	Impact of ease of use (effort expectancy) on the intention to use eHealth services in developing countries.	The lower effort expectancy, the higher the Intention to use eHealth services.
H3	Impact of opinion leaders (social influence) on the intention to use eHealth services in developing countries.	The higher the social influence, the higher the intention to use eHealth services.
H4	Impact of facilitating conditions on the intention to use eHealth services in developing countries.	The more the hospital has ICT assistance, the stronger the intention to use eHealth services by medical professionals in developing countries.

Hypotheses	Relationship studied in the hypothesis	Formulation of the hypothesis
H5	Impact of government policy and support on the intention to use by medical professionals of eHealth services in developing countries.	The more the medical professional perceives strong government policy and support, the stronger the intention to use eHealth services.
H6	Impact of eHealth medical education on intention to use of eHealth services by medical professionals in developing countries.	The more the medical professional perceives he/she is knowledgeable and skilled on eHealth services, the stronger the intention to use eHealth services.
H7	The impact of intention of use of eHealth services in developing countries is lower for medical professionals who perceive themselves of having inadequate medical knowledge.	The more the medical professional perceives eHealth services as an indication that they have low medical knowledge, the lower the intention to use eHealth services.
Ha	The impact of performance expectancy will be moderated by geographic location, such as rural areas will have a stronger intention to use eHealth services than urban regions as the shortage of medical professionals is more prevalent in rural areas in developing countries.	The impact of performance expectancy on intention to use eHealth services is higher for medical professionals from urban areas than from rural areas.

Hypotheses	Relationship studied in the hypothesis	Formulation of the hypothesis
Hb1 and Hb2	The impact of effort expectancy on intention to use by medical professionals in developing countries will be moderated by gender and age, such as; effort expectancy is higher for women and older medical professionals. .	The impact of effort expectancy on intention to use is stronger for female medical professionals than male medical professionals and intention to use is stronger for older medical professionals than younger medical professionals.
Hc1 and Hc2	The impact of opinion leaders on intention to use by medical professionals in developing countries is moderated by gender and age, such as it is higher for women and younger medical professionals.	The impact of social influence on intention to use eHealth services is stronger for female medical professionals than male medical professionals and intention to use eHealth services is stronger for younger medical professionals than older medical professionals.
Hd1 and Hd2	The impact of facilitating conditions on intention to use by medical professionals in developing countries will be moderated by gender and age, such as; facilitating conditions are stronger for older medical professionals and women.	The impact of facilitating conditions on intention to use eHealth services is stronger for older medical professionals than younger medical professionals and intention to use eHealth services is stronger for female medical professionals than male

Hypotheses	Relationship studied in the hypothesis	Formulation of the hypothesis
		professionals.
He1 and He2	The impact of perceived inadequate medical knowledge on intention to use by medical professionals in developing countries will be moderated by gender and age, such as: perception of inadequate medical knowledge will be stronger for male medical professionals and older medical professionals.	The impact of perceived inadequate medical knowledge on intention to use eHealth services is stronger for male medical professionals than female medical professionals and intention to use eHealth services is stronger for older medical professionals than younger medical professionals.

3.4.3 Elaboration of the Model in the context of Developing Countries

In order to answer the research question, this research will include the testing of hypotheses. Figure 11 depicts the variables taken from the UTAUT model and the new variables from the qualitative study findings as discussed above.

Figure 11: Main Constructs Development
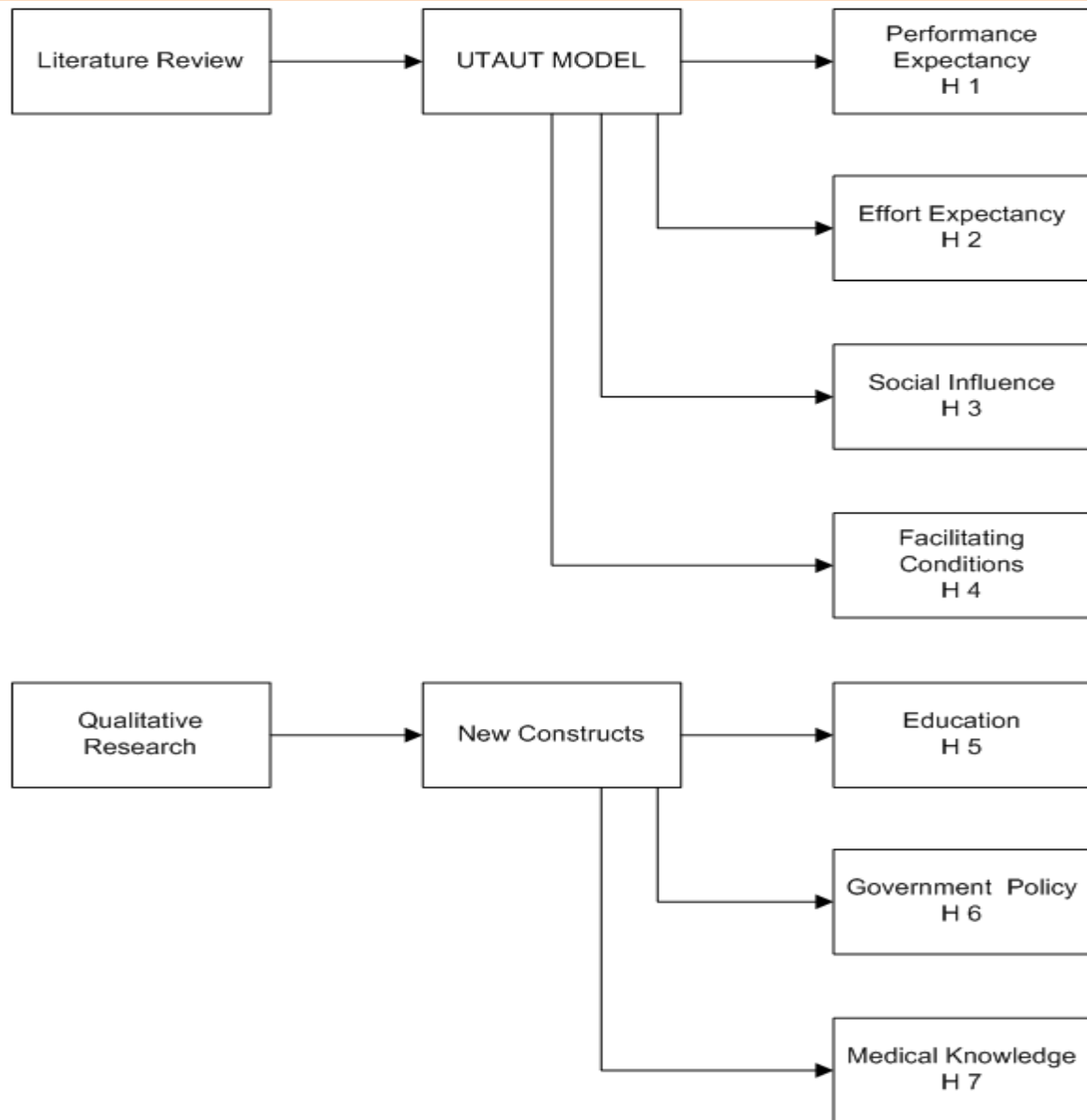
In concluding, an extended UTAUT model will be tested in several developing countries within the final quantitative study.

Chapter 4: Quantitative Pilot study and Final Research Model

This chapter presents the objectives and outcomes of the quantitative pilot study which led to the development of the definitive structure of the questionnaire for the final study. This pilot study confirmed the final conceptual research model to measure eHealth behavioural intention by medical professionals in developing countries. Methodological and/or statistical relevance of the different scales used in the research model are provided.

4.1 Objectives and Methodology

4.1.1 Objective

The objective of the pilot study was to pre-test a questionnaire instrument based on the research model. The process involved the pre-testing of the questionnaire which is a vital stage of the research process (Churchill and Iacobuchi, 2005). The final objective of the pilot study is the creation of a new behavioural intention model for eHealth in developing countries. This final conceptual model will then be tested quantitatively to understand which factors will influence intention to use eHealth services in developing countries.

4.1.2 Methodology

The questionnaire instrument was pre-tested at an International Conference on eHealth in Luxembourg by 19 medical professionals from several developing countries, including: Malaysia, Venezuela, Turkey, Peru, and Argentina. The instrument was tested via face-to-face interviews with the researcher in April 2009. This is in line with best practices as pre-tests should be done through personal interviews, with candidate numbers typically ranging from 15-30 test respondents (Malhotra, 2006).

In addition, the questionnaire was also pre-tested by a panel of experts whose knowledge of the subject was used to ensure that the scales in the questionnaire instrument represented the situation in developing countries. The interviewed experts in the field of eHealth were: Professor

Dr. Pradeep Ray, University of New South Wales; Mr. Yunkap Kwankam, Ph.D eHealth Department of Knowledge Management and Sharing, World Health Organization; Dr. Leonid Androuchko, Rapporteur eHealth ITU-D Study Group 2; and Prof. Dr. Cavit AVCI, Surgeon, Istanbul Medical Facility, Istanbul, Turkey. All of these individuals are experts in the field of eHealth in developing countries.

The questionnaire is shown in Appendix 5.

4.2 Outcomes of the Pilot study

The researcher was able to clarify any misconceptions and/or unclear wordings. The pre-testing of the questionnaire enabled the researcher to re-formulate some questions to ensure the expected interpretation, to re-formulate some questions to be more specific to the domain as some questions were too general (because they were based on the original UTAUT model), include a new additional construct in the model which is detailed below in section 4.2.2, add some descriptive questions and include an information fact sheet as awareness of eHealth can be quite low in certain developing countries.

The questionnaire was tested in terms of validity and reliability, whereby the questions were understood to be the same for the testers and for the designer of the questionnaire. The questionnaire was also deemed valid as it reflected relevant questions to the situation of eHealth in developing countries. Where questions were unclear or open to multiple interpretations, these ambiguities were corrected in the final questionnaire.

4.2.1 Validation of Scales' Structure

The pilot study aided the adaptation of the instrument and revisions to the final research study as many respondents gave detailed qualitative comments in their responses. In addition, the instrument was tested with domain experts and their feedback also was used in the revision of the questionnaire instrument. Table 10 summarises the changes that were made to the final questionnaire instrument.

Table 10: Pilot Study Results

Hypotheses	eHealth survey constructs	Pilot Study Scale	Final Scale	Changes	Type of Change
1	Performance Expectancy	7	5	-2	Deleted two items and reworded four items
2	Ease of use	3	3	0	Deleted one item and added 1 new item
3	Social Influence	5	5	0	Reworded one item to final instrument
4	Facilitating Conditions	6	5	-1	1 item deleted and 2 reworded
5	Medical Education	4	4	0	Reworded 3 items
6	Government Policy	5	4	-1	1 item deleted and 1 item reworded
7	Medical Knowledge	2	3	+1	1 item added and 1 item reworded
8	ICT Infrastructure	0	6	+6	Not in pilot added to final instrument
A	Performance Expectancy Moderated by Geographic location	1	1	0	No change
b1 and b2	Effort moderated by gender and age	1	1	0	No change
c1 and c2	Social Influence moderated by age and gender	2	3	+1	Added geographic location as moderator

Hypotheses	eHealth survey constructs	Pilot Study Scale	Final Scale	Changes	Type of Change
d1 and d2	Facilitating Conditions moderated by age and gender	2	2	0	No change
e1 and e2	Medical knowledge moderated by age and gender	2	3	+1	Added geographic location as moderator

The pilot study confirmed that the modified UTAUT model with its extended constructs is a good model to use for this study.

The results from the 19 completed questionnaires indicated a strong Cronbach's Alpha > .7 for all construct scales exceeding the threshold of .6 for exploratory research (Hair *et al*., 2010). The results can be found in Table 11. Only one construct (facilitating conditions) did not meet the threshold, but it was retained given the pioneering nature of this research and it is a validated construct from the UTAUT model. The Cronbach Alpha scores indicate construct reliability and the feedback from the pre-test confirmed the theoretical bases for this model.

Table 11: Alpha Cronbach for quantitative pilot study

Constructs Reliability	Performance	Effort	Facilitating Conditions	Social Influence	Government	Medical education	Medical Knowledge	Usual heuristic
Cronbach Alpha	.712	.735	.219*	.859	.730	.713	.758	>.7 (confirmatory) >.6 (exploratory)

*kept due to small sample and part of original UTAUT model.

4.2.2 Additional Hypothesis and New Moderators

During this stage of the quantitative pilot study, the domain experts in the field of eHealth consistently remarked about the significance of having a working ICT infrastructure. Medical professionals require a working ICT to examine patients remotely. To enable eHealth usage, a country needs a solid IT infrastructure. eHealth has had a relatively slow diffusion rate partly due to the inadequate ICT infrastructures as explained in the case studies in Chapter 1. Kifle *et al.* (2007) states that the sub-Sahara region has the lowest level of ICT's in the world. There are several factors that can influence the use of a national ICT infrastructure in developing countries. These include: data transmission speed, availability, and reliability of maintenance services. Additionally, two important elements of ICT infrastructure on eHealth outcomes are bandwidth and the Internet. Broader bandwidth allows for data to be transmitted more quickly and enables greater resolution for expanding the technical capacity of eHealth services. Also, the Internet has become a medium for transmission of data for tele-consultations at a distance. Bashshur *et al.* (2002) explains that the slow diffusion of eHealth services is due to poor telecommunication infrastructures.

Based on these interviews, it was deemed important to include this additional construct to the conceptual research model: ICT infrastructure. ICT infrastructure was initially included in the facilitating conditions' construct within the research model. Therefore, this additional hypothesis is now included as a separate construct and a new hypothesis, H8.

According to the quantitative pilot study, ICT infrastructure is an important influencing factor in medical professionals' intention to use eHealth services. This construct assesses medical professionals' perceptions of ICT availability and performance. The premise is if medical professionals believe that the necessary ICT infrastructure is unavailable, they are unlikely to intend to use these new eHealth services. ICT infrastructure was part of facilitating conditions in the pilot study, however, the recipients of the pilot study felt that it was better to make ICT a separate construct which is in line with Kifle's (2006) study. Thus, the more the hospital/clinic is perceived as having an available and reliable ICT infrastructure, the greater the intention to use eHealth services.

H8: **The more the hospital/clinic is perceived as having an available and reliable ICT infrastructure, the greater the intention to use eHealth services.**

In addition to the new hypothesis, H8, two additional moderators were included in the final research model. Interviewees within the countries selected and domain experts indicated that geographic location should also be included as a moderator for the constructs of social influence and medical knowledge in addition to performance expectancy. The differences in the environment of geographic regions as related to healthcare services is significant. As rural areas have less skilled medical professionals and a significant shortfall in healthcare workers, the effect of social influence on behavioural intention as moderated by these two areas is presented. According to Venkatesh (2003), social influence was important in the early stages of individual experience and since medical workers in rural areas are relatively inexperienced compared to urban healthcare workers, the premise is medical professionals working in rural areas would be more affected by social influence.

The same rationale pertains to adding this moderator of geographic location to the construct of medical knowledge. The hypothesis is testing if urban medical professionals are more affected by image and status appearances regarding the intention to use eHealth services. For example, the imbalance of healthcare workers in rural areas is partly related to the low status conferred upon those working in rural and remote areas. Positions in urban centers are perceived as more prestigious (Dussault and Franceschini, 2006). Therefore, the perception that the use of eHealth services would give the impression of inadequate medical knowledge would be greater for urban medical professionals than rural heath workers.

Thus, this moderation to added to the final research model.

4.3 Pilot Study Research Conclusions and Implications

The pilot study confirmed the feasibility of the study as an important topic in the healthcare field. Part of the pre-test was conducted at a leading International Conference, Med-e-Tel on eHealth in Luxembourg, which is attended by medical professionals in developing countries. This also included discussions with leading domain experts and medical practitioners in the field of

eHealth and Telemedicine. There were about 400 participants at the conference and the feedback was encouraging.

4.3.1 Final Research Model Quantitative Study

Research Model Extended based on Quantitative Pilot Study in Developing Countries

Figure 12: Final Conceptual Research Model
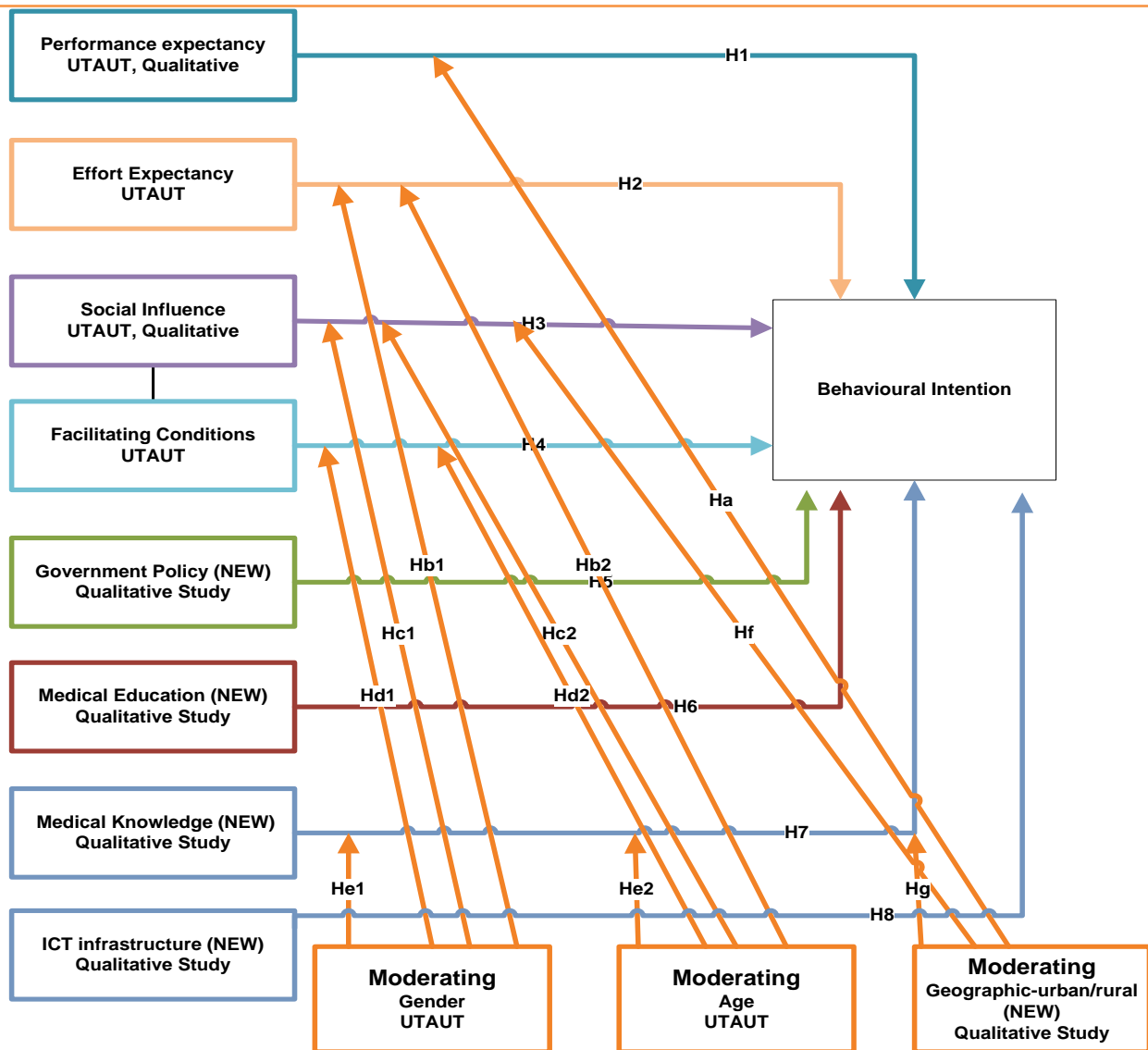
4.3.2 Final Structure of the Questionnaire

Based on the pilot study, the questionnaire was finalised. This questionnaire is presented in Appendix 6. The questionnaire consists largely of multi-item Likert scales. Likert scales require respondents to indicate their degree of agreement or disagreement with a series of statements. Each of the answers from strongly agree to strongly disagree were coded on a five point scale. This approach was also used in the original UTAUT model which is the foundation for this research study.

4.3.3 Scale Modifications

The statements used in the questionnaire have been modified to reflect the situation of eHealth in developing countries. The closer definitions of these statements reflect the results of the pilot study. Modifications were made to reflect a different technology and environment. This was confirmed with domain experts in the quantitative pilot study. Table 12 details the modified scales.

Table 12: Scale modifications from pilot to final scales

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
1	Performance Expectancy	I would find eHealth useful in my job. Using eHealth would enable me to accomplish tasks more quickly. Using eHealth would decrease my productivity. If I would use eHealth, I would increase my chances of earning	I would find eHealth useful in my job. Using eHealth would decrease my productivity, serving less patients. If I would use eHealth, I would increase my chances of earning more money. I would use eHealth because I can consult patients from rural and remote areas at a distance.

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
		more money.	eHealth would provide diagnoses and treatments more accurately through consultation at a distance with other medical staff.
		If I would use eHealth, I would diagnose patients more accurately.	
		If I would use eHealth I would provide treatments more accurately.	
		eHealth would provide more accurate diagnosis through consultation at a distance with other medical staff.	
2	Ease of use	I would find eHealth easy to use.	Learning to use eHealth would be easy for me.
		It would be difficult for me to become skillful at using eHealth.	It would be difficult for me to become skillful at using eHealth without proper training.
		Learning to use eHealth would be easy for me.	I would use eHealth if telemedicine infrastructure/equipment/workstation would be user-friendly.
3	Social Influence	People who are important to me think that I should use eHealth.	Medical experts who are important to me think that I should use eHealth.
		Senior management's opinion would be helpful in the use of eHealth.	Senior management's opinion would be helpful in the use of eHealth.
			It is important to have local volunteers

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
		It is important to have local volunteers amongst medical staff using eHealth.

I would try eHealth if I see others using it positively.

Having successful local eHealth pilot projects is not important to me. | amongst medical staff using eHealth

I would not try eHealth if I see other medical staff using it positively.

Having successful local eHealth pilot projects is important to me. |
| 4 | Facilitating Conditions | In general, the organization would support the use of eHealth.

I would not have the resources necessary to use eHealth.

A specific person (or group) would not be available for assistance with eHealth system difficulties.

I could complete a job or task using eHealth: If there was no one around to tell me what to do as I go.

I could complete a job or task using eHealth: If I could call someone for help if I got stuck.

I would have the knowledge necessary to use eHealth. | In general, your organization would support the use of eHealth.

I would not have the resources necessary to use eHealth.

I would have the knowledge necessary to use eHealth.

Technical support would not be available for assistance with eHealth system difficulties.

If there is no one around to assist me in patient diagnostics and treatment, I could complete my task using eHealth. |

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
5	Medical Education	Introduction to eHealth within my University medical education would make it easier to use eHealth in practice.

Learning the benefits of eHealth within my University medical education would give me a positive attitude towards eHealth.

I would use eHealth if I received training within my University medical education.

I would not use eHealth if I received continuous training after Medical University. | Introduction to eHealth within my medical education (University/College/Nursing school, Continuous Medical Education (CME) etc.), would make it easier to use eHealth in practice.

Learning the benefits of eHealth within my medical education (University/College/Nursing school, CME, etc.) would give me a positive attitude towards eHealth.

I would use eHealth in practice if I received training within my medical education (University/college/Nursing school, CME, etc.).

I would use eHealth if I received continuous training in eHealth after Medical University/college/Nursing school, CME, etc. |
| 6 | Government Policy | Awareness of the government's eHealth strategic implementation plan is not important for eHealth use.

I would use eHealth if I perceived a positive government eHealth | Awareness of the government's eHealth strategic implementation plan is not important for eHealth use.

I would use eHealth if I perceived a positive government eHealth policy

I would use eHealth if government |

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
		policy. I would use eHealth if government gave financial incentives to use eHealth. I would use eHealth if government gave access to Internet. I would use eHealth if I perceived government health officials as using eHealth.	provided financial incentives to use eHealth. I would use eHealth if government/administration installed the necessary Information and Technology infrastructure.
7	Medical Knowledge	Using eHealth would make me feel more competent. Using eHealth would give me more knowledge in international medical experience.	Using eHealth would give me more prestige over those who do not use it. Using eHealth would make me feel less competent. Using eHealth would give me more knowledge in international medical experience.
8	ICT Infrastructure		Urban health institutions have adequate access to phone services, whether fixed or mobile phone service. Rural health institutions have adequate access to phone services, whether fixed or mobile phone service. Policies focusing on security, privacy, and confidentiality of data would be necessary for eHealth services. Policies focusing on security, privacy, and confidentiality of health data

Hypotheses	eHealth survey	Pilot Study Scale	Final Scale
			would be necessary for eHealth services.
			Urban health institutions have adequate access to internet services.
			Rural health institutions have adequate access to internet services.

Chapter 5: Final Quantitative Study and Hypotheses Testing

5.1 Objectives and Methodology

5.1.1 Objectives

The objective of the final quantitative study is to test, validate, and measure the nineteen hypotheses in the context of a unique behavioural intention model for developing countries as described in Chapter 4. The quantitative research study is conclusive and underpins the recommendations for marketing strategies for these innovative eHealth services in developing countries. This purpose is to generalize from a sample of the population so that inferences can be made about some characteristics, attitude, or behaviour of this population (Babbie, 1990). And in the case of this research, inferences can be made regarding behavioural intention factors.

5.1.2 Methodology

The quantitative study was conducted in six developing countries. The six countries surveyed were: Malaysia, Mongolia, Sri Lanka, Argentina, Saudi Arabia, and Kazakhstan. As described earlier in this thesis, these countries are part of the pool of countries working with the ITU eHealth Study Group 2 or working with the International University in Geneva data collection network. The countries were randomly selected and showed a willingness to participate in the study. Formal agreements to conduct the survey were required and reached with the Maternal and Child Health Research Centre in Mongolia, The Rural Government Hospital in Wellawa, Sri Lanka, and the University Putra Malaysia in Kuala Lumpur. Argentina, Saudi Arabia, and Kazakhstan were organized by the researcher using the data collection network as explained in the data collection section of this thesis.

The sample was taken from hospitals, medical clinics, and hospital universities, both private and public establishments. These establishments are presented in Appendix 7. A convenience judgment sample was used and the questionnaire was distributed randomly on-site by the data collection network mainly through personal visits. The advantage of this approach over 100% self-administered questionnaires is that a member of the data collection network is present to

119

explain things to the respondent and to clarify any misconceptions (McDaniel and Gates, 2006). As eHealth is not well known, a face-to face administered questionnaire was deemed better as to assure that the respondents understood the questions (Gill and Johnson, 2002).

5.1.2.1 Characteristics of the Empirical Study

The questionnaire was constructed carefully to maintain a neutral stance regarding eHealth services. Particular attention was paid to the wording and ordering of the questions (Malhotra and Birks, 2006) in accordance with the results of the quantitative pilot study.

To ensure further comprehension from the respondents, the questionnaire was translated into local languages: Spanish, Russian and Mongolian. The translation was performed by members of the data collection network who have excellent knowledge of the subject as well as being native speakers. In line with translation practices, the translations were thought-based and not word-based. The translations were conducted in a traditional manner. Sechrest *et al.,* (1972) refer to this method as direct translation or 'one to one' translation. McKay *et al*. (1996) use the term direct translation for translation from source to target language which is one way or forward translation as opposed to 'two-way' or forward and backward translation. The medical terminology in the translations was performed using the WHO ICD-10 medical dictionary for translations.

-**Sampling**

The objective was to have a large sample of relevant medical professionals (doctors, nurses, IT managers, hospital administrators, University medical students) in a variety of developing countries. The sample size of 329 meets the threshold of 20 samples per construct as recommended by Hair *et al.* (2010).

Since eHealth is a new service and the exploratory qualitative survey showed that there was a low level of awareness of eHealth in developing countries, a detailed description explaining what is eHealth was added to the final questionnaire to ensure understanding of the concept of eHealth. The respondents were asked to read the explanation prior to answering the questionnaire. The use of the eHealth data collection network, which was available to provide

further clarification with the interviewees, helped to ensure that the respondents understood the concept.

5.1.2.2 Classification of the Sample

Table 13 details the specialism of respondents (329 from 6 developing countries) with a good cross-section of medical professionals including: Generalists (21.6%), Specialists (28.6 %), Medical students (23.7%), IT staff (7.3%), Nurses (14.3%), and hospital administrators (4.0%).

Table 13: Final Quantitative Study: Occupation of Respondents

Profession	Frequency	Percent	Cumulative Percentage
Generalist Doctors	71	21.6	21.6
Specialist Doctors	94	28.6	50.2
IT Staff	24	7.3	57.5
Medical Students	78	23.7	81.2
Nurses	47	14.3	95.5
Hospital Administrators	13	4.0	99.5
Missing Data	2	.6	100.0
Total	329	100.0	

Table 14 presents the type of hospital that the respondents represent which is also a good cross-section of public and private hospitals and clinics. The respondents surveyed work in hospitals (38.9%), medical clinics (22.5%), medical universities (14.9%), private practice (3%), government health service (5.2%) and private clinics (6.7%). The respondents represent a good cross section of the medical population.

Table 14: Final Quantitative Study: workplace

Place of Work	Frequency	Percent	Cumulative Percent
Hospital	128	38.9	38.9
Medical Clinic	74	22.5	61.4
Medical University Hospital	49	14.9	76.3
Private Practice	10	3.0	79.3

Place of Work	Frequency	Percent	Cumulative Percent
Health Department/Government Service	17	5.2	84.5
Private Clinic/Hospital	22	6.7	91.2
Combinations	18	5.5	96.7
Missing data	11	3.3	100.0
Total	329	100.0	

Table 15 details the distribution of age and experience in the medical profession.

Table 15: Main study: experience (age) of medical staff

Experience (age)	Frequency	Percent	Cumulative Percent
Less than 25	86	26.1	26.1
Between 25-34	88	26.7	52.8
Between 35-44	72	21.9	74.7
Between 45-54	54	16.4	91.1
Between 55-64	21	6.4	97.5
Greater than 65	2	.6	98.1
Missing Data	6	1.9	100.0
Total	329	100.0	

Table 16: Final Quantitative Study: Gender of respondents

Table 16 shows a good representation (almost a 50-50 split) of male and female medical professionals.

Gender	Frequency	Percent	Cumulative Percent
Male	152	46.2	49.2
Female	157	47.7	93.9
Missing Data	20	6.1	100.0
Total	329	100.0	

Table 17 shows the distribution between urban and rural professionals. The sample for rural areas was deemed logical and acceptable by the researcher as it represents generally, the actual percentage of urban to rural doctors in developing countries. In addition, based on the large sample of medical professionals from both the quantitative and qualitative studies (549 respondents); the representativeness of both environments was deemed acceptable from the researcher's perspective.

Table 17: Final Quantitative Study: geographic location

Geographic Location	Frequency	Percent	Cumulative Percentage
Rural	71	21.6	21.6
Urban	250	76.0	97.6
Both	3	.9	98.5
Missing Data	5	1.5	100.0
Total	329	100.0	

5.2 Methodology for the development of multi-item scales

In order to create an original model with multi-item scales to measure eHealth in developing countries, the approach suggested by Nunally (1967), developed by Churchill (1979) and updated by Gerbing and Anderson (1988) was adopted. This procedure is generally known as "the Churchill paradigm". The Churchill paradigm provides a method for reliable and valid scale development that relies on eight steps (see Figure 13). This procedure was designed for the development of multi-item scales. According to Churchill (1979), multi-item scales are better than single-item scales. In particular, reliability tends to increase whereas measurement error tends to decrease.

Figure 13: Churchill's Paradigm


```
┌─────────────────────────────────────┐
│   Specifiy the domain of the construct │
│          Literature Review            │
└─────────────────────────────────────┘
        ┌─────────────────────────────┐
        │   Generate sample of items   │
        │      Literature Review       │
        │      Qualitative Study       │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │        Collect Data          │
        │      Qualitative Study       │
        │      Quantitative Pilot      │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │       Purify Measure         │
        │       Alpha Cronbach         │
        │       Factor Analysis        │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │        Collect Data          │
        │    Final Quantitative Study  │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │      Assess Reliability      │
        │       Alpha Cronbach         │
        │       Joreskog's rhô         │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │       Assess Validity        │
        │ Content, Construct, and Discriminant │
        └─────────────────────────────┘
        ┌─────────────────────────────┐
        │        Develop Norms         │
        └─────────────────────────────┘
```

The first step for developing better measures involves specifying the domain of the construct. Step 1 analysed the relevant literature to clearly delineate the construct in terms of what is and what is not included in the definition. This step was adhered to by the researcher. The second step in this procedure is to generate a sample of items which capture the domain of this study. This is performed through exploratory research methods, such as the literature review and qualitative research, and are relevant techniques to generate an appropriate set of items (Churchill, 1979). The third set is data collection and step 4 is to "purify" the measure in order to keep the items which really belong to the domain of the concept and to eliminate those that do not. Step 5 is to collect data and step 6 is to assess reliability. Reliability has been defined (Malhotra and Birks, 2006) as the extent to which a scale produces consistent results if repeated

measurements are made on the characteristics. The recommended measure for internal consistency is provided by coefficient alpha (Churchill, 1979).

Step 7 assesses the validity of the measurement. Malhotra and Birks (2006) define validity as the extent to which a measurement represents characteristics that exist in the phenomenon under investigation. To establish construct validity of a measure, one must determine if the measure correlates with other measures designed to measure the same thing and whether the measure behaves as expected.

Step 8 involves the development of norms by comparing the results with those achieved by others. This step could not be performed due to the absence of norms in this area of research since we are in the exploratory stage. A similar research model does not exist for eHealth in developing countries.

5.2.1 Development and validation of the independent variables

The independent variables in the model (Performance expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Government Policy, Medical education, Medical Education, and ICT Infrastructure) were refined, developed, and validated. These independent variables were deemed most relevant by the researcher in the context of eHealth in developing countries.

Before starting the data analysis procedures, the step of purifying the measure was conducted. This step aims to keep the items which really belong to the domain of the concept and to remove inappropriate items (Churchill, 1979).

To reach this goal, principle components factor analysis was conducted. Factor analysis is a statistical technique employed for scale development and scale validation. The generic objective is to define whether the various items that are intended to represent the factors of behavioural intention to use eHealth services actually fulfil this purpose.

Results of the purification of measure using factor analysis

Factor analysis was used to confirm whether the hypothesized factor structure actually fits the initial set of data. Using principle components factor analysis, the researcher was able to

ascertain which scales actually contribute to the measure. The software package SPSS was used for this procedure.

Factorability of the data

The first step in the analysis was to check the factorability of the data. Two complementary tests were run to verify factorability: the Keiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity (Hair *et al.* 2010). The KMO indicates that partial correlations between variables are small, which means that the variables strongly contribute to the construction of a common factor. The KMO should be greater than .500. Kaiser (1974) declares measures in the .90's as marvellous, in the .80's as meritorious, in the .70's as middling, in the .60's as mediocre. Anything below .50 is unacceptable. Bartlett's test of sphericity is used to test the null hypothesis that variables are uncorrelated. If the significance level is small, the null hypothesis is rejected, which confirms that the variables are factorable. Table 18 details the test scores for both measures.

Table 18: Bartlett's test and KMO test

Influencing Factors	Bartlett's test of sphericity	Kaiser-Meyer-Olkin
Performance Expectancy	Approx.chi-square=278.867,df=3,significance=.000	Kaiser-Meyer-Olkin=.600
Effort Expectancy	Approx.chi-square=67.087,df=3,significance=.000	Kaiser-Meyer-Olkin=.596
Social Influence	Approx.chi-square=152.752,df=3,significance=.000	Kaiser-Meyer-Olkin=.589
Facilitating Conditions	Approx.chi-square=15.653,df=1,significance=.000	Kaiser-Meyer-Olkin=.500
Government Policy	Approx.chi-square=316.870,df=3,significance=.000	Kaiser-Meyer-

		Olkin=.696
Medical education	Approx.chi-square=726.134,df=6,significance=.000	Kaiser-Meyer-Olkin=.758
Medical Knowledge	Approx.chi-square=201.844,df=1,significance=.000	Kaiser-Meyer-Olkin=.500
ICT Infrastructure	Approx.chi-square=631.406,df=6,significance=.000	Kaiser-Meyer-Olkin=.614

The above table shows that the data are factorable. KMO is equal to or greater than .500 (Kaiser, 1974). Bartlett's test of sphericity shows that the null hypothesis on the non-correlation of the variables is rejected.

The next step in the analysis is to assess communalities. This is the proportion of variance that each item has in common with the other items in the model. Communalitiy refers to the proportion of variance of a particular item that is due to common factors (shared with other items). The proportion of variance that is unique to each item is then the respective item's total variance minus the communality. Therefore, one should not expect that the factors will extract all variance from the items; rather, only that proportion that is due to the common factors and shared by several items. Therefore, an additional task when applying this model is to estimate the communalities for each variable, that is, the proportion of variance that each item has in common with other items.

The researcher used the method of principal components analysis which is a preferred method for data reduction (Hair *et al*. 2010).

Estimation of Communalities

The scales after factor analysis used in the research model for each of the constructs are shown in Table 19.

Table 19: Scales used in Hypotheses Testing

Construct	Scales
Performance Expectancy	V7: I would find eHealth useful in my job.
	V8: Using eHealth would decrease my productivity, serving less patients.
	V9:eHealth would provide diagnoses and treatments more accurately through consultation at a distance with other medical staff.
Effort Expectancy	V12: Learning to use eHealth would be easy for me.
	V13: It would be difficult for me to become skillful at using eHealth without proper training.
	V14: I would use eHealth if telemedicine infrastructure/equipment/workstation would be user-friendly.
Social Influence	V24: Medical experts who are important to me think that I should use eHealth.
	V25: Senior management's opinion would be helpful in the use of eHealth.
	V26: It is important to have local volunteers amongst medical staff using e Health
Facilitating Conditions	V32: Technical support would not be available for assistance with eHealth system difficulties.
	V29: In general, your organization would support the use of eHealth
Government Policy	V35: I would use eHealth if I perceived a positive government eHealth policy.
	V36 I would use eHealth if government provided financial incentives to use eHealth.
	V37: I would use eHealth if government/administration installed the necessary Information and Technology infrastructure.
Medical Knowledge	V43: Using eHealth would make me feel less competent.
	V44: Using eHealth would give me more knowledge in international medical experience.
ICT Infrastructure	V17: Policies focusing on security, privacy, and confidentiality of data

Construct	Scales
	would be necessary for eHealth services.
	V18: Policies focusing on security, privacy, and confidentiality of health data would be necessary for eHealth services.
	V19: Urban health institutions have adequate access to internet services

Table 20 shows that the majority of communalities are superior to 0.500. Effort expectancy is the weakest. The different variables contribute satisfactorily to the creation of the factor. Communality measures the percentage of variance explained by all the factors combined and may be interpreted as the reliability of the indicator (Garson, 2008). Communalities greater than .5 indicate the reliability of the scale. However, if Cronbach's internal consistency is reached, the lower communalities obtained are accepted.

Table 20: Communalities

Performance Expectancy	Effort Expectancy	Social Influence	Facilitating Conditions	Government Policy	Medical Knowledge	ICT Infrastructure
V7 = .812	V12=.436	V24= .591	V29=.608	V35= .662	V43= .842	V17= .856
V8= .693	V13=.502	V25= .729	V32= .608	V36= .771	V44= .842	V18 = .855
V11=.505	V14=.599	V26= .452		V37= .718		V19= .481

The following step in deciding how many factors to keep is to look at the percentage of the total variance in the sample explained by each of the factors. All variables and factors are expressed in standardized form with a mean of 0 and a variance of 1. The goal is to explain as much variance using as few factors as possible. In order to ascertain the number of factors and variances, the researcher includes only factors that account for variances greater than 1. (Eigenvalues represent the amount of variance accounted for by a factor).

For this model, using Principal Component Analysis, the researcher was able to purify the measure. It is useful when the research possesses data on a large number of variables and

believes that there is some redundancy in those variables. Redundancy means that some of the variables are correlated with one another, possibly because they are measuring the same construct. Because of this redundancy, the researcher believes that it should be possible to reduce the observed variables into a smaller number of principal components (artificial variables) that will account for most of the variance in the observed variables.

Dimensionality

The number of factors kept indicates the number of underlying dimensions of the scale. Different procedures confirm that only one factor should be taken into account. One common method is the Kaiser criterion (1960). The rule defined by Kaiser (1960) is to retain only those factor(s) whose eigenvalue(s) is / are superior to 1.

The following tables show that only one factor should be retained for each construct (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Government Policy, Medical education, Medical Knowledge, and ICT Infrastructure).

Table 21 demonstrates that only 1 factor should be retained for performance expectancy. The eigenvalue is 2.010 which is the only value greater than 1. This factor explains 67% of the variance, i.e. superior to the usual threshold of 50%.

The first example enabled the researcher to purify the data and allowed the researcher to define a scale that measured performance expectancy.

Table 21: Principal Component Factor Analysis: Performance Expectancy

Total Variance Explained		Performance Expectancy					
Component		Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
V7	1	2.010	67.015	67.015	2.010	67.015	67.015
V8	2	.692	23.068	90.082			
V11	3	.298	9.918	100.000			

Extraction Method: Principal Component Analysis.

Principal Component Analysis was conducted for all independent variables (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Government Policy, Medical education, Medical Knowledge, and ICT Infrastructure).

The following tables indicate that one factor should be retained for each of the below-mentioned independent variables and each explains more than 50% of the variance.

Table 22: Principal Component Factor Analysis: Effort Expectancy

Total Variance Explained			Effort Expectancy			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension 1	1.538	51.268	51.268	1.538	51.268	51.268
2	.809	26.957	78.225			
3	.653	21.775	100.000			

Table 23: Principal Component Factor Analysis: Social Influence

Total Variance Explained			Social Influence			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension 1	1.773	59.091	59.091	1.773	59.091	59.091
2	.775	25.825	84.916			
3	.453	15.084	100.000			

Extraction Method: Principal Component Analysis.

Table 24: Principal Component Factor Analysis: Facilitating conditions

Total Variance Explained			Facilitating Conditions			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension 1	1.217	60.834	60.834	1.217	60.834	60.834
2	.783	39.166	100.000			

Extraction Method: Principal Component Analysis.

Table 25: Principal Component Factor Analysis: Government Policy

Total Variance Explained			Government Policy			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.151	71.703	71.703	2.151	71.703	71.703
2	.500	16.683	88.385			
3	.348	11.615	100.000			

Extraction Method: Principal Component Analysis.

Table 26: Principal Component Factor Analysis: Medical education

Total Variance Explained			Medical education			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.904	72.607	72.607	2.904	72.607	72.607
2	.596	14.908	87.516			
3	.288	7.190	94.706			
4	.212	5.294	100.000			

Extraction Method: Principal Component Analysis.

Table 27: Principal Component Factor Analysis: Medical knowledge

Total Variance Explained			Medical Knowledge			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.684	84.179	84.179	1.684	84.179	84.179
2	.316	15.821	100.000			

Extraction Method: Principal Component Analysis.

Table 28: Principal Component Factor Analysis: ICT Infrastructure

Total Variance Explained			ICT Infrastructure			
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.541	63.517	63.517	2.541	63.517	63.517
2	.877	21.934	85.451			
3	.441	11.013	96.464			
4	.141	3.536	100.000			

(dimension)

Extraction Method: Principal Component Analysis.

Based on the above tables, the researcher can define the uni-dimensionality (one factor) of Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Government Policy, Medical education, Medical Knowledge, and ICT Infrastructure. The result is coherent with the expected structure.

Unidimensionality concerns whether the data forms a single factor (Bond and Fox, 2001). It can be used to assess whether the single latent trait explains all the variance in the data. Unidimensionality of each scale was evaluated with principal components analysis (PCA). This study used a cut-off of 50% of variance explained and eigenvalues greater than 1 as explained above. Spector (1992) recommends that there should be three items per scale; however, this is only appropriate if practical concerns, such as the length of the questionnaire prevent the inclusion of more items. The reliability of the scales will now be assessed.

Reliability Assessment

In order to assess the reliability of the eHealth behavioural intention scales, Cronbach's Alpha (1951), also termed coefficient alpha, was used.

-Cronbach's Alpha

Cronbach's Alpha is a measure of the internal consistency (reliability) of each scale. Thus, it indicates if a set of items can be considered to measure a single latent variable. The Alpha

coefficient ranges in value from 0 to 1. The closer the coefficient is to 1, the more consistent the scale. Conversely, a score close to 0 indicates weak internal consistency. In practice, the assessment of the Cronbach's Alpha relies on heuristics (Peterson, 1994). A score superior to .7 is recommended in a confirmatory context. A score of .6 is sufficient in an exploratory context (Hair *et al.*, 2010). This study is exploratory.

In seven out of eight of the constructs, the coefficient Alpha matches the theoretical requirement. All of the scales have internal consistency except facilitating conditions. Facilitating conditions did not meet the conditions for factor analysis and reliability and therefore, facilitating conditions will not be used in regression analysis.

One limitation of Cronbach's Alpha is its sensitivity to the number of items that forms the scale as the larger the number of items, the higher the coefficient alpha. Jöreskog's Rhô overcomes this issue (Valette-Florence, 1998). The interpretation is relatively similar to the coefficient alpha: when Rhô is close to 1, it reveals that the scale is consistent and thus reliable. Conversely, a score close to 0 indicates a poor level of reliability.

In the study, Joreskôg Rhô meets the required threshold of greater than .7 in confirmatory research studies and greater than .6 in exploratory research studies. In this case, all constructs were greater than .6 except medical knowledge, and six out of seven constructs were greater than .7, and three constructs were greater than .8. The Joreskôg Rhô score meets the requirement that the multiple-item scale to measure eHealth behavioural intention is reliable.

Table 29 shows that the scales used in the research model have internal consistency and have been confirmed using two different methods (Cronbach's Alpha and Joreskog's rhô). This confirms that the researcher has an internally reliable scale.

Table 29: Alpha and Joreskog's rhô

Constructs	Performance	Effort	ICT	Social Influence	Govern-ment	Medical education	Medical Knowledge	Usual heuristic
Reliability								
Cronbach Alpha	.729	.671	.795	.871	.801	.871	.810	>.7 (confirmatory) >.6 (exploratory)
Joreskog's rhô	0.780	.707	.804	.687	.805	.873	.521	>.7 (confirmatory) >.6 (exploratory)

However, the computation of Cronbach's Alpha and Joreskog's rhô does not ensure the validity of the scale (Nunally, 1967; Churchill, 1979). Therefore, other dimensions of validity must be discussed: content validity, construct validity (convergent and discriminant validity) and criterion validity.

The assessment of validity

-Content Validity

According to Malhotra and Birks (2006), content validity is the subjective but systematic evaluation of the representativeness of the scales for measuring the task at hand. In the study, it refers to the extent to which the measure represents all facets of eHealth behavioural intention factors.

Content validity depends on the attention paid by the researcher as to the specification of the construct domain. The researcher took great care to ensure that the items represented the measurement of eHealth behavioural intention.

The researcher conducted a thorough literature review of the subject and based on the limited research conducted on eHealth in developing countries, an exploratory qualitative study was undertaken to better assess the domain of eHealth in developing countries. A pre-test of the quantitative research study was conducted to ensure the items were coherent and understandable. Domain experts in the field were consulted and contributed to the validity of the scale and model.

Moreover, the items have high communality: all are superior to .5 except for 2 items (good Alpha Cronbach). In conclusion, content validity is established.

- Construct validity

Construct validity was defined by Peter (1981) as the extent the research effectively operationalizes the concept that one is supposed to measure. To assess construct validity, Campbell and Fiske (1959) suggest analyzing both convergent and discriminant validity. According to Bagozzi and Yi (1991, p. 427), convergent validity is "the degree to which multiple attempts to measure the same concept are in agreement" while discriminant validity "is the degree to which measures of different concepts are distinct".

The scale in this research is classified as reflective as the underlying constructs are hypothesized to cause changes in the indicators (Fornell and Bookstein, 1982) or effects (Bollen and Lennox, 1991). Behavioural intention is measured in this model which is an appropriate application of a reflective model. The underlying assumption is that the measures are caused by a single underlying construct. The Chau and Hu (2002) study on telemedicine which was used in this study considered their scales as reflective.

- Convergent validity

When different measures of the same construct exist, one common method used by researchers is the multi-trait multi-method approach. This approach measures the correlations obtained with the different scales used. Unfortunately, this method cannot be used because no other measures of eHealth in developing countries exist.

Bagozzi and Yi (1991) propose that two levels of convergent validity can be assessed: weak evidence for convergent validity and strong evidence for convergent validity. Bagozzi and Yi (1991, p. 433) consider that weak evidence for convergent validity is ensured when "the factor loading on a measure of interest is statistically significant".

Table 30 shows that this condition is satisfied in the model. All the relationships are significant with p-value < 0,001.

Table 30: Weak evidence for convergent validity

Construct	Parameter Estimate	Standard Error	T Statistic	P-value
(PERF EXP)-1->[V7]	1.000	0,000	1,196722E+09	0,000 ***
(PERF EXP)-2->[V8]	0,673	0,031	2,196449E+01	0,000 ***
(PERF EXP)-3->[V11]	0,493	0,042	1,160268E+01	0,000 ***
(EFFORT)-1->[V12]	0,823	0,069	11,970	0,000 ***
(EFFORT)-2->[V13]	0,791	0,067	11,790	0,000 ***
EFFORT)-3->[V14]	0,341	0,056	6,068	0,000***
(ICT)-1->[V15]	0,425	0,048	8,883	0,000***
(ICT)-2->[V17]	0,939	0,022	42,448	0,000***
(ICT)-3->[V18]	0,909	0,023	40,183	0,000***
(ICT)-4->[V19]	0,497	0,044	11,219	0,000***
(SOCI INF)-1->[V24]	0,550	0,065	8,510	0,000***
(SOCI INF)-2->[V25]	0,929	0,088	10,602	0,000***
(SOCI INF)-3->[V26]	0,427	0,061	7,042	0,000***
(GOVT)-1->[V35]	0,676	0,039	17,536	0,000***
(GOVT)-2->[V36]	0,852	0,034	25,048	0,000***
(GOVT)-3->[V37]	0,751	0,036	20,811	0,000***
(MED EDU)-1->[v38]	0,731	0,030	24,450	0,000***
(MED EDU)-2->[V39]	0,734	0,030	24,767	0,000***
(MED EDU)-3->[V40]	0,908	0,019	48,984	0,000***
(MED EDU)-4->[V41]	0,801	0,025	32,179	0,000***
(KNOW)-1->[V43]	0,963	0,000	2,318990E+09	0,000***
(KNOW)-2->[V44]	0,710	0,031	2,302662E+01	0,000***

Evidence for convergent validity is often assessed through an approach suggested by Fornell and Larcker (1981). The method consists in calculating the variance shared by the measured concept with its items. This indicator is usually termed the ρ CV. If the ρ CV is inferior to 50%, it means that the latent variable (the concept) shares less than 50% of its variance with its items. In this case, measurement errors explain the greater part of the variance. Conversely, if the ρ CV is superior to 50%, the latent variable shares more than 50% of its variance with the items. Measurement errors explain less than 50% of the variance. Thus, it is considered that strong evidence for convergent validity is ensured when the ρ CV is superior to 50%. In the study the ρ CV meets the threshold as evidenced in Table 31. Thus evidence of convergent validity was provided.

-Discriminant validity

Malhotra and Birk (2006, p.315) suggest that discriminant validity is useful in assessing "the extent to which a measure does not correlate with other constructs from which it is supposed to differ".

Based on this definition, the analysis of discriminant validity was not applicable in the study because the objective was not to compare the eHealth behavioural intention scale to another eHealth behavioural intention scale from which it should differ or to compare group membership.

- Criterion validity

Criterion validity is usually ensured at the hypotheses validation stage: the criterion validity is ensured if the research hypotheses are verified. It would implicitly mean that the measure of eHealth behavioural intention runs as theoretically expected.

Table 31 summarizes the assessment of content, convergent and discriminant validity.

Conclusion

The eHealth behavioural intention model overall meets the requirements of reliability and validity. Table 31 presents the results of scale validity.

Table 31: Scale Validity

Indices	Performance	Effort	ICT	Social Influence	Government	Medical education	Medical Knowledge	Usual heuristic
Content validity	ok	ok	ok	ok	ok	ok	ok	
Construct: Convergent Weak evidence	ok	ok	ok	ok	ok	ok	ok	See Table 30
Construct: Convergent strong evidence	.560	.472	.534	.449	.582	.634	.715	Rho VC (ρ CV) superior to 0,5
Construct part 2: Discriminant	ok	ok	ok	ok	ok	ok	ok	
Criterion validity	hypothesis	hypothesis	hypothesis	hypothesis	hypothesis	hypothesis	hypothesis	

5.2.2 Scale used for dependent variable

The study included intention to use eHealth services as the dependent variable. The literature (Fishbein and Ajzen, 1975) validated the relationship between intention and acceptance in the context of developed countries.

Therefore, the researcher wanted to test the same relationship for developing countries and for a new service, eHealth.

The dependent variable for intention to use eHealth is:

139

The researcher used multi-item scales for all of the independent variables since they have better psychometric qualities (Churchill, 1979).

The choice of a mono-item scale for intention to use (dependent variable) is noteworthy. Researchers in the field of "intention to use" scales have shown that mono-item scales present sufficient psychometric properties (Gururajan, 2008).

Bergkvist (2007, p.175) argues that there is no difference in the predictive validity of the multiple-item and single-item measures. In the context of eHealth (relatively unknown in the developing world) the use of a single-item measure for intention to use was more relevant as asking respondents to answer behavioural intention to use eHealth in *n* number of months is unrealistic due to the early stage and general low awareness of this service.

5.3 Key Findings

5.3.1 Hypothesis Testing

Multiple linear regression is used to test the seven main hypotheses (H4 eliminated because of the poor psychometric qualities of the scale used to measure facilitating conditions). This mathematical model is used to model the relationship between a single dependent variable (intention to use) and a set of independent variables (Performance, Effort, Social Influence, Government Policy, Medical Education, Inadequate Medical Education, ICT Infrastructure). Multiple regression analysis predicts the values of a dependent variable as a linear combination of the values of one or more independent (predictor) variables. The coefficients are estimated using the method of ordinary least squares as the behavioural intention scale (5 -point Likert scales) are considered interval scales. They result in the smallest sum of squared differences between the observed and predicted values of the dependent variable. Once the regression coefficients were obtained, the coefficient of determination (R^2) was considered. This coefficient is a measure of the proportion of the variance of the dependent variable that is explained by the

independent, or predictor variables. It is therefore a measure of the explanatory power of the regression equation.

To validate the different relationships of the research model, two categories of results must be presented. The first category refers to the statistical significance of the relationship analyzed. First, the correlation measure is presented, which indicates the strength of the relationship between the predictor and the explained variable. This correlation is associated with its significance level (p-value). A 5% level of significance was used as a threshold. Based on earlier research (see literature review and hypotheses section), the directions of the relationships between variables were specifiable prior to conducting the study. Intention to use eHealth services is the dependent and all other variables are independent. The *p*-value for all hypotheses was calculated using SPSS-18 software package which automatically resulted in a bilateral coefficient. Since a unilateral coefficient is sufficient, the resultant *p*-value was divided by two (*p*/2). According to Norusis (2008) this adjustment to a one-tailed test is acceptable, if the direction of the effect is known. The second category refers to the practical significance measured through the R^2 coefficient. Multiple regression analysis was performed using SPSS software. Regression analysis is performed for each hypothesis, and then it is performed for all of the hypotheses.

The assumptions of normality were reached. According to Hair (2010), the sample size of 329 meets the threshold of 20 samples per construct as recommended by Hair *et al.* (2010). Having a large sample size enables normality of the data.

The assumption of linearity was verified using Pearson's Product Moment Correlation coefficient which measures the degree of the linear relationship between variables. The R score of .607 demonstrates linearity.

5.3.1.1 Results of Hypotheses Testing:

Validation of H1

H1 measures the impact of performance expectancy on intention to use eHealth services. It is hypothesized as: *"the higher perceived performance expectancy, the higher the intention to use eHealth services."*

The outcome is significant ($p/2$ <.05). Accordingly, perceived usefulness has an effect on behavioural intention. Therefore, H1 is validated.

Table 32: H1 Regression Analysis for Performance expectancy

H1: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	PERFEXP	**.201**	**.046**	**.251**	**4.372**	**.000**

This hypothesis is validated. According to analysis presented above, H1 is validated (p/2<.05). Coefficient B (.251) shows that there is a positive relationship between both variables. Therefore, a higher level of performance expectancy has a positive effect on the dependent variable, intention to use eHealth services.

The researcher has scientifically validated that there is an effect of performance expectancy, i.e. improved productivity on behavioural intention when the performance expectancy construct was applied to eHealth services in developing countries.

Validation of H2

H2 measures the impact of ease of use (effort expectancy) on the intention to use eHealth services in developing countries. It is hypothesized as: *"The lower the effort expectancy, the higher the intention to use eHealth services."*

The outcome is not significant ($p/2$>.05). Accordingly, perceived ease of use has no effect on behavioural intention. Therefore, H2 is not validated.

Table 33: H2 Regression Analysis for Effort Expectancy

H2: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
	EFFORT	**-.027**	**.046**	**-.034**	**-.597**	**.275**

a. Dependent Variable: V46

This hypothesis is not validated. $p/2$ is .275 which is higher than the 5% level of significance. Effort expectancy was a construct that was taken from the UTAUT model and the scale was adapted to represent eHealth in developing countries.

Validation of H3

H3 measures the impact of social influence on the intention to use eHealth services in developing countries. It is hypothesized as: "*The higher the social influence, the higher the behavioural intention to use eHealth services.*" The outcome is not significant ($p/2>.05$). Accordingly, social influence has no effect on behavioural intention. Therefore, H3 is not validated.

Table 34: H3 Regression Analysis for Social Influence

H3: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
	SOCINF	**-.002**	**.045**	**-.002**	**-.036**	**.486**

a. Dependent Variable: V46

This hypothesis is not validated. As demonstrated in the application of the UTAUT model, it was shown that social influence is non-significant as a behavioural intention factor without the inclusion of moderators. The researcher in this study had the same result.

The hypotheses were not supported as p/2 was greater than the .05 significance level threshold.

H4: Impact of facilitating conditions on the intention to use eHealth services in developing countries. This hypothesis was not tested "because of the poor psychometric qualities of the scale used to measure facilitating conditions."

Validation of H5

H5 measures the impact of government policy and support on the intention to use of eHealth services in developing countries. It is hypothesized as: *"The more the doctor (medical staff) perceives strong government policy and support, the stronger the intention to use eHealth services."* The outcome is significant at the 10% level but not at the 5% threshold. Therefore, it is concluded that there is partial support for hypothesis H5. However, the practical significance is very low, as the coefficient B is close to 0.

Table 35: H5: Regression Analysis for Government Policy

H5: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	GOVT	**.063**	**.046**	**.080**	**1.361**	**.087**

a. Dependent Variable: V46

Validation of H6

H6 measures the impact of eHealth medical education on intention to use of eHealth services by medical professionals in developing countries.

It is hypothesized as: *"The more the doctor (medical staff) perceives he/she is knowledgeable and skilled on eHealth services, the stronger the intention to use eHealth services."*

The outcome is significant ($p/2<.05$). Accordingly, medical education has an effect on behavioural intention. Therefore, H6 is validated.

Table 36: H6 Regression Analysis for Medical Education

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
H6: Regression Analysis						
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	MEDEDU	**.173**	**.055**	**.218**	**3.121**	**.001**
a. Dependent Variable: V46						

This hypothesis is validated. This hypothesis was supported with $p/2$ of .001 and a positive regression coefficient, beta of .218. The quantitative study confirmed the results of the exploratory study and shows that medical education will have an effect on medical professionals' intention to use eHealth services.

Validation of H7

H7 measures the impact of inadequate medical knowledge on intention to use eHealth services in developing countries. It is hypothesized as: *"The more doctors perceive eHealth services as an indication that they have low medical knowledge, the lower the intention to use eHealth services."* The outcome is significant ($p/2<.05$). Accordingly, inadequate medical knowledge has an effect on behavioural intention. Therefore, H7 is validated.

Table 37: H7 Regression Analysis for Medical knowledge

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
H7: Regression Analysis						
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	KNOWLEDGE	**.175**	**.056**	**.219**	**3.132**	**.001**
a. Dependent Variable: V46						

This hypothesis is validated.

This hypotheses was supported with p/2<.05 and a positive regression coefficient of .219. This new hypothesis was added to the UTAUT scale. The quantitative study confirmed the results of the exploratory study and shows that medical knowledge will have an effect on medical professionals' intention to use eHealth services.

Validation of H8

H8 measures the impact of having a good ICT infrastructure on intention to use eHealth services in developing countries. It is hypothesized as: *"The more the hospital/clinic is perceived as having an available and reliable ICT infrastructure, the greater the intention to use eHealth services."*

The outcome is not significant (*p*/2>.05). Accordingly, ICT infrastructure has no effect on behavioural intention. Therefore, H8 is not validated.

Table 38: H8 Regression Analysis for ICT Infrastructure

H8: Regression Analysis						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	ICT	**.023**	**.042**	**.029**	**.546**	**.293**
a. Dependent Variable: V46						

This hypothesis is not validated, P/2>.05. This hypothesis and its subsequent scale was modified from the literature review (Kifle 2003) and the quantitative pilot study. The final quantitative study using regression analysis did not confirm this factor as having an effect on medical professionals' intention to use eHealth services. Users' intentions are not driven by technology infrastructure as explained earlier and this factor may become an effect when further research is undertaken on actual implementations of eHealth services.

5.3.1.2 Summary of the model

Table 39 shows the results of the multiple regression analysis for all factors from the research model. Performance expectancy has the strongest effect on intention to use eHealth services which is consistent with other research studies (Chau and Hu 2002; Venkatesh *et al.* 2003). As this construct was based on the UTAUT model, we can assume that it also works in the context eHealth and in the context of developing countries. This is an important finding and the researcher feels that we are closer to generalization of this particular construct.

Table 39: Multiple Regression Analysis-all predictors

Total Model Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Regression p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.861	.038		102.616	.000
	PERFEXP	**.201**	**.046**	**.251**	**4.372**	**.000**
	GOVT	**.063**	**.046**	**.080**	**1.361**	**.087**
	MEDEDU	**.173**	**.055**	**.218**	**3.121**	**.001**
	SOCINF	-.002	.045	-.002	-.036	.486
	KNOWLEDGE	**.175**	**.056**	**.219**	**3.132**	**.001**
	ICT	.023	.042	.029	.546	.293
	EFFORT	-.027	.046	-.034	-.597	.275

a. Dependent Variable: V46

The next constructs that have an effect on behavioural intention are medical education and medical knowledge. These two constructs were added to the research model based on the qualitative study. They were not in the original UTAUT study. This is an important finding that confirmed the results of the exploratory qualitative study.

The last construct that has an effect on the dependent variable is government policy, albeit a much smaller effect than the other independent variables. This also confirms the results of the qualitative study.

The variable, social influence has moderating effects which will be discussed in the next section. Therefore, the quantitative study confirmed several results of the qualitative study. The other three constructs: ease of use, facilitating conditions and ICT infrastructure were not supported. As the researcher stated earlier, this may be due to the fact that the study was assessing behavioural intention and not actual use of the system.

Table 40 summarises the goodness of fit for the model with all predictors of eHealth services.

Table 40: Integrated Multiple Regression Table, all predictors

Behavioural Intention Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
Dimension	.607a	.368	.353	.648	

a. Predictors: (Constant), EFFORT, ICT, PERFEXP, GOVT, SOCINF, MEDEDU, KNOWLEDGE

Behavioural Intention Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	70.686	7	10.098	24.080	.000a
Residual	121.193	289	.419		
Total	191.879	296			

The r^2 of 36.8% is consistent with other eHealth studies (Chau and Hu, 2002). The model suggests that other factors which were not tested could have an effect on behavioural intention in developing countries. This will be discussed under future research directions in Chapter 6.

The next section considers the role of moderators that were part of the research model.

5.3.2 Moderation Effects

A moderator effect occurs when a moderator variable, a second independent variable, changes the form of the relationship between another independent variable and the dependent variable (Hair *et al.*, 2010). The moderator effect in regression analysis is a compound variable formed by multiplying X1 by the moderator X2. The moderator is represented by b0=Y intercept, b2x2=

148

linear effect of X2, B3x1x2= moderating effect of X2 on X1. To determine if a moderating effect takes place, a significant value of 5% is used.

Nominal variables such as geographic location, gender, and age need to be recoded to be included in a test of moderation[3]. This commonly involves using dummy coding, whereby one level of the variable is made a reference category and then a series of dummy variables are created to represent belonging to every other category. These restructured variables are multiplied to form the interaction term that will be used to test the moderation hypothesis; the independent and the moderator variable need to be multiplied together to create a third variable (the interaction).

Validation of Ha

Ha measures the impact of performance expectancy moderated by geographic location, such as urban areas will have a stronger behavioural intention to use eHealth services than rural regions.

It is hypothesized as: "*The impact of performance expectancy on behavioural intentions is higher for doctors and medical staff from urban areas than from rural areas.*" The outcome is significant ($p/2<.05$). Accordingly, performance expectancy is moderated by a geographic location effect on behavioural intention. Therefore, Ha is validated.

This hypothesis is validated as follows:

Table 41: Performance moderated by environment regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.831	.090		42.435	.000
	rurban_dummy	.016	.103	.008	.152	.439
	PERFxruralurban	**.175**	**.085**	**.170**	**2.056**	**.020**
	GOVT	.069	.048	.088	1.454	.073
	MEDEDU	.174	.056	.220	3.100	.001
	SOCINF	.003	.046	.003	.058	.476
	KNWOLEDGE	.172	.057	.216	3.010	.001
	ICT	.021	.043	.026	.486	.313
	EFFORT	-.018	.047	-.022	-.376	.353
a. Dependent Variable						

---

[3] The number of groups minus one binary variable need to be created.

The hypothesis is validated. Perceived performance is moderated by geographic location, where perceived performance has a stronger effect on medical professionals from urban regions. This finding is not surprising as medical professionals have more resources at their disposal and intention to use eHealth requires strong perceived benefits.

Validation of Hb1 and Hb2

Hb1 and Hb2 measure the impact of effort expectancy on intention to use by medical professionals in developing countries moderated by gender and age, such as; effort expectancy is higher for women and older doctors.

These hypotheses were formulated based on the original UTAUT model. It is hypothesized as: "*The impact of effort expectancy on behavioural intention is stronger for female doctors than male doctors.*" It is also hypothesized as "*The impact of effort expectancy on behavioural intention is stronger for older doctors than younger doctors.*" The outcome is not significant (*p/2*>.05). Accordingly, effort expectancy is not moderated by a gender and age effect on behavioural intention. Therefore, Hb1 and Hb2 are not validated.

This hypothesis is not validated as follows:

Table 42: Effort expectancy moderated by gender

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.901	.056		69.560	.000
	EFFORT	-.033	.063	-.041	-.527	.299
	Gender	-.091	.079	-.056	-1.151	.125
	Effortgender	.034	.078	.030	.437	.331
	PERFEXP	.209	.047	.261	4.426	.000
	GOVT	.052	.047	.067	1.103	.135
	MEDEDU	.183	.057	.230	3.208	.000
	SOCINF	-.017	.046	-.021	-.367	.357
	KNOWLEDGE	.183	.057	.231	3.210	.000
	ICT	.018	.044	.022	.407	.342

a. Dependent Variable: V46

Table 43: Effort expectancy moderated by experience

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.839	.052		74.435	.000
	EFFORT	-.028	.059	-.035	-.480	.315
	PERFEXP	.202	.046	.253	4.371	.000
	GOVT	.067	.046	.086	1.443	.075
	MEDEDU	.172	.056	.217	3.081	.001
	SOCINF	-.003	.045	-.004	-.077	.469
	KNOWLEDGE	.172	.056	.217	3.059	.001
	ICT	.022	.043	.028	.514	.303
	Experience_dummy	.052	.077	.032	.683	.247
	Experienceeffort	.008	.075	.007	.101	.460

The finding shows that there is no effect on effort for either female medical professionals or older medical professionals. As effort expectancy did not work in general, the findings showed that there was no moderation effect either for female or older doctors as behavioural intention does not appear to be influenced by perceived effort.

Validation of Hc1 and Hc2

Hc1 and Hc2 measure the impact of opinion leaders on intention to use as moderated by gender and age, such as it is higher for women and younger doctors. It is hypothesized as: "*The impact of social influence on behavioural intention is stronger for female doctors than for male doctors and "the impact of social influence on behavioural intention is stronger for younger doctors than for older doctors.*" The outcome is not significant ($p/2 > .05$) for gender but is significant for younger doctors ($p/2 < .05$). Accordingly, social influence is partially moderated. Therefore, Hc1 is not validated and Hc2 is validated.

This hypothesis is partially validated. It is validated for younger medical professionals and it is not validated for gender. The findings show that social influence is a factor that has an

effect on behavioural intention for younger medical professionals. Tables 44 and 45 detail the estimations.

Table 44: Social influence moderated by gender

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.899	.056		69.519	.000
	EFFORT	-.016	.047	-.020	-.335	.369
	PERFEXP	.213	.048	.266	4.452	.000
	GOVT	.051	.047	.065	1.072	.142
	MEDEDU	.183	.057	.231	3.215	.000
	SOCINF	-.037	.062	-.047	-.601	.274
	KNOWLEDGE	.183	.057	.232	3.216	.000
	ICT	.017	.044	.021	.376	.353
	Socialgender	.039	.080	.033	.488	.313
	Gender	-.091	.079	-.056	-1.148	.126

a. Dependent Variable: V46

Table 45: Social influence moderated by experience

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.838	.051		74.927	.000
	EFFORT	-.019	.046	-.024	-.418	.338
	PERFEXP	.195	.046	.244	4.243	.000
	GOVT	.063	.046	.080	1.361	.087
	MEDEDU	.178	.056	.225	3.213	.000
	SOCINF	.062	.055	.078	1.112	.133
	KNOWLEDGE	.169	.056	.213	3.025	.001
	ICT	.025	.042	.031	.582	.280
	Experiencedummy	.054	.076	.033	.704	.241
	Socialinfluexper	**-.148**	**.075**	**-.124**	**-1.963**	**.025**

a. Dependent Variable: V46

Hd1 and Hd2: The impact of facilitating conditions on intention to use by medical professionals in developing countries will be moderated by gender and age." This hypothesis was not tested as it failed the factor analysis test and the reliability test (low Alpha Cronbach of .345).

Validation of He1 and He2

He1 and He2 measure the impact of perceived inadequate medical knowledge on intention to use eHealth services as moderated by gender and age, such as: perception of inadequate medical knowledge will be stronger for male medical professionals and older medical professionals. It is hypothesized as: *"The impact of perceived inadequate medical knowledge on behavioural intention is stronger for male medical professionals than female medical professionals."* It is also hypothesized as *"The impact of perceived inadequate medical knowledge on behavioural intention is stronger for older medical professionals than younger medical professionals."* He1 is slightly validated, but with a lower level of significance ($p<0,1$). The outcome is not significant ($p/2>.05$) for He2. Therefore, He1 is slightly validated and He2 is not validated.

This hypothesis is partially validated. It is validated for male medical professionals and it is not validated for older ones. Table 46 and Table 47 show the results of this moderation.

Table 46: Medical knowledge moderated by gender

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.895	.056		69.528	.000
	EFFORT	-.015	.047	-.019	-.317	.376
	PERFEXP	.205	.047	.256	4.351	.000
	GOVT	.052	.047	.067	1.109	.134
	MEDEDU	.186	.057	.235	3.275	.000
	SOCINF	-.013	.046	-.017	-.294	.384
	KNOWLEDGE	.141	.064	.178	2.214	.014
	ICT	.018	.044	.022	.413	.340
	Gender	-.095	.079	-.058	-1.202	.115
	Knowlgender	**.109**	**.081**	**.080**	**1.343**	**.090**

a. Dependent Variable: V46

Table 47: Medical knowledge moderated by experience

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.839	.052		74.349	.000
	EFFORT	-.025	.046	-.031	-.537	.295
	PERFEXP	.202	.046	.253	4.355	.000
	GOVT	.067	.046	.086	1.449	.074
	MEDEDU	.172	.056	.217	3.068	.001
	SOCINF	-.003	.045	-.004	-.075	.470
	KNOWLEDGE	.169	.070	.213	2.429	.008
	ICT	.022	.043	.028	.518	.302
	Experience_dummy	.052	.077	.032	.683	.247
	Knowlexper	.005	.076	.004	.059	.476

a. Dependent Variable: V46

Validation of Hf

Hf measures the impact of social influence as it is assumed that it will be greater for medical professionals from rural compared to urban areas. It is hypothesized as: "*The impact of social influence on behavioural intention is stronger for medical professionals from rural areas than from urban areas.*"

The outcome is significant ($p/2<.05$). Accordingly, social influence is moderated by geographic location. Therefore, Hf is validated.

Hf: **This hypothesis is validated**. This finding showed that social influence is moderated by geographic areas such that medical professionals in rural settings will be affected by social influence. Therefore, medical staff that are based in rural settings will be influenced by persons that they deem important and influential to a greater extent than urban medical professionals. Table 48 shows the results of this hypothesis. This is a new hypothesis and finding.

Table 48: Social influence moderated by geographic area

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. Error	Beta		
1	(Constant)	3.831	.086		44.323	.000
	rurban_dummy	**.008**	**.100**	**.004**	**.081**	**.467**
	PERFEXP	.199	.046	.248	4.287	.000
	GOVT	.053	.047	.068	1.126	.130
	MEDEDU	.207	.056	.260	3.662	.000
	SOCINF	-.199	.074	-.249	-2.700	.003
	KNOWLEDGE	.195	.056	.246	3.452	.000
	ICT	.006	.043	.008	.151	.440
	EFFORT	-.027	.046	-.034	-.589	.278
	Socinfrurbn	**.279**	**.084**	**.275**	**3.320**	**.000**

Validation of Hg

Hg measures the impact of perceived inadequate medical knowledge on intention to use by medical professionals in developing countries as it will be moderated by geographic area, such as: perception of inadequate medical knowledge will be stronger for urban doctors than rural doctors.

It is hypothesized as: *"The impact of inadequate medical knowledge on behavioural intention is stronger for medical professionals from urban areas than from rural areas."*

The outcome is significant ($p/2<.05$). Accordingly, inadequate medical knowledge is moderated by geographic location. such as: perception of inadequate medical knowledge will be stronger for urban medical professionals than rural medical professionals.

 Therefore, Hg is validated.

Hg: **This hypothesis is validated**. This finding showed that medical knowledge is moderated by geographic areas such that medical professionals in urban settings will be affected by medical knowledge. Therefore, medical staffs that are based in urban settings will be influenced by

medical knowledge such as the use of eHealth is perceived as gaining prestige and image in international circles, thus giving a positive image with the use of eHealth services. This is a new hypothesis and finding.

Table 49: Medical knowledge moderated by geographic location

Model		Unstandardized Coefficients		Standardized Coefficients	t	p/2-value
		B	Std. error	Beta		
1	(Constant)	3.816	.091		41.765	.000
	rurban_dummy	**.024**	**.103**	**.012**	**.229**	**.409**
	PERFEXP	.187	.047	.233	3.970	.000
	GOVT	.072	.048	.092	1.508	.066
	MEDEDU	.173	.056	.218	3.078	.001
	SOCINF	.010	.046	.012	.210	.417
	KNOWLEDGE	.070	.074	.089	.945	.173
	ICT	.016	.043	.021	.382	.351
	EFFORT	-.034	.047	-.043	-.732	.232
	Knowlrurban	**.188**	**.083**	**.169**	**2.255**	**.012**

a. Dependent Variable: V46

5.3.3 Conclusion of the Hypotheses Testing: Summary and Discussion

The findings of the hypotheses testing showed that five constructs, performance expectancy, social influence through two moderating effects, government policy, medical education, and medical knowledge have a significant effect on intention to use eHealth services in developing countries. The findings also show that moderating effects exist for performance expectancy in urban settings, social influence for younger doctors and for rural settings, and medical knowledge for urban medical professionals and slightly for male medical professionals.

Table 50 presents a summary of the hypotheses testing results.

Table 50: Hypotheses Testing Results, Final Quantitative Study

Factors	Theoretical framework	Result of hypotheses testing
H1:Performance	UTAUT model	Hypothesis validated
H2:Effort	UTAUT model	Hypothesis not validated
H3:Social Influence	UTAUT model	Hypothesis validated with moderating effect
H4:Facilitating Conditions	UTAUT model	Hypothesis not validated
H5:Government Policy	New Hypothesis	Hypothesis validated
H6:Medical Education	New Hypothesis	Hypothesis validated
H7:Medical knowledge	New Hypothesis	Hypothesis validated
H8:ICT Infrastructure	New Hypothesis	Hypothesis not validated
Ha:Performance:Urban/Rural	New Hypothesis	Hypothesis validated
Hb1:Effort:Gender	UTAUT model	Hypothesis not validated
Hb2: Effort/Age	UTAUT model	Hypothesis not validated
Hc1:Social:Gender	UTAUT model	Hypothesis not validated
Hc2:Social:Age	UTAUT model	Hypothesis validated
Hd1: Facilitating Conditions:Gender	UTAUT model	Hypothesis not validated
Hd2: Facilitating Conditions: Age	UTAUT model	Hypothesis not validated
He1:Knowledge: Gender	New Hypothesis	Hypothesis validated
He2:Knowledge: Age	New Hypothesis	Hypothesis not validated
Hf:Social Influence:Rural	New Hypothesis	Hypothesis validated
Hg:Knowledge:Urban	New Hypothesis	Hypothesis validated

5.4 Discussion of Model Validation

Looking at the results, the adapted UTAUT model is deemed appropriate as five of the eight main constructs were validated and five of the eleven moderators had an effect on behavioural intention. Clearly, some constructs were not validated and therefore, there is room for additional research. The following are the results of the hypotheses testing.

5.4.1 Non-validated Hypotheses

-Ease of use of the new services and its effects were not validated in this study (H2)

The effect of ease of use as validated in the UTAUT model was not validated in this study. This construct is supported in all key generic technology acceptance models (TAM, TAM2, and UTAUT). The researcher can suppose that due to the early stages of eHealth, the other constructs in the model have greater significance. This was also supported by Chau and Hu (2002) due to the early stages of implementation and the higher education levels of doctors.

As the researcher included this construct in the tested model due to the nature of developing countries, the fact that it was not validated could be due more to image than reality. The respondents may not want to admit that they cannot use the technology and therefore, they don't rate it as significant.

It also may be that the ease of use construct would become significant during the implementation phase when medical professionals are actually using the system. Again, as the study is exploratory in nature, ease of use could be significant when research in this area moves to confirmatory research. It may also be that medical professionals do not want to admit that they cannot operate ICT independently.

As mentioned in the literature review, the findings of the Chau and Hu (2002) study suggest that healthcare professionals might differ in terms of technology acceptance decision-making, compared with the user populations commonly examined in prior research. They suppose that when making a decision to accept or reject a technology, healthcare professionals appear to be

fairly pragmatic, concentrating on the technology's usefulness rather than on its ease of use. In contrast to technology acceptance studies in other environments, studies completed in the healthcare sector imply that effort expectancy is inapplicable in the health professional context (Chau & Hu 2002b; Chismar & Wiley-Patton, 2003; Jayasuriya, 1998). In all of these studies, effort expectancy (operationalised as 'ease of use') was found to have no significant influence on intention. To conclude, it appears that the importance of performance outweighs the importance of ease of use at the current stage of eHealth services. It is also significant that it confirms that ease of use has no effect on behavioural intention in a healthcare context and was also supported in a developing country context. This is a new finding based on this research study.

-Facilitating Conditions and its effects were not validated (H4)

Organisational facilitating conditions are defined as the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system (Venkatesh *et al*., 2003). This incorporates objective factors in the implementation context such as management support, training, and the provision of computer support.

Facilitating conditions as a motivator for user intention and use is well documented in the literature (Venkatesh *et al*., 2003). However, this construct did not work at all in this study in the context of eHealth services in developing countries at the current stage of eHealth. It appears that other constructs contribute more to user intention in the initial stages and facilitating conditions may play more of a role as services become operationalised.

An application of the UTAUT model found evidence suggesting the insignificance of facilitating conditions in predicting behavioural intention when both performance expectancy constructs and effort expectancy constructs are present in the model (Venkatesh *et al*. 2003). However, the latter's findings indicate the influence of organisational facilitating conditions on actual usage and not behavioural intention.

To conclude, the fact that facilitating conditions were not validated seems to indicate a step towards generalisation of the UTAUT model to eHealth and developing countries, as evidence suggests the insignificance of facilitating conditions in predicting behavioural intention when

both performance expectancy constructs and effort expectancy constructs are present in the model (Venkatesh *et al.*, 2003).

-ICT Infrastructure and its effects were not validated (H8)

In developing countries, as reported in the literature and in the quantitative pilot study, possessing the relevant ICT infrastructure is an important condition for use. As the author of this thesis found that ease of use and facilitating conditions were not validated, and likewise, ICT infrastructure, one can suppose the same reasoning. Due to the very early stage of eHealth in developing countries, it may become a predictor of usage when actual implementations occur.

-Moderating Effects of gender and age were not validated (Hb1,Hb2,Hc1,Hd1,Hd2,He1)

The UTAUT model includes a moderating effect for gender, so that ease of use, facilitating conditions, and social influences are stronger for females. In the context of developing countries, no moderating effect was found with gender. Additionally, the effect of age was not significant for ease of use, facilitating conditions, and medical knowledge.

5.4.2 Validated Hypotheses

Performance Expectancy and its effects were validated for developing countries (H1)

Performance expectation as a motivator for intention was validated for eHealth in the context of developing countries. This construct was also validated in Hong Kong (Chau and Hu, 1999) for telemedicine services.

The study provides empirical evidence that performance expectancy positively impacts behavioural intention to use eHealth services. As such, this construct was validated in developing countries as well. The effect is explained by improving the accuracy of diagnostics and treatments from a clinical perspective. eHealth services will only be adopted if real improvements to clinical operations are expected.

This finding is consistent with the literature that technology acceptance decisions appear to focus on usefulness. That is, medical professionals are likely to accept (or use) a technology when it is considered to be useful to his or her practice. This finding is consistent with the results of several prior studies of technology acceptance. As Keil *et al.* (1998) concluded, in determining whether

or not to use a technology, usefulness is more important than ease of use. However, it should become more important as actual implementations are realised. This has been confirmed in this research study.

-Social Influence and its effects were validated as a moderator (H3)

Social influence as a motivator for user intention and behaviour is well documented in the literature (Rogers, 1983). This study found that social influence had an effect for medical professionals in rural settings and little or no effect in urban settings. This is a unique finding. It was also found to have a moderating effect on younger doctors consistent with prior studies (Venkatesh *et al.*, 2003).

These findings indicate that medical professionals in rural settings will be more influenced by other medical experts than medical professionals in urban settings. This is consistent with the on-going operational procedures between rural and urban areas. Rural medical professionals maintain a favourable relationship with urban medical centres using them for patient referrals. Patient referrals are necessary since medical doctors in rural regions are normally generalist practitioners and specialty doctors are concentrated in urban areas. This procedure of using higher level medical experts for advice explains why doctors from rural regions are more influenced by doctors in urban settings. These general practitioners will learn from their urban partners and gain better knowledge than before from these higher educated medical professionals.

Furthermore, in general, medical professionals seem to be relatively independent in making technology acceptance decisions, e.g. not attaching much weight to suggestions or opinions from others (Chau and Hu, 2002). This hypothesis only works when moderators are included as was the case in the original UTAUT model.

-Government Policy and its effects were validated (H5)

Government Policy was a new construct added to the researcher's model. A positive attitude and supportive government policy will have an effect on user intention to use eHealth services as healthcare systems in developing countries are predominately public and government-run institutions. This motivator was slightly validated in the research study. This means that it has some effect but not as strongly as other factors. In management practice, the ITU has started working with countries on the development of an eHealth master plan. This strategic plan guides

developing countries on specific roll-out plans for these healthcare services. The research shows that the ITU should continue in this direction with help from the WHO. Awareness programmes regarding the benefits of eHealth services should be communicated by these International Organizations.

The researcher's qualitative study in developing countries showed that government policies and attitude would be important motivators for behavioural intention to use eHealth services. This hypothesis was supported.

-Medical Education and its effects were validated (H6)

Medical education was a new construct added to the research model. Medical education was validated as having a strong effect on user intention. This includes eHealth training in medical schools and through continuous education. Without education, there will be a big reluctance to try eHealth services. This research supports the introduction of eHealth services' training. This result is strongly significant and without eHealth education, the diffusion of eHealth services will continue to be slow.

-Inadequate Medical knowledge and its effects were validated (H7)

Medical knowledge was a new construct and as defined in this model has a strong effect on user intention. It is important for companies offering eHealth services to market their services as a way for medical staff to be perceived as knowledgeable and using state-of the art technology. This influencing factor will be further elaborated within Chapter 6 under management considerations.

-Moderating Effects of geographic region, gender, and age were validated for performance expectancy, social influence, and inadequate medical knowledge (Ha, Hc2, He1, Hf, Hg)

The researcher found moderating effects for three constructs: performance expectancy, social influence, and inadequate medical knowledge. Performance expectancy was found to have a moderating effect in urban settings. From a managerial perspective, companies developing and marketing eHealth services must develop and demonstrate concrete clinical performance improvements. These improvements are in the areas of increased productivity, real

improvements in the accuracy of diagnoses and treatments, access to specialists for consultative purposes, and participation into specialised surgeries for learning purposes.

Social influence was moderated by geographic location, specifically rural settings. From a managerial perspective, marketing activities by companies need to be sensitive to this moderation and show utilisation from well respected medical centres and doctors.

Social Influence was also moderated by age and medical knowledge had a moderating effect in urban settings. The findings show that companies' marketing activities should include product positioning strategies emphasizing the unique opportunity to be part of a special group of medical users. These users will gain respect and status with other peers in international settings. The marketing messages must address any hesitations to use eHealth due to internal perceptions related to a low level of knowledge. Rather adopters should feel part of a privileged international group of new users of eHealth services, putting medical professionals from developing countries on an equal footing with medical professionals from developed countries. This point will be elaborated further within Chapter 6.

Chapter 6: Conclusions and Managerial Implications

6.1 Contributions of the Research

In this research, clear evidence has been provided that performance expectancy, government policy, social influence with moderating effects, medical education, and medical knowledge positively impacts on behavioural intention. These influencing factors were validated and measured. The study answered the research question: *"What are the key factors influencing the intention of use for eHealth services by medical staff in developing countries"?*

The development and testing of a new model in developing countries brings an important contribution to research on eHealth services as it is the first research study to validate user influencing factors on behavioural intention in several developing countries. It addition to the validated influencing factors, the research showed the effects of moderation for social influence in rural environments, performance expectancy in urban environments, social influence for younger doctors, and medical knowledge for urban areas and male medical professionals. These results are unique and contribute to knowledge in this field.

The detailed contributions of the research are summarized below, in light of the research questions. The contribution of this work can be classified as theoretical, methodological, and managerial. An overall view of the key conclusions is presented in Table 51.

Table 51: Contributions of this research study

Theoretical:	Methodological:	Managerial:
The creation of a unique behavioural intention model for eHealth services in developing countries.	Nature of the study -Ten developing countries -Extensive sample of medical professionals, i.e. doctors,	Influencing factors validated and measured for eHealth intention to use in developing countries.
Development and validation of	nurses, specialists, health	Principles for marketing

Theoretical:	Methodological:	Managerial:
scales to measure the constructs in this new model.	administration, IT health managers, etc.	strategies developed based on validated behavioural intention factors.
The identification of new constructs which have a significant effect on behavioural intention: government policy, medical education, and medical knowledge, in the context of marketing theory.	-Two primary research studies using mixed methods conducted within the environment of developing countries. -Data collection method relevant to developing countries.	Identification of marketing segmentation variables for eHealth services based on research findings.

6.1.1 Theoretical contribution

The theoretical contribution is the identification and validation of new constructs which impact significantly on behavioural intentions: government policy, social influence with moderating effects of geographic location and age, medical education, and medical knowledge in the context of marketing theory. This unique research model with eight constructs and eleven moderating effects was tested empirically.

To bridge the gap in eHealth services research within the context of developing countries, the relationships between factors and behavioural intention were determined and tested. The empirical validation showed that such relationships are significant. To that effect, an original model is proposed which contributes to the understanding of the effects of eHealth services in developing countries.

Moderating effects were also empirically validated for performance expectancy, social influence, and medical knowledge. These findings inform the choice of segmentation variables (discussed in the managerial recommendations).

An additional substantial contribution to theory is the development and validation of scales to measure the constructs in this new model. New, unique scales pertaining to eHealth in developing countries were developed, refined and validated for identifying the multiple influencing factors. This discovery adds to knowledge in the field of eHealth services in developing countries. These new scales passed the test of reliability and validity as demonstrated in Chapter 5.

The analysis indicates that a generic technology acceptance model cannot be applied to developing countries without modifications as the majority of the validated hypotheses were obtained from primary research undertaken in this study. The most distinctive contribution to theory and knowledge is the development and validation of a new behavioural intention model for eHealth services in developing countries. This is a unique contribution which adds to knowledge in this field. This validated model is shown in Figure 14.

Figure 14: Validated eHealth Behavioural Intention Model for Developing Countries
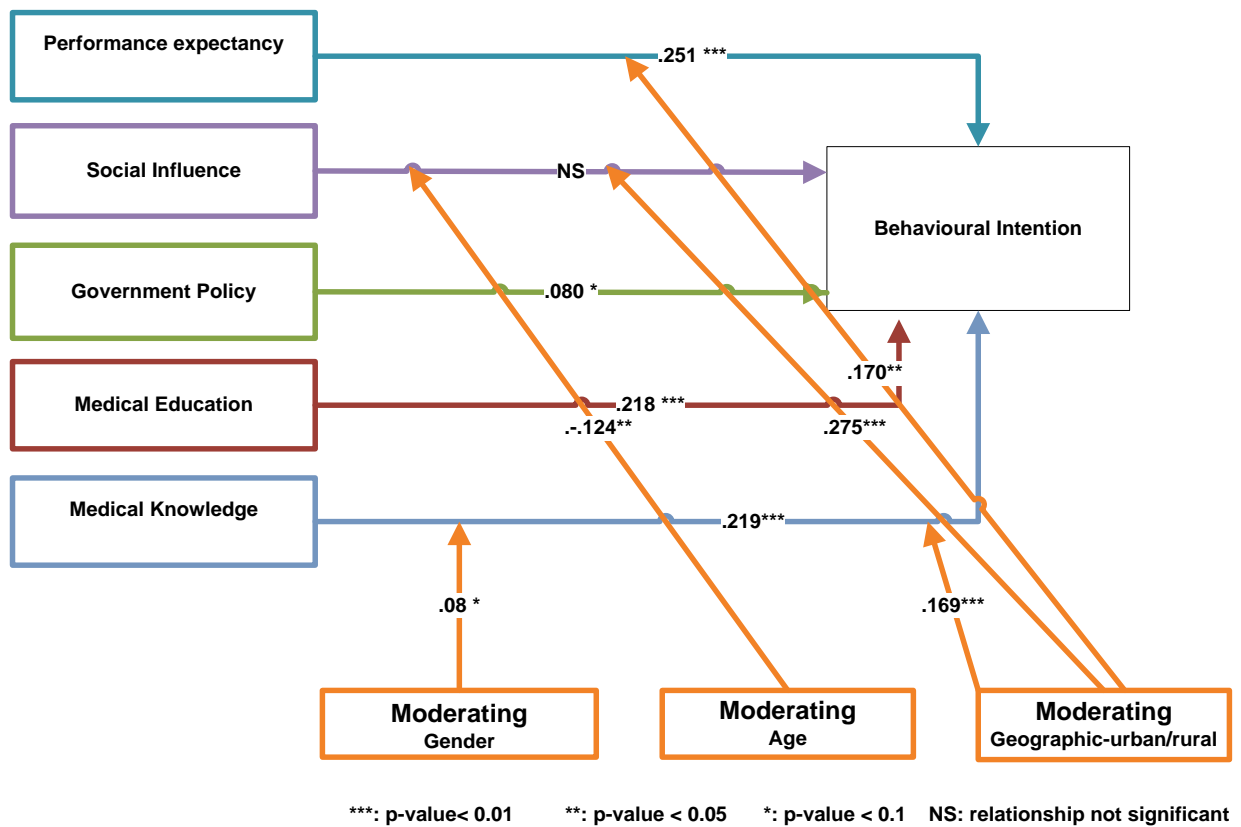
The development of a behavioural intention model to measure eHealth services in developing countries is an important achievement of this study. The multi-item scales of the constructs revealed strong psychometric properties.

An important finding concerns the role of environmental factors. This variable plays a moderating role on the relationship between three factors (performance expectancy, social influence, and medical knowledge). Therefore, it was determined that medical professionals in urban settings have a higher expectancy regarding eHealth performance than medical professionals working in rural areas. This is based on the fact that more resources are available in urban settings and therefore, in order to use this new technology, the system must out-perform current work practices. Medical professionals need to experience better productivity by using eHealth over their present way of performing medical tasks.

The findings also demonstrate that social influence is moderated by environmental factors where medical professionals in rural settings are more influenced by significant others than medical professionals in urban regions due to the fact that urban doctors are better educated and skilled than doctors in rural areas. Therefore, they are considered as more knowledgeable in medical diagnoses and treatments. Another moderating effect of geographic region is medical knowledge whereby medical professionals in urban regions are more influenced by the image and status attributes that eHealth would generate. This was explained earlier where doctors prefer to work in urban centres where positions are perceived as more prestigious.

It has also been shown that government policy, medical education and medical knowledge directly influence behavioural intention. These constructs were developed based on the specificities of developing countries as evidenced in the exploratory qualitative study.

This important result shows that an existing model (UTAUT) elaborated in a developed country cannot be used and generalized to developing countries without specific modifications. However, the construct- 'performance expectancy' can be generalized to the environment of eHealth services and in the context of developing countries. This is a valuable contribution. Ease of use, facilitating conditions, and ICT infrastructure do not appear to have a direct influence on

behavioural intention to use eHealth services in developing countries. This is probably due to the early stage of eHealth, considering intention rather than actual usage. Once these services are operationalised at the ground level, these factors should become more substantial for continued usage.

Interestingly, three of the four constructs that were validated in the context of a developed country (United States) and using a different domain (financial services and other non-healthcare services) were not validated in this research study. Only, performance expectancy and social influence with moderating effects have an influence on behavioural intention for eHealth services in developing countries according to this research study. Interestingly, these two constructs were the only two of the original UTAUT model to be identified in the qualitative research, therefore, demonstrating the necessity to perform an exploratory study. In concluding, all validated hypotheses were derived from the qualitative study.

6.1.2 Methodological contribution

The coverage of ten developing countries enhances the study. All prior research to the best of my knowledge was based on a single country, both in the developed and the developing world. The wide cross-section of medical professionals included in the study also enhances the research. The study not only surveyed doctors, but also medical students, nurses, specialists, health administration, and IT hospital managers. It was too early to separate them by group as the goal was to analyze them based on a global approach in line with the objectives of this study. No study to the best of my knowledge covers such a broad base of medical professionals.

This study used a mixed method approach with two primary research studies, a qualitative study to explore the environment of eHealth services in developing countries, followed by a quantitative study using new scales formulated from the qualitative study.

Lastly, the data collection method used was necessary in the environment of developing countries. Classical approaches for data collection do not work in this environment and therefore, the researcher found an effective method for obtaining the necessary information and data for this particular environment.

As explained in the literature review, the absence of quantitative measures of the effects of behavioural intention to use eHealth services in developing countries could be explained first by the absence of a model to measure eHealth services in developing countries. This research fills that gap. Multi-item scales were developed which measure eHealth services in developing countries formulated from the exploratory qualitative study. This work was necessary because no existing model was consistent with the purpose and the context of the study. This model presents satisfactory psychometric qualities in terms of reliability and validity.

6.1.3 Managerial contribution

The study provides guidance to eHealth companies regarding how to speed up the diffusion of these services in developing countries and move from pilot schemes to sustainable and widespread implementations. Recommendations are proposed hereafter.

The results show that geographic location is a segmentation variable that should be taken into account in any eHealth services initiative within developing countries. This segmentation should lead companies to implement eHealth services that are specific to each group (urban doctors/ rural doctors). For example, medical professionals in urban environments would be motivated to try eHealth services if clear performance improvements can be demonstrated for clinical purposes. The results also show that age is a segmentation variable that should be taken into account in any eHealth services initiative as younger doctors are influenced more by opinion leaders. This segmentation should lead companies to implement eHealth services that are specific to each group (younger doctors/older doctors).

Specifically, the influences of eHealth services can be different. The study indicates that younger doctors are more influenced by opinion leaders than older doctors. The study also reveals that medical professionals in urban environments are more influenced by the performance of the services than in rural settings. The study also reveals that the use of eHealth services will enable doctors in urban regions to be perceived as having up-to-date medical knowledge and will be

perceived in a positive light in international settings. eHealth will give doctors from urban settings the perception of being highly knowledgeable in clinical situations.

Companies must ensure that eHealth is introduced in medical schools (as this group had one of the lowest awareness levels) so younger doctors will acquire a threshold level of skills, and more importantly, a favourable attitude. For current practitioners, medical establishments must provide continuous education and demonstrate the benefits of using eHealth services. This influence is important in the development of a company's marketing strategies as using this identification to motivate medical staff in rural regions is significant. Marketers should highlight cases of successful projects in well respected medical hospitals where eHealth is being used.

One of the prime management objectives of this study is to move eHealth from the pilot stage to full-scale implementation. In order to achieve this, different stakeholders in the uptake of eHealth services are identified and need to be made aware of the benefits of these innovative services. The scope of the study was aimed at the intention to use eHealth services by medical professionals. Therefore, the main stakeholders to motivate are medical professionals. The other stakeholders to evaluate and discuss is the government and health administration in medical establishments. Other important stakeholders are patients and the services providers of ICT and eHealth solutions.

The case studies showed that successful pilot schemes are based on collaboration between several stakeholders, i.e. the medical professionals, the patients, health administration, government, telecom operators, NGO's etc. In the case studies that were researched in the literature review, examples of healthcare providers include: Sankara Nethralaya, Apollo Hospitals, and Aravind Eye Hospitals in India. These case studies are based on private and public sector cooperation and investment.

Using the framework of stakeholder analysis by Rowlins (2006) and the linkage model developed by Grunig and Hunt (1984) there are five linkages that identify stakeholder relationships to an organization: enabling linkages, input and output functional linkages, diffused linkages, and normative linkages. These linkages help in the identification of stakeholders.

Figure 15: Stakeholders Model by Grunig and Hunt (1984)
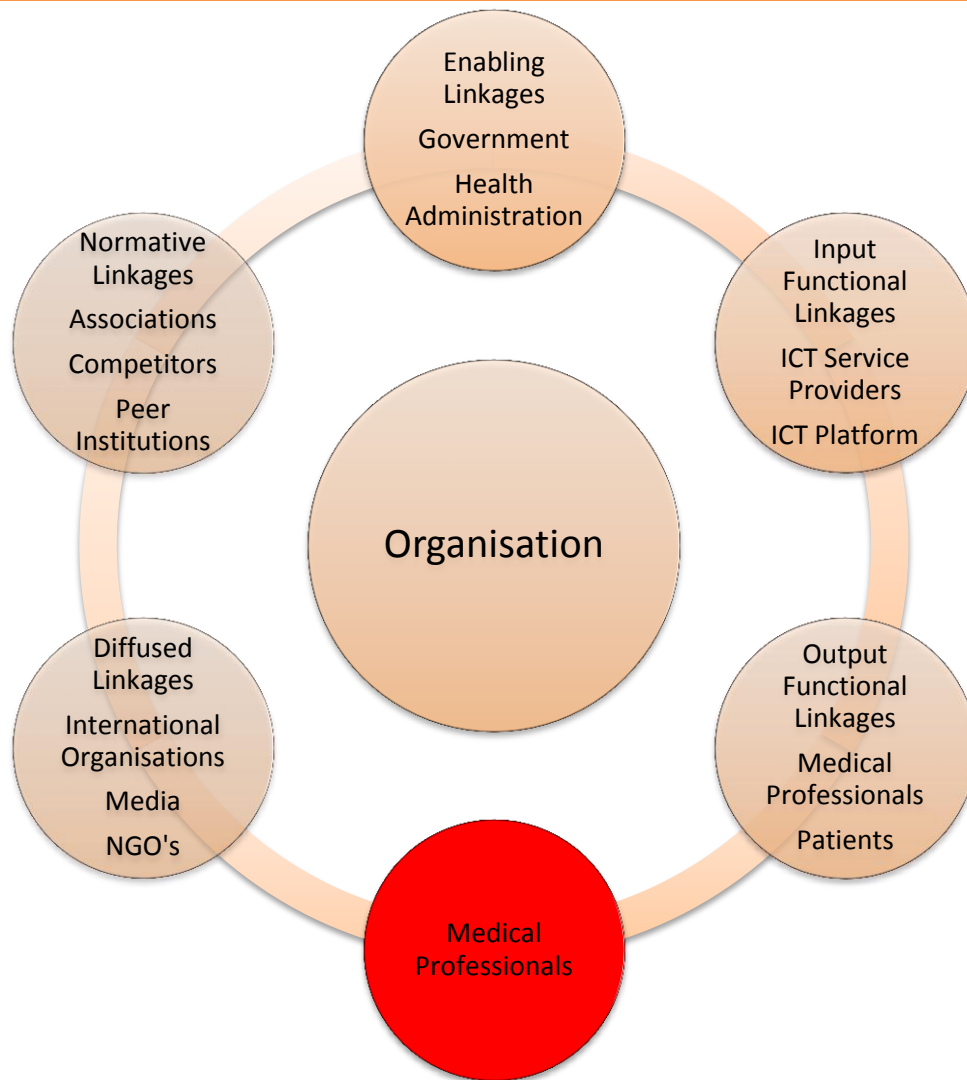
Source: Modified from J. Grunig and T. Hunt (1984)

Using Grunig and Hunt's (1984) model, the identification of the major stakeholders for the diffusion of eHealth services in developing countries can be established. A major stakeholder is medical professionals who are consumers or users of these services. The consumers in the model are characterized as functional linkages. The second stakeholder is the government. This stakeholder must be perceived as having a positive attitude and policy towards eHealth. This

stakeholder according to the model is the enabling linkage. An important stakeholder is health administration which plays an important role in the decision-making process for eHealth services. This stakeholder is part of the enabling linkage.

The ICT service provider of eHealth services is part of the functional linkages. Another major stakeholder is the patient. The patient is also a functional linkage.

The enabling linkages identify stakeholders, such as governmental health agencies and administrations which have some control and authority over the organisation. These stakeholders enable an organisation to have resources and autonomy to operate. In the case of eHealth services, these stakeholders are required to provide or assist in the development of an ICT infrastructure and training to enable the adoption of eHealth services. The study showed that a positive government attitude and support has an effect on eHealth behavioural intention.

Medical professionals and patients are functional linkages that are essential to the organisation, and are divided into input functions that provide labour and resources to create products or services (such as suppliers) and output functions that consume the products or services (such as eHealth users) (Rowlins, 2006).

The ICT platform and service provider are input functions. Diffused linkages are the most difficult to identify because they include stakeholders who do not have frequent interaction with the organisation, but become involved based on the actions of the organisation. These are the publics. This linkage includes the media, the community, activists, and other special interest groups. In the context of this study, diffused linkages are NGO's, International Organisations, and the media who can play a role in the adoption of these new services. Therefore, the diffusion of eHealth services must include these identified stakeholders in the principles for marketing strategies.

In practice, a collaboration between these stakeholders is required. Governments can demonstrate a positive attitude towards eHealth by engaging the private sector in the provision of ICT infrastructure and applications. This can be set up on a committee basis with healthcare professionals, government officials, NGOs, ITU, telecommunication and communication services providers, and potential users. The group should design an adequate eHealth architecture

for the country with one or more designated telecommunication operators and users (medical professionals) and perform feasibility studies through pilot schemes. This approach will help build consensus regarding a plan to initiate and expand eHealth services. An action plan should therefore be formulated for the entire process from trials to full-scale implementations and towards the sustainable development of eHealth. The media should be briefed on the successes of these new services for further dissemination to the general public.

As part of this plan, existing and future healthcare professionals should be trained in medical schools, nursing schools, universities or within their medical organisations as medical education is a key measured influencing factor in this study.

6.2 Managerial Recommendation

In order to aid the adoption of eHealth services, marketing strategies are developed based on the measured influencing factors. These factors provide a framework for specific marketing strategies. To expand on the validated influencing factor of performance expectancy, eHealth products and services must provide real benefits in improved clinical solutions over current practices. Therefore, medical professionals must experience an improvement in the accuracy of their diagnoses and treatments, increased productivity, and the ability to treat more patients; in other words greater efficiency compared to current work practices. If not, these users will be reluctant to try these new innovative services. The study also showed that this is more important for urban medical professionals.

The next validated influencing factor is social influence and the effect that opinion leaders have on influencing other medical professionals to use eHealth services. The study showed that medical experts exert a stronger influence among younger medical professionals and medical workers in rural settings. The identification of "opinion leaders" or "eHealth champions" is critical to eHealth behavioural intention.

The next validated influencing factor is the importance of having government support for eHealth services. A positive government policy is important for eHealth behavioural intention.

Therefore, the work undertaken by the ITU and the WHO to involve the public sector should continue for these services to move from pilot to full-fledged and sustainable implementations.

Another important validated factor is training and education. Thus, medical education must concentrate on the benefits of eHealth and how to use it to be more productive in clinical uses, i.e., diagnosis and treatments at a distance. Clearly, if users are not trained on how to use these new services, their willingness to adopt will be reduced. The findings of this study provide evidence for early eHealth training in medical school so that it is incorporated into everyday medical practice from beginnings of medical careers.

The final factor to influence intention to use eHealth is the perception by medical professionals, especially in urban settings and with male doctors, of how their image and status will be enhanced with these new services. This will be positively perceived by their patients and other medical professionals in international circles.

6.2.1 Principles for marketing strategies: eHealth services in developing countries

As this research study is in the field of marketing, the influencing factors can be used in the development for marketing strategies. The principles for marketing strategies are organised by the measured and validated behavioural intention influencing factors. Table 52 outlines the key points.

Table 52: Principles for Marketing Strategies

Influencing Factors	Characteristics	Principles for Marketing Strategies
Performance Expectancy	Medical professionals must experience real benefits in improved clinical solutions over current practices. Medical professionals must experience more accurate diagnosis and treatments and improved productivity. The study showed	Create awareness amongst medical professionals on the capacities of eHealth and communicate successful eHealth pilot implementation projects. This should be prioritised in urban settings.

Influencing Factors	Characteristics	Principles for Marketing Strategies
	that this is more important for urban medical professionals.	
Social Influence	Medical Experts who exert strong influence among younger medical professionals and medical workers in rural settings. The identification of "opinion leaders" is critical to eHealth adoption.	Inform medical professionals in rural settings of eHealth pilots in urban settings, while setting up pilot projects between urban and rural settings. Create awareness campaigns in both urban and rural environments. As rural medical professionals were more influenced by expert or famous medical professionals, a promotional campaign using well-known and respected medical professionals from both local urban and international settings could be applied.
Government Policy	A positive government policy is important for eHealth behavioural intention.	Design and introduce with the government and eHealth experts adequate eHealth infrastructure and training tools. Conceive motivating programs that fit national systems. Government agencies with the help of the ITU and WHO can develop a promotional campaign to raise awareness of the benefits of eHealth.

Influencing Factors	Characteristics	Principles for Marketing Strategies
Medical Education	Training and education on the benefits of eHealth and how to use it to be more productive in clinical uses, i.e., diagnosis and treatments.	Educate and train future and existing doctors, nurses and medical staff members on eHealth benefits, practices and applications. This can be in collaboration with Governments.
Medical Knowledge	eHealth will favourably improve medical professionals' knowledge in their appearance to patients and other medical professionals in international circles.	Demonstrate to medical professionals the usage of eHealth by medical professionals in developed countries. This campaign should demonstrate that eHealth has advantages for medical professionals across countries; mitigating the perception that eHealth shows a lack of medical knowledge. This principle can be linked to social influence.

From the empirical research, principles for marketing strategies to facilitate the introduction of eHealth in developing countries are presented. This managerial contribution is important for any organisation interested in introducing new eHealth services in developing countries.

As outlined in Table 52, marketers must create awareness of the benefits of eHealth and demonstrate improved productivity through the use of these services. The models that were identified in the marketing literature, Hierarchy of effects model (Lavidge and Steiner, 1961), Robertson model (Robertson, 1989), and Rogers' (1995) for creating awareness are proven communication frameworks. These models follow a hierarchical process for the introduction and acceptance of new services. The first step is awareness. Without awareness, companies cannot

expect their services to be adopted. As the study confirmed the low awareness level of eHealth services and its benefits, companies who are planning to enter this market need to start with a services awareness campaign. The cognitive stage is the beginning step in the awareness campaign. As this is a service targeted towards medical professionals, a general awareness campaign using a medium that this target group uses must be identified. For example, the identification of events, conferences, medical journals and press that reaches this target group. A more tailored approach in line with the findings of the study is to identify a medium that initially reaches medical students and younger doctors in urban areas. This includes case studies where real tangible benefits are demonstrated. The findings in the study show that the term eHealth may be known, but what it is and what it does is unknown. Therefore, a general awareness campaign with specific case studies would fill this gap. Figure 16 shows the hierarchy of effects model (Lavidge and Steiner, 1961). Companies marketing eHealth services should start with an awareness campaign in line with the three stages of buyer behaviour.

Figure 16: Hierarchy of Effects Model

Cognitive Stage	• Awareness • Knowledge
Affective Stage	• Liking • Preference • Conviction
Behaviour Stage	• Purchase

Source: Lavidge and Steiner (1961)

The hierarchy of effects model as described above can be applied to stimulate awareness for the different segments as identified in the research for: 1) students in medical schools, 2) younger medical professionals in urban settings, 3) health administration and 4) government officials in the health ministry.

Medical professionals who lack awareness have been identified in the study as more rural, and students and nurses. Gender did not seem to make a difference. An awareness campaign for each segment, incorporating the cognitive, affective, and behavioural steps should be developed.

In the cognitive stage, a strong awareness campaign to reach segment 1 at medical schools can be achieved through training, medical journals, Internet forums and user groups including Facebook and Linked-In, and the use of guest speakers. Segment 2 can be reached through international conferences, medical journals, Internet forums, and chats, etc. Segment 3 can be reached through direct sales channels, conferences, and journals. Segment 4 can be reached through international organizations such as ITU, WHO, NGOs etc. and the private sector. Communication bulletins and international conferences are good ways to reach this audience.

The affective stage in the hierarchy of effects model is to move from awareness to learning about the application of eHealth services and their benefits. This can be achieved through training courses, learning at seminars and conferences, and promotional materials.

The behavioural step in the process is through trials set up in collaboration with governments and the private sector. These pilot initiatives should begin with urban settings in well respected hospitals, clinics, and medical universities, etc. The communication of testimonials from other countries, like Switzerland and the US should also be included in the marketing campaigns.

Aaker (2007) outlines the marketing planning process. He notes that there are two parts of marketing, the strategic and the tactical aspects. The strategic areas consist of segmentation, targeting, and positioning, The tactical areas include the marketing mix.

In line with this process, the demographic segmentation variables that are evidenced in this study are: younger medical professionals, medical students, urban settings, and government officials in the health ministry.

Psychographic segmentation is based on personality and lifestyles. This is where the construct social influence is discussed. Social influence has a moderating effect for younger medical professionals and medical professionals operating in rural settings. Therefore, this segment can be influenced with marketing efforts focusing on opinion leaders- positively influencing the

adoption of eHealth services. Marketing efforts to identify these opinion leaders in specific countries or across developing countries would be important in influencing the acceptance of eHealth.

The third set of segmentation variables are behavioural variables. Behavioural segmentation includes: usage, uses, attitude, customer value and others. The results of the literature review indicate a direct relationship between intention and attitude (Azjen and Fishbein, 1980). Therefore, one principle for behavioural segmentation would be a segmentation strategy for medical professionals exhibiting a positive attitude towards eHealth services. The identification of these target medical professionals would be beneficial in "word of mouth communication" and trial initiatives. Another behavioural segment would be diagnoses and treatment applications. Companies could segment potential users by type of application (heart, diabetes, cancer, malaria, etc). The development of eHealth services targeting different medical diseases would be recommended. A focused marketing approach by medical specialty would aid in improving productivity and enhance diagnoses and treatment. As evidenced in this study, eHealth services must outperform current systems for eHealth to be adopted in a general way.

The last part of a marketing strategy is market positioning. Positioning relates to the perceived competitive advantage in the minds of consumers. A positioning strategy for eHealth services is essential for eHealth acceptance and adoption. The positioning strategy should be based on customer needs and maintaining a sustainable competitive advantage. The results of the study enable several positioning opportunities for eHealth providers. As this study identified concrete motivators, the positioning should be based on those drivers of intention. A company can position their services along the line of product features, product benefits, and image. As performance expectancy has the highest effect on behavioural intention, this would constitute a good positioning principle. Medical knowledge which includes image is another possible positioning principle. eHealth could have a positioning of prestige and state of the art characteristics in line with the construct of medical knowledge. In conclusion, a positioning strategy that focuses on product usefulness, enhanced status, and international recognition would follow the results of this study.

The findings enable the identification of market segmentation variables as explained above. Innovation diffusion models (Rogers, 1983) suggest that early adopters should be identified.

Until this is accomplished, moving to the early majority stage will not take place. The findings show that the early adopters are: students in medical school and younger medical professionals in practice living in urban environments. This segmentation allows different approaches for reaching these segmentation targets. The literature demonstrated the strong mediating effect of favourable attitude (Chau and Hu, 2002). Marketers need to target segments having a favourable attitude towards these services. Findings show that a favourable attitude will have a direct relationship to behavioural intention and acceptance (Azjen and Fishbein, 1980).

Government policy had an effect and marketing strategy needs to address this area. Strong promotion of these services to government health officials would have an effect on user behavioural intention. The continued diffusion of country strategic eHealth master plans should be continued. As measured in this study, a perceived positive attitude from governments is important for the adoption of eHealth services.

Many published reports state that rural settings have a stronger need for eHealth services due to a shortage of doctors (WHO, 2005). The results show that there is a stronger effect on urban than rural settings for performance expectancy which supports the need for eHealth in rural areas, as these areas lack the required skills and resources to satisfy patient demand, and therefore, performance expectancy has a weaker effect on behavioural intention. There was a moderating effect for social influence. Therefore, initial principles for marketing strategies are:

- Target younger medical practitioners in urban settings.
- Set up trials or pilot projects in respected hospitals, clinics, and medical universities.
- Move to rural settings referencing well respected examples of implementation in urban areas.
- ITU should continue to create a favourable attitude for eHealth services with government health officials through master strategic plans.
- Government health officials should communicate the benefits of eHealth services to medical professionals giving their support to these new services.
- Companies need to communicate and demonstrate performance advantages through pilot projects.

- Marketers should create a favourable attitude to younger medical professionals in urban settings through product positioning.

- Product positioning should demonstrate unique features and benefits of the eHealth services

- Product positioning should have a unique positioning of adding value to medical services (improved productivity). For younger urban medical professionals, prestige positioning is appropriate so that eHealth gives status to medical professionals using it in developing countries and puts this group on an equal, peer relationship with medical doctors from developed countries.

- Companies need to set up training centres both for current practitioners and in medical universities.

Companies which are planning to offer eHealth services should target initially younger medical professionals in urban settings. These medical professionals have a stronger behavioural intention to use eHealth services. These medical professionals should, thereafter, be used as the opinion leaders for medical professionals in medical universities and rural areas. These medical professionals appear to have the image to influence others in the adoption of eHealth services.

A collaboration of private ICT/eHealth providers as described above and government support should set up pilot projects in prestigious hospitals. These respected hospitals, clinics, and medical universities can be referenced in marketing activities. These activities will help in the acceptance of eHealth in rural settings. These respected hospitals in urban settings can be linked with rural medical establishments for tele-consulting clinical purposes. This will enable the users and patients to see real benefits which are necessary for sustainable usage.

As discussed earlier, the ITU is creating eHealth master plans with government officials in developing countries. As the study found a positive relationship between government and user behavioural intention, improved awareness of these plans by medical professionals is suggested. The awareness of these master plans will send a positive message to the target audiences. This action will aid greater intention to use eHealth services.

The marketing plan should start with services based on the most important illnesses for the relevant country. The marketing message should centre on improved productivity, more access to quality care, and international recognition/status. The development of push and pull strategies to reach medical professionals and patients would be an effective marketing approach. Applying the stakeholder analysis in the context of push and pull marketing strategies, a proposed marketing strategy is the push from hospital administrators to medical professionals of eHealth services adoption. This can be achieved through private sector providers commencing trials with government support.

A marketing pull from government to private sectors providers and international organizations would speed up eHealth adoption. A pull from the government would also have a positive perception on medical professionals as shown in the regression results. A pull marketing strategy from medical professionals using the measured motivational factors of performance, social influence, government policy, medical education, and medical knowledge would put pressure on hospital administration to offer eHealth services. Pull can be done through strong promotional activities aimed at medical professionals.

Therefore, a mixture of both push and pull marketing strategies are essential to eHealth adoption. As this study focused on behavioural intention factors of medical professionals, these segments should be pursued using a pull strategy. If marketing professionals are able to create "pull" with these segments, and the service providers with support from hospital administration and governments can create market "push", eHealth adoption can be realized. However, as stated above, strong collaboration amongst all of the stakeholders is necessary to move eHealth from small pilot initiatives to full- scale sustainable implementations.

The strategy should start with a few countries, build success stories, and then move to other countries. It is important to identify lead countries whose market or markets are attractive with regard to available ICT infrastructure and government support. The services are tailored to have maximum success there and then can be modified for other markets.

In conclusion, principles for marketing strategies were presented that could aid the diffusion of eHealth services in developing countries. Specifically, marketing principles were proposed,

which can help companies to better position their products and services in the environment of developing countries. Finally, and this is the most important managerial contribution of the work, empirical evidence of specific behavioural intention factors for companies was validated.

6.3 Limitations

The environment of developing countries in itself leads to some limitations. However, the strength of this thesis in conducting primary research in ten developing countries far outweighs any limitations. Although careful attention was exercised throughout the course of this thesis, some limitations are mentioned. These constraints are related to the theoretical and methodological implications in Table 51. These aspects are addressed further in section 6.4 under Suggestions for Future Research.

Hypotheses related

One specific predictor variable based on primary research, ICT Infrastructure, had no significant impact. This was not expected but ICT infrastructure may be a predictor of use and not of intention.

Two of the researched independent variables derived from the UTAUT model, effort expectancy and facilitating conditions, were not validated in the context of developing countries, which is also a key finding. This is again attributed to measuring intention to use eHealth and not actual use. These predictor variables should be included in an extended model for developing countries based on use and not intention which is a suggestion for future research.

As the unique behavioural intention model did not explain all of the variance, further research should try to identify additional specific influencing factors.

Methodology related

As the data collection was done through a network, some may see this as a limitation. However, due to the environment of developing countries, the use of a data collection network was deemed an advantage over traditional data collection methods. This approach meets the standards as outlined by Howe and Eisenhart (1990). Access to the right informants requires formal agreements and / or local contacts within the same domain. Without these parties, this research

would not have been feasible. The lack of research in the literature regarding developing countries indicates the difficulty of gaining access to this environment. The study by Kifle (2006) also supports this situation as he based his data collection on electronic mail and obtained very poor response rate. Therefore, the author of this thesis does not see this as a limitation, but expressed the desire to confront this directly under this section.

6.4 Suggestions for Future Research

The researcher proposes that this newly created model for developing countries be confirmed for more developing countries with the aim of being able to generalize the findings. It could consist in finding complementary mechanisms that would enhance the understanding of the relationships between performance expectancy, social influence, government policy, medical education, and inadequate medical knowledge with eHealth behavioural intention.

The direction of further research should be confirmatory in nature as more eHealth projects are implemented.

- Consolidating the model of the outcomes of eHealth services

The model is relevant in depicting the relationships between performance expectancy, social influence, government policy, medical education, inadequate medical knowledge and eHealth behavioural intention. However, this model should be reinforced by replicating the study for other countries. The model can also be extended by identifying complementary mediating/moderating variables.

The discussion of the limitations of the study leads to the conclusion that replications and refinements are indeed necessary as this was the first study to explore this subject in a cross-national, developing country environment. Specifically, further empirical investigation could help refine the model and then validate the constructs to a greater extent. It could also provide both practitioners and academics with a generalisation of the model of eHealth outcomes in developing countries.

Complementary investigations should focus on eHealth implementations in both urban and rural regions. Investigations could also involve the empirical testing of differences in rural and urban

settings. In the study, the analysis sheds light on the advantages of using eHealth services in developing countries due to improved productivity as the shortage of medical staff is well documented in the literature.

Further research could also extend the study to different types of medical services, such as: cardiology, dermatology, radiology, etc. Further research could consider specific country differences, such as: cultural, social, political, and economic differences.

As this study looked at behavioural intention for individuals, further research could explore institutional factors as this was not the scope of the researcher's study.

- Extending the model from behavioural intention to use

This last section goes beyond the current research topic. It evokes broader ideas that would expand the research model. One proposition would be to test this model in the context of actual usage to see if the model still holds for several developing countries. The intention-behaviour relationship is well documented in the technology acceptance literature and has been found to be conclusive when applied to industry and health-care contexts (Chau & Hu, 2001; Chismar and Wiley-Patton, 2003; Davis *et al.,* 1989; Sheppard, Harwick and Warshaw, 1988; Venkatesh *et al*., 2003).

The author of this thesis identified important variables that determine behaviour intentions. The study also showed that a modified UTAUT model can be used for both eHealth services and for eHealth in developing countries.

The study also produced an original eHealth behavioural model for developing countries. Due to its exploratory nature, it is important to refine this model. However, it is a good first step towards achieving generalisation.

The study produced some surprises, such as the non-validation of ease of use, facilitating conditions, and ICT infrastructure, i.e. all variables related to the technology and support functions themselves. As stated earlier, this probably relates to the early stage of eHealth

development in developing countries and should become more important as implementations are realised.

This author feels that this new behavioural model will build the foundation for future eHealth models in developing countries as more constructs, moderators, and mediators are discovered.

6.5 Extending the model from behavioural intention to practice

The theoretical findings of the study were applied in two countries, Jordan and Azerbaijan using the case study method. The objective of these case studies was to ascertain if the results of this study can be generalised to other countries in the developing world. The answer is 'yes'. The results are consistent with the ten researched countries within this thesis. The case studies show that eHealth is perceived as useful and there is a strong intention to use these new innovative services. The multiple influencing factors as validated in the research model for this thesis are supported in the case studies in Jordan and Azerbaijan. The factors supported in the two case studies are: performance expectancy, medical education, social influence, and government policy. Facilitating conditions as operationalised in the research model in the thesis was not supported in the case studies as it was too early and not in use to fully understand this construct. This confirms the same findings from the research model. The case studies were presented at the ITU Study Group Meeting in Tokyo, Japan on the 10th of March, 2011 and these results are now included in official working papers of the eHealth Study Group, Question 14, for the purpose of aiding public and private sectors in the adoption of these new innovative services. The case studies are presented in Appendix 8. In concluding, this adoption within the ITU eHealth Study Group 2, Question 14, as a new recommendation, "Tokyo call for action" provides evidence that the validated research model from this thesis is currently being used in management practice.

In order to close the loop and demonstrate how this study is supported in management practice by International Organisations, the case studies in Jordan and Azerbaijan led to several recommendations for the principles of a marketing strategy. These managerial recommendations were also presented at the ITU eHealth Study Group Meeting held on the 31st of March, 2011 held in Geneva, Switzerland. The recommended marketing strategies from these case studies centre on the key role of government and the Ministry of Health and the importance of involving

them in these services. In order to penetrate medical institutions, e-Health benefits need to be clearly outlined for the hospital administration. In order to overcome the obstacle of computer illiteracy in some circles, training in medical schools and continuous education is required. On-going dissemination of information about good practices and successful eHealth pilot projects will also aid in the intention to use eHealth services. These recommendations are consistent with the outcomes for the principles of marketing strategies within this doctoral thesis.

One of the main goals of the ITU study group on eHealth is to raise the awareness of decision-makers, health professionals, partners, beneficiaries and other key players about the benefits of telecommunication for the eHealth applications. This message is prepared in the format of a Resolution to be discussed and approved by the highest level of the ITU international meetings.[4] The ITU eHealth study group is strongly participating in the drafting of such Resolutions based on the contributions received. Being a member of this group and making contributions related to the marketing of eHealth services, the results of my thesis are taken into account in the preparation of the draft Resolutions.

There were two important Conferences in 2010. The World Telecommunication Development Conference which took place in May 2010 in India in Hyderabad which approved Resolution 65 on "Improving access to healthcare services by using information and communication technologies". This was followed by the Plenipotentiary Conference of the International Telecommunication Union in October 2010 in Guadalajara, Argentina. This is the highest ITU Conference where it approved Resolution 183 on "Telecommunication/ICT applications for eHealth". The full text of both Resolutions is presented in Appendices 9 and 10. These Resolutions present the instructions and guidelines for all ITU Member countries and also for the ITU management on how to promote and expedite the introduction of these important services for the entire population. These resolutions can be considered as a global marketing strategy of eHealth services at the international level where part on my research is included.
The Resolution also stresses the importance of cooperation between the WHO and ITU organisations to ensure the successful implementation of such services. For example, it was

---

[4] World Telecommunication Development Conference which is running every four years, and the Plenipotentiary Conference of the International Telecommunication Union which is organized every five years. These conferences are attended by all members of the ITU. This equates to approximately 150 to 180 countries.

mentioned in the Resolution 183 "…that WHO and ITU have a key role to promote stronger coordination among the key players…" (ITU Resolution, 2010).

Figure 17 portrays the full cycle of this research study from the research questions until the use of this study in management practice. The idea is to demonstrate how this research study is currently being used in practice.

Figure 17: Research Cycle: Question to Management Practice
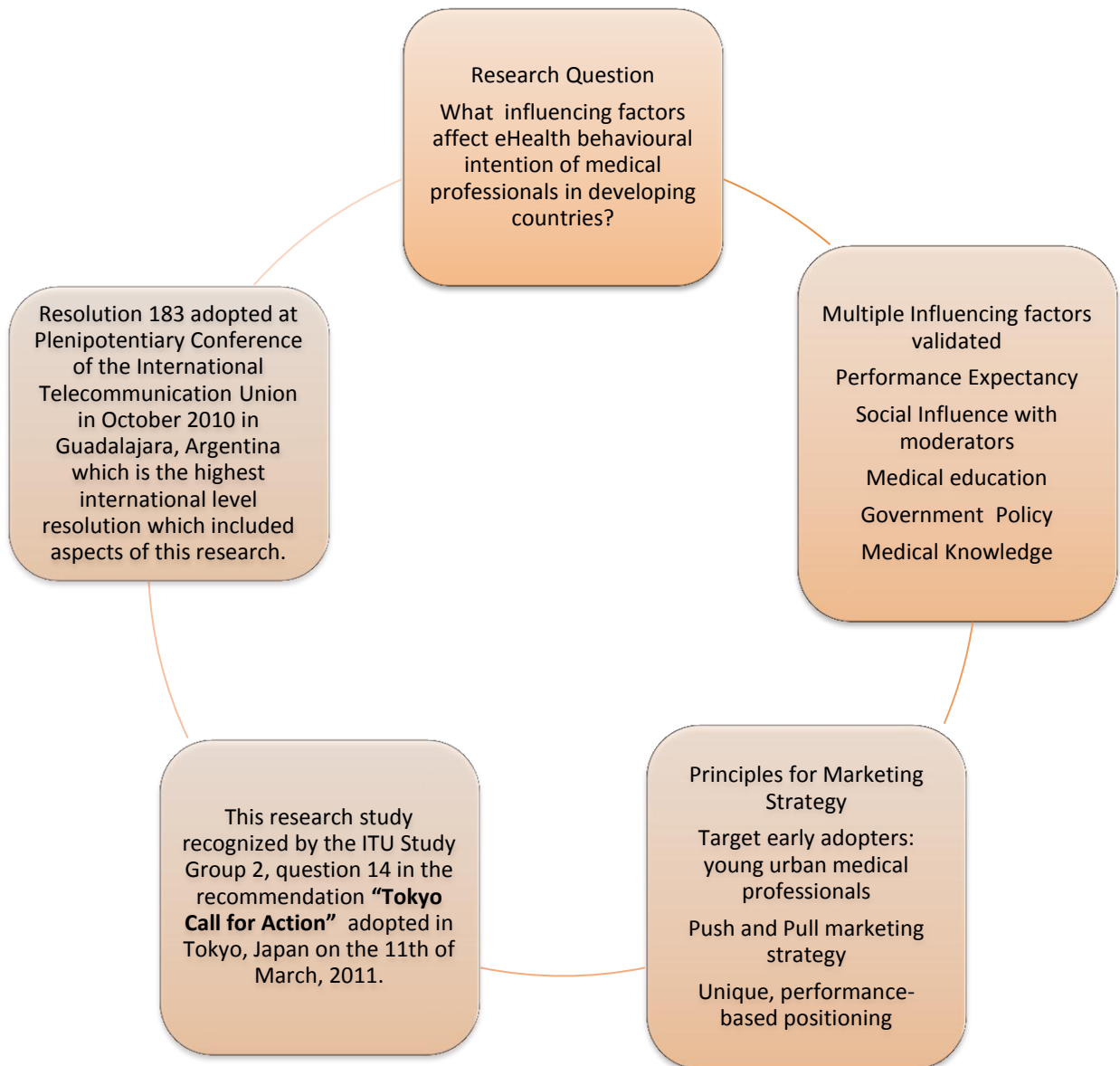
In addition to the two case studies, Jordan and Azerbaijan, recommendations from this doctoral thesis have been presented to the following countries: Mongolia, Malaysia, and Tanzania. Table 53 gives details of how the findings of this study are currently being used in management practice.

Table 53: eHealth Thesis Recommendations in Management Practice

Country	Action in Management Practice
Mongolia	Meeting was held in Geneva in November 2010 with Dr. Sambuu LAMBAA, Minister of Health and member of the State Great Khural (Parliament) of Mongolia, and Dr. Sh. Enkhbat, Director, State Implementing Agency of Health. There is a cooperation agreement between the Maternal and Child Health Research Centre in Mongolia and the International University in Geneva which was signed on the 3rd of December, 2009. As the result of this meeting, the cooperation will be extended to the Telemedicine Centre in Mongolia and the State Implementing Agency will receive the recommendations from this thesis related to the marketing of eHealth services at the level of the Mongolian Government.
Malaysia	A cooperation agreement was signed in December, 2009 between the University Putra Malaysia, Faculty of Medicine and Health Sciences, and the International University in Geneva. This agreement was signed by Professor Azhar Bin Ad Zain, Dean of the Faculty of Medicine. Medical staff of the University in Malaysia have participated in this thesis' study. The recommendations for eHealth marketing strategy were presented to the Dean in order to be included in the one of the training courses dealing with Healthcare Management.
Tanzania	There is the cooperation agreement between the Tanzanian Training Centre for International Health and the International University in Geneva, which was signed on the 6th of September, 2010. Thereafter, a meeting was held in Geneva with Dr. Senga Pemba, Director of the Training Centre. It was agreed that the University will assist in the preparation of a training course on the "Management and Marketing of eHealth Services for Developing

Country	Action in Management Practice
	countries" in line with the findings of this thesis.
	The Training Centre was also provided with information about best practices of eHealth services in some developing countries.

As this research was an exploratory study due to its newness and due to the limited number of pilot projects in developing countries, future research should evaluate case studies of implementation. These case studies will help to understand which factors determine the success of eHealth services once operationalised at the ground level. There are some preliminary findings from some of the pilot projects in developing countries. The case in Uganda where hand-held PDA's are being used to help doctors to better diagnose and advise treatments has been successful due to enhanced performance and the support of local government agencies. Another case study in India works well due to strong government support and demonstrated productivity performance. The key lesson from the Apollo project in India is that to make teleconsulting viable requires government support and / or by providing a bundle of shared services using the same infrastructure.

The eLearning project in Tanzania identifies the importance of not only initial training but on-going training to users for continued usage. Studying additional case studies of implementation could enable researchers to find other factors that would support or add to this model.

A recent case study present by Zolfo *et al.* (2011) on the implementation of teleconsulting for the management of difficult HIV/AIDS clinical cases in developing countries, showed that the system improved patient management, increased the knowledge of the medical staff, and reduced patient referrals. The medical staff that used this telemedicine system reported that the system was useful in the establishment of diagnoses and for medical education. Thus, this study shows that at the operational level, two of the validated influencing factors for behavioural intention were also experienced in medical practice. Some of the issues for continuation of this system by medical staff were related to an overstretched work schedule, followed by personnel changes,

and slow Internet connections. This also supports that importance of the technical aspects of eHealth, once operationalised at the ground level.

The UTAUT model provides a solid foundation for research in this area but needs to be adapted to the context of developing countries. The research showed that developing countries have specific attributes. Therefore, any company or organisation that is looking to develop and market eHealth services for developing countries can use this model as a starting point. However, one must adapt to the current local market conditions.

As a researcher, I am passionate about this subject and I want this new eService to work as it can bring benefits to both the medical field and its patients. As stated above, with the lack of medical professionals as well as skilled professionals to deliver the necessary medical advice and treatments in developing countries, a service such as eHealth would aid in improving this situation. As a professional marketing person having served as Director of marketing in several large multinational companies, it gives me personal satisfaction to be involved in services that not only contribute financially to companies, but also offer a real contribution to society.

References

References

Ahern, D., Kreslake, K., Phalen, J. M. (2006). What is eHealth (6): perspectives on the evolution of eHealth research. *J Med Internet Res*, Vol.8, Issue 1.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice Hall.

Ajzen, I. (1985). From intention to actions: a theory of planned behaviour, in: J. Kuhl, J. Bechmann (Eds.). *Action Control: From Cognition to Behavior*, Springer, New York, pp. 11–39.

Ajzen, I. (1991). The theory of planned behaviour, *Organizational Behavior and Human Decision Processes* 50, pp. 179–211.

Akinsola, O., Herselman, M., & Jacobs, S. (2005). ICT provision to disadvantaged urban communities: A study in South Africa and Nigeria. International Journal of Education and Development using ICT [Online], 1(3).

Albert, T., & Sanders, W. (2003). *e-business.marketing*, Pearson Education, New Jersey, USA

Androuchko, L. (2009). Rapporteur eHealth ITU-D study group 2, Geneva, Switzerland.

Anupindi, R., Das Aundhe, M., Sarkar, M. (2007). Healthcare Delivery Models and the Role of Telemedicine. *World Scientific*, Singapore.
Apollo Clinics (2007). http://www.apollohospitals.com/about_apollo.php.

Arnett, D., German, S., & Hunt, S. (2003). The Identity Salience Model of Relationship Marketing Success: The Case of Nonprofit Marketing. *Journal of Marketing*, Vol. 67, No.2, p. 89.

Atkinson, N.L. (2007). Developing a questionnaire to measure perceived attributes of eHealth innovations. *Am J Health Behavior*, Vol. 31, Issue 6.

Avci, C. (2009). Med-e-Tel Conference, Luxembourg, 1-3 April 2009.

Ayers, D.,Dahlstrom, R., Skinner, S. (1997). An Exploratory Investigation of Organizational Antecedents to New Product Success. *Journal of Marketing Research*, Vol.3 4, No.1.

Babbie, E. (1990). *Survey Research Methods*. Belmont, CA: Wadsworth.

Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 36: 421-458.

Balas, E.A., Santosh, K., & Tessema, T. (2008). eHealth: Connecting Health Care and Public Health. *Studies in Health Technology and Inform*atics.134,169-176.

Bashur, R. L., Mandil, S.H., & Shannon, G. W. State-of-the-Art Telemedicine/Telehealth:An International Perspective, ISBN: 0-913113-97-2.
Bergkvist, L., & Rossiter, J.R. (2007). The Predictive Validity of Multiple-item Versus Single-item Measures of the Same Constructs. *Journal of Marketing Research*, 44 (May): 175-184. Lead article.

Berwick, D. M. (2003). Diffusion of innovation theory for clinical change, Disseminating Innovations in Health Care. *Journal of the American Medical Association*, 289:1969-1975.

Bhor, M, Mason, H.L. (2006). Research in Social and Administrative Pharmacy, Elsevier.

Blythe, J. (2008). Consumer Behaviour, Thomsom, London

Booz Allen Hamilton. (2007). The new Saudi Arabian healthcare market over the coming years, Saudi Arabia is likely to experience a sharp increase in its healthcare needs. http://www.ameinfo.com. Saudi Arabia: Monday, March 12 - 2007 at 08:20.

Bordé, A., Fromm, C., Kapadia, F.,Molla, D. Sherwood, E., & Sorens, S. (2010). Communication Technologies for Development: Health White Paper commissioned by GAID, New York, April, 2010.

Brittain, M. & Norrist, A.C. (2000). Delivery of health informatics education and training. *Health Libraries Review*, 17: 117-128,

Bulletin of the World Health Organization (2005). Vol.83, no.1. ISSN 0042-9686.

Burley, L., Scheepers, H., & Fisher, J. (n.d.). Diffusion of Mobile Technology in Healthcare, Faculty of Information and School of Information School of Information Communication Technologies Management and Sys. Management and Sys. Swinburne Univ.of Technology 900 Dandenong Rd, 900 Dandenong RdJohn Street, Hawthorn, Caulfield East Caulfield East, Australia.

Campbell, D.T., & Fiske, D.W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56: 81-105.

Carlisle, S., & Sefton A.J. (1988), Healthcare and the information age: implications for medical education. *Medical Journal of Australia*, 168: 340-3.

Chau, P., & Hu, P. (2001). Information technology acceptance by individual professionals: A model comparison approach. *Decision Sciences,* 32 (4): 699–720.

Chau, P., & Hu, P. (2002a). Examining a model of information technology acceptance by individual professionals: An exploratory study. *Journal of Management Information Systems* 18 (4): 191–229.

Chau, P., & Hu, P. (2002b). Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical test of competing theories. *Information & Management* 39:297–311.

Chau P.Y.K. (1996). An empirical investigation on factors affecting the acceptance of CASE by systems developers. *Information and Management* 30 (6), pp. 269–280.

Chau, P.Y.K. (1996). An empirical assessment of a modified technology acceptance model. *Journal of Management Information Systems* 13 (2), pp. 185–204.
 Chau, P.Y.K. (1997). Reexamining a model for evaluating information center success using a structural equation modeling approach. *Decision Sciences* 28 (2), pp. 309–334.

Chetley, A. (2006). Improving health, connecting people: the role of ICTs in the health sector of developing countries, A framework paper. Info Dev program Grant no. 1254 – page 1.

Chetley, A. (2005). Improving health, connecting people: the role of ICTs in the health sector of developing countries A framework paper. Edited by; with contributions by Jackie Davies, Bernard Trude, Harry McConnell, Roberto Ramirez, T Shields, Peter Drury, J Kumekawa, J Louw, G Fereday, Caroline Nyamai-Kisia. International Telecommunication Union. Making better access to healthcare services. ITU-D Study Groups, Report on Question 14 ½.

Chismar, W., & Wiley-Patton, S. (2002). Does the extended technology acceptance model apply to physicians. Proceedings of the 36th Hawaii International Conference on System Sciences 6:160–67.

Chismar, W. R., & Wiley-Patton, S. (2006). Predicting Internet use: Applying the extended technology acceptance model to the healthcare environment.

Cisco Internet Business Solutions Group (2006). Customer Case Study. Rural Kenya Adopts Wireless Technology and Unique Medical Map to Improve Patient Care and Student Education.

Clark, R.A., Goldsmith, R.E., & Goldsmith, E.B. (2008). Market Mavenism and Consumer Self-Confidence. *Journal of Consumer Behaviour*, 7, 239-248.

Churchill , G.A. Jr. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research* 16, (1), 64-73.

Churchill G.A. Jr., & Iacobucci, D. (2005). Marketing Research, Methodological Foundations, 9th Edition, South-Western. USA.

Creswell, J. (1994). Research Design Qualitative and Quantitative Approaches. SAGE Publications, Thousand Oaks, London.

Dada, D. (2006), eReadiness for developing Countries. *The electronic Journal of Is in developing Countries*, 27,6, 1-14.

Danzon, P. M., & Furukawa, M. (2000). The Wharton School University of Pennsylvania, e-Health: Effects of the Internet on Competition and Productivity in Health Care, Health Care Dept. The Wharton School, University of Pennsylvania 3641 Locust Walk, Philadelphia 19104, danzon@wharton.upenn.edu.

Dubin, R. (1978). *Theory building*, New York: The Free Press.

Dussault, G., & Franceschini, M.C. (2006). Not enough there, too many here:understanding geographical imbalances in the distribution of the health workforce. *Human Resources for Health* (4):12.

Davis, F., R. Bagozzi, & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two. *Management Science* 35 (8): 982–1004.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13 (3), pp. 319–339.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science* 35 (8), pp. 982–1003.

Dearne, K. (2003). Health's tech bypass. In *The Australian*, Sydney, pp. 1, 4.

Drury, P. (2005). The eHealth agenda for developing countries. *World Hosp Health Serv*, Vol. 41, Issue 4.

Economist Intelligence Unit. (2008). E-readiness rankings 2008.

Educating medical students: assessing change in medical education-the road to implementation (ACME-TRI Report) (1993). *Academic Medicine*, Vol. 68, Supplement, June 1993.

Elder, L., & Clarke, M. (2009). Experiences and lessons learnt from telemedicine projects supported by IDRC. Telehealth in the Developing World, edited by Richard Wootton, Nivritti G. Patil, Richard E. Scott, and Kendall Ho, Royal Society of Medicine Press/IDRC, 2009, ISBN: 978-1-85315-784-4; e-ISBN 978-1-55250-396-6.

Eng, T. (2001). The eHealth Landscape: A Terrain Map of Emerging Information and Communication. *Technologies in Health and Health Care*, http://www.informatics-review.com/thoughts/rwjf.html.

Engle, J., Blackwell, R. & Miniard P. (1995). Consumer Behavior, 8th edn, The Dryden Press, USA.

Erlandson, D.A., Harris, E.L., Skipper, B.L.,& Allen, S.D. (1993). Doing naturalistic inquiry: A guide to methods. Newbury Park, CA. Sage.

European Commission (2010). Report on Innovation eHealth. http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/ehealth.

Evers, K.E. (2006). eHealth promotion: the use of the Internet for health promotion. *Am J Health Promotion*, Vol. 20, Issue 4.

Eysenbach, G. (2001). What is e-health?. *J Med Internet Res,* 2001;3(2):e20.

Eysenbach, G. (2004). Tackling publication bias and selective reporting in health informatics research: register your eHealth trials in the International eHealth Studies. Registry *J Med Internet Res*, Vol. 6, Issue 3.

Feick, L.F., & L.L. Price (1987). The Market Maven: A Diffuser of Marketplace Information. *Journal of Marketing*, 51, 83-97.

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research, Reading, MA: Addison-Wesley.

Fitzgerald, P., Aitken, J., & Krauss, I. (2003). HealthConnect interim research report: volume 1 overview and findings. Department of Health and Aging, Canberra, ACT.

Flynn, L., & Goldsmith, R. (1999). A Short, Reliable Measure of Subjective Knowledge. *Journal of Business Research* 46, 57-66.

Flynn, L.R., & Pearcy, D. (2001). Four subtle sins in scale development: Some suggestions for strengthening the current paradigm. *International Journal of Market Research* 43 (4), 409-423.

Gagnon, M. P., Godin, G., Gagne C., Fortin, J. P., Lamothe, L., Reinharz, D., & Cloutier, A.. (2003). An adaptation of the theory of interpersonal behaviour to the study of telemedicine adoption by physicians. *International Journal of Medical Informatics* 71 (2/3): 103–15.

Garson, D. G. (2008). Factor Analysis: Statnotes. Retrieved March 22, 2008, from North Carolina State University Public Administration Program, http://www2.chass.ncsu.edu/garson/pa765/factor.htm.

Gatignon, H. & Robertson T.S. (1985). A propositional inventory for new diffusion research. *Journal of Consumer Research*, 11, 849-867.

Geissbuhler, A., Bagayoko C., Oumar, L. (2007). The RAFT network: 5 years of distance continuing medical education and tele-consultations over the Internet in French-speaking Africa. *Int J Med Inform,* Vol. 76, Issue 5-6.

Gerber, T., Olazabal, V., Brown, K.,& Pablos-Mendez, A. (2010). An Agenda for Action On Global E-HEALTH. *Health Affairs*, 29,NO.2: 235-238.

Gerbing, D., & Anderson, J. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research*, vol. 25, no.2, 186-192.

Ghauri, P., & Gronhaug, K. (2002). Research Methods in Business Studies, Prentice Hall, London.

Gill, J., & Johnson, P. (2006). Research Methods for Managers, 3rd edn, Sage Publications, London.

Goetz, J.P., & LeCompte, M.D. (1984). Ethnography and qualitative design in educational research. New York : Academic Press.

Goldsmith, R.E., Flynn, L.R., & Goldsmith, E.B. (2003). Innovative Consumers and Market Mavens. *Journal of Marketing Theory and Practice*, 11, 54-64.

Ghosh, A., Argarwall, V., & Marwaha, N. (2009). Telecom Infrastructure in India. *ICRA Limited,* March, 1-12.

Greene, J. C., Caracelli, V.J., & Graham, W.F. (1989). Toward a conceptual framework for mixed-method evaluation designs. Educational Evaluation and Policy Analysis,11(3),255-274.

Gummesson, E. (2000). Qualitative Methods in Management Research, 2nd edn, Sage Publications, London.

Gururajan, R., Gurney, T., & Hafeez-Baig, A. (2009). Confirmatory factor analysis to establish determinants of wireless technology in the Indian healthcare. *International Journal of Healthcare Delivery Reform Initiatives*, 1 (3). pp. 19-37. ISSN 1938-0216 1 dependent variable.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (2010). Data Analysis, A global Perspective. 7th edn, Pearson education, Upper Saddle River, New Jersey.

Hall, D.T. & R. Mansfield (1975). Relationships of age and seniority with career variables of engineers and scientists. Journal of Applied Psychology, 60, 201- 210.

Hanson, K., & Berman, P. (n.d.). Private Health Care Provision in Developing Countries: A preliminary analysis of levels and composition. *Health Policy and Planning*, 13(3): 195-211.

Han, S., Mustonen, Seppanen, P., & Kallio, M. (2006). M. Physicians' acceptance of mobile communication technology: an exploratory study by *International Journal of Mobile Communications* (IJMC), Vol. 4, No. 2.

Harkness, J.A., & Schoua-Glusberg, A. (1998). Questionnaires in Translation. ZUMA-Nachrichten Spezial.

Heinzelmann, P., Jacques, G., & Kvedar, J.C. (2005). Telemedicine by email in remote Cambodia. *Journal   of   Telemedicine   and   Telecare*,   vol.11:44-47

Hirshman, E. (1980). Innovativeness, Novelty Seeking, and Consumer Creativity. *The Journal of Consumer Research*, Vol. 7, No. 3, pp. 283-295.

Horan, T.A., Tulu, B., & Hilton, B. (2005). Dimensions of Work Practice Compatibility and Influences on Actual System Use: Examining Physician Use of Online Disability Evaluation System, Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, USA August 11th-14th.

Houston, T. K., & Jeroan, J. (2002) . Users of Internet health information: differences by health status. *J Med Internet Res*, Vol. 4, Issue 2.

Howe, K., & Eisenhart, M. (1990). Standards for qualitative (and quantitative) research: A prolegomenon. *Educational Researcher, 19* (4), 2-9.

Hu, P., & Chau, P. Y. (1999). Physician acceptance of telemedicine technology: An empirical investigation. *Topics in Health Information Management* 19 (4): 20–35.

Hu, P., Chau, P., Sheng O., & Tam K. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems* 16 (2): 91–113.

Hwang, Y. (2005). Investigating enterprise systems adoption: Uncertainty avoidance, intrinsic motivation, and the technology acceptance model. *European Journal of Information Systems* 14 (2): 150–61.

Idea Group Inc. (2007). Technology Acceptance among Physicians: A New Take on TAM Med *Care Res Rev*, 64; 650 originally published online.

Report of International Telecommunication Union (2005). Making better access to healthcare services, (ed). National Institute of Information and Communications Technology, Tokyo, Japan.

Report of International Telecommunication Union (2001). New Technologies for Rural Applications. ITU-D Focus Group 7.

Report of International Telecommunication Union (2000). Achieving the Malaysian Health Vision Through TeleHealth. ITU Study Group 2, June.

Jannett, P., Gagnonb, M., & Brandstadt, H. (2005,). Preparing for success: Readiness models for rural Tele-Health. *Journal of Postgraduate Medicine*, vol.51.

Jayasuriya, R. (1998). Determinants of microcomputer use: implications for education and training of health staff. *International Journal of Medical Informatics*, vol 50, pp. 187-194.

Jordanova, M., & Lievens, F. (2008). Global Telemedicine and eHealth Updates, Vol. 1, 2008.

Keil M., Cule PE., Lyytinen K., & Schmidt R.C. (1998). A framework for identifying software project risks. Communications of the ACM. 41(11), pp. 76-83.

Kerlinger, F.N. (1986). *Foundations of behavioral research*, Holt, Rinehart & Winston, New York.

Kifle, M. (2008). A TeleMedicine Transfer Model for Sub-Saharan Africa. Proceedings of the 41st Hawaii International Conference on System Sciences – 2008.

Kifle, M. (2006). A Theoretical Model for Telemedicine: Social and Value Outcomes in Sub-Saharan Africa, Ph.d Thesis, Department of Computer and System Sciences, Stockholm University/Royal Institute of Technology.

Kifle, M., Mbarika, V., & Tan, J. (2007). Telemedicine Transfer in Sub-Saharan Africa: Investigating Infrastructure Culture Proceedings of the 9th International Conference on Social Implications of Computers in Developing Countries, São Paulo, Brazil, May 2007.

Kijsanayotina1, B., Pannarunothaib, S., & Speedie S. (2009). Factors Influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model. *International Journal of Medical Informatics,* Volume 78, Issue 6, Pages 404-416.

Kinnear, T., & Taylor, J. (1996). Marketing Research An Applied Approach.McGraw Hill, 5th ed.

Kisambira, E. (2008). Uganda to invest in eHealth System, IDG News Service, November 03, 2008 02:10 PM ET.

Koch, S. (2006). Home telehealth--current state and future trends. *Int J Med Inform*, Vol.75, Issue 8.

Kotler, P. (2003). Marketing Management (11th ed.). Upper Saddle River, NJ: Prentice-Hall.

Kwankam, Y., Ph.D. (2009). eHealth Department of knowledge Management and Sharing, World Health Organization.

Lam, D., M. (2009). Conceptual Model. Med-e-Tel Conference, Luxembourg, 1-3 April 2009.

Lavidge, R. J., & Steiner, G. A. (1961). A Model of Predictive Measurements of Advertising Effectiveness. *Journal of Marketing*, vol. 25, no. 6, pp. 59-62.

Lievens, F., & Jordanova, M. (2004). Is there a contradiction between telemedicine and business?. *J Telemed Telecare*, Vol.10, Suppl 1.

Lintonen, K. (2007). Seedhouse Information technology in health promotion. *Health Education Research.*

Liu, L., & Ma, Q. (2005). The impact of service level on the acceptance of application service oriented medical records. *Information & Manag*ement 43 (8): 1121–35.

Lubinski, D., Tellegen,A. & Butcher, J. N. (2000). Masculinity, Femininity, and Androgyny Viewed and Assessed as Distinct Concepts. *Journal of Personality and Social Psychology,* (53:2), 2000, pp. 375-403.

Ma, Q., & Liu, L.(2004). The technology acceptance model: A meta-analysis of empirical findings. *Journal of Organizational and End User Computing,* 16 (1): 59–72.

Macduff C., West B., & Harvey S. (2001) Telemedicine in rural care. Part 2: assessing the wider issues. Nursing Standard, 15(33), 33-37.

Macq, J., Ferrinho, P., De Brouwere, V., & Van Lerberghe, W. (2001). Managing Health Services in Developing Countries: Between the Ethics of the Civil Servant and the Need for Moonlighting: Managing and Moonlighting Human Resources. *Health Development Journal* (HRDJ), Vol. 5 No. 1 - 3, January - December 2001.

Mahajan, V., Muller, E., & Bass**,** F. M. (1990). New Product Diffusion Models in Marketing: A Review and Directions for Research. *Journal of Marketing*, Vol. 54, No. 1 (Jan., 1990), pp. 1-26,doi:10.2307/1252170.

Bulletin of the World health Organization: Makinem *et al*. (2000). Inequalities of healthcare use and expenditures, an empirical study of 8 developing countries and countries in transition, 78.

Malhotra, N.K., & Birks, D.F. (2006). Marketing Research: An Applied Approach, Prentice Hall.

Mathieson, K. (1991). Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. *Information Systems Research*, Vol.2, No.3, pp. 173--191. Mathauer I., & Imhoff, I. (2006). Health worker motivation in Africa: the role of non-financial incentives and human resource management tools. *Human Resources for Health* 2006, 4:24doi:10.1186/1478-4491-4-24.

Mathieson, K., Peacock, E., & Chin, W. (2001). Extending the technology acceptance model: The influence of perceived user resources. *Database for Advances in Information Systems*, 32 (3): 86–113.

Mathie, A. Z. (1997). Doctors and change. *Journal of Management in Medicine*, Issue: 6 Page: 342 – 356 Volume: 11.

May, C., Gask, L., Atkinson, T., Ellis, N., Mair, F., & Esmail, A. (2001). Resisting and promoting new technologies in clinical practice: the case of telepsychiatry. *Social Science and Medicine*, vol. 52, no. 12, pp. 1889-1901.

Mbarika, V., Tsuma, C. & Wilkerson, D. (2007). Proceedings of the 9th International Conference on Social Implications of Computers in Developing Countries, São Paulo, Brazil, May 2007.

McCoy, S., Everard, A., & Jones, B. M. (2005). An examination of the technology acceptance model in Uruguay and the US: A focus on culture. *Journal of Global Information Technology Management* 8 (2): 27–45.

McDaniel, C., & Gates, R. (2002). Marketing Research: The Impact of the Internet, Fifth Edition, John Wiley & Sons, Inc., USA.

Meuter, M., Bitner, M. J.,Ostrom, A., & Brown, S. (2005), Choosing Among Alternative Service Delivery Modes: An Investigation of Customer Trial of Self-Service Technologies. *Journal of Marketing*, Spring, p.61.

Miles, M.B., & Huberman, A.M.(1984). Qualitative data analysis: A sourcebook of new methods. Beverly Hills CA: Sage.

Miller, J. B. (1976). *Toward a New Psychology of Women*, Beacon Press, Boston.

Mitchell J. (1999). From telehealth to e-Health: The unstoppable rise of e-health. Canberra, Australia: National Office for the Information Technology. Available: [http://www.onlineaustralia.net.au/Projects/ecommerce/ehealth/rise_of_ehealth/unstoppable_rise.htm]

Morris, M. G., & Venkatesh, V. (2000). Age Differences in Technology Adoption Decisions: Implications for a Changing Workforce. *Personnel Psychology* (53:2) pp. 375-403.

Murray, D. (2002). Healthcare challenge. In Australian *Information Week*, vol. 3, pp. 10-18.

Nguyen H.Q., Carrieri-Kohlman V., Rankin, S. H, Slaughter R., & Stulbarg, M. S. (2004). Supporting cardiac recovery through eHealth technology. *J Cardiovasc Nursing*, Vol.19, Issue 3.

Nguyen H.Q., Carrieri-Kohlman V., Rankin, S. H, Slaughter R., & Stulbarg, M. S. (2004). Internet-based patient education and support interventions: a review of evaluation studies and directions for future research. *Comput Biol Med* , Vol. 34 , Issue 2.

Norris, A. C. (2002). Essentials of telemedicine and Telecare, John Wiley & sons. Ltd.

Norusis, M. (2008). SPSS Statistics 17.0 Statistical Procedures Companion. Prentice Hall, Upper Saddle River, New Jersey.

Norusis, M. (2008). SPSS 16.0 Guide to Data Analysis. Prentice Hall, Upper Saddle River, New Jersey.

Norusis, M. (2008). SPSS 16.0 Statistical Procedures Companion. Prentice Hall, Upper Saddle River, New Jersey.

Norusis, M. (2008). SPSS 16.0 Advanced Statistical Procedures Companion. Prentice Hall, Upper Saddle River, New Jersey.

Nunnally, J. C. (1967). Psychometric theory. New York: McGraw Hill, 1, p. 640
University of Chicago, Chicago, IL.

Nuq, P. (2008). eHealth Market Segmentation Framework in Developing Countries. Global Telemedicine and eHealth Updates,Volume 1.

Nuq, P., Androuchko, V., Malik, A., Omaswa C., & Lungten, L. (2008). The role of Education for the Introduction of eHealth services in Developing Countries. Global Telemedicine and eHealth Updates,Volume 1.

Nuq, P., & Androuchko, V. (2007). Global Marketing Strategies for eHealth services in Developing Countries. *Journal of eHealth Technology and Application*, Volume 5, Number 2.

Nuq, P., & Androuchko, V. (2007). Role of International Organization in the Promotion and Marketing of eHealth Services for Developing Countries. Proceedings of the Conference Med-e-Tel, Luxembourg, April 18-20, 2007.

Nurses' adoption of technology: Application of Rogers' innovation-diffusion model*1. *Applied Nursing Research,* Volume 17, Issue 4, November 2004, Pages 231-238.

Oh, H., Rizo, C., Enkin, M., & Jadad, A. (2005). What is eHealth?: a systematic review of published definitions, *World Hospital Health Serv*, Vol. 41, Issue 1.

Orlikoff, J., & Totten, M. (2001). The Trustee Handbook for Health Care Governance, Second ed. ISBN: 10: 0787958859.

Peter, J. P. (1981). Construct Validity: A Review of Basic Issues and Marketing Practices. *Journal of Marketing Research*, 18 (May), 133-45.

Powell, J. A., Lowe, P., Griffiths, F. E., & Thorogood, M. (2005). A critical analysis of the literature on the Internet and consumer health information. *J Telemed Telecare*, 11 Suppl 1.
Pradeep, R. (2009). Interview ITU, eHealth services, University of New South Wales, Australia.

Raimondo, M., Micell, G., & Costabile, M. (2008). How Relationship Age Moderates Loyalty Formation:The Increasing Effect of Relational Equity on Customer Loyalty. *Journal of Service Research*, Volume 11, Number 2, 142-160.

Rachagan, S. (1996). Ensuring Consumer Interest in Managed HealthCare. Paper presented at the National Conference on Managed Care: Challenges facing Primary Care Doctors., Petaling Jaya, Malaysia.

Reimers, V. (2009). Retail centre convenience : It's Influence over consumer patronage behaviour. *International Journal of Retail and Distribution*, Vol. 37, pp. 541-62.

Report of the United Nations Foundation. The opportunity of Mobile Technology for Healthcare in the Developing World. Vital Wave consulting: UN Foundation-Vodaphone Foundation, 2009.

Report of the Telecommunication Development Bureau, ITU-D Study Groups, document 2/153-E, 9 June 2000.

Report of the European Commission, eHealth priorities and strategies in European Countries, eHealth ERA report, March, 2007.

Rogers, E. M. (2003). Diffusion of Innovations. 5th ed. The Free Press, New York.

Rogers, E. M. (1995). Diffusion of Innovations. 4th ed. The Free Press, New York.

Rogers, E. M. (1983). Diffusion of innovations. 3rd ed. New York: Free Press.

Rogers, E.M., & Shoemaker, F. (1971). Communication of Innovations: A Cross-Cultural Approach (2nd ed.). New York: The Free Press.

Rossiter, J. R., & Bergkvist, L. (2009). The Importance of Choosing "One Good Item" for Single-Item Measures and for the Components of Multiple-Item Measures. European Marketing Academy (EMAC), Nantes, France.

Sanson-Fisher & Robert, W. (2004). Adopting Supplement Best Evidence in Practice, *MJA* 2004; 180: S55–S56 Robert W Sanson-Fisher MJA 2004; 180: S55–S56 Faculty of Health, University of Newcastle, Newcastle, NSW.

Schaper, L. K., & Pervan, G. P. (2007). ICT and OTs: A model of information and communication technology acceptance and utilisation by occupational therapists. *International Journal of Medical Informatics,* 7 6 S (2 0 0 7) S212–S221.

Schaper L., & Pervan, G. (2004). A Model of Information and Communication Technology Acceptance and Utilisation by Occupational Therapists, Decision Support in an Uncertain and Complex World: The IFIP TC8/WG8.3 International Conference 2004.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: a meta-analysis of past research with recommendation for modifications and future research. *Journal of Consumer Research*, vol.15, no. 3, pp. 325-343.

Shoaib, S.F., Mirza, S., Murad, F.,& Malik, A.Z. (2009). Current status of e-health awareness among healthcare professionals in teaching hospitals of Rawalpindi: a survey. *Journal of eHealth/ Telemedicine*, May;15(4):347-52.

Shuyler, K., & Knight, K. (2003). What are patients seeking when they turn to the Internet. *Journal of Medical Internet Research*, 5 (4):e24.

Skinner, H., Biscope, S., Poland, B., & Goldberg, E. (2003). How adolescents use technology for health information: implications for health professionals from focus group studies. *J Med Internet Res*, Vol. 5, Issue 4.

Smith, A.(1999). Some problems When Adopting Churchill's Paradigm for the development of Service Quality Measurement Scales. *Journal of Business Research*, Vol. 46, No. 2.

Smith, J. (2000). Health management information systems: a handbook for decision-maker. Buckingham: Open University Press- p.3.

Smith, J. K. (1983). Quantitative versus Qualitative Research: An attempt to clarify the issue. *Educational Researcher*, pp.6-13.

Solomon, M., Bamossy, G., Askegaard, S., & Hogg, M. (2006). Consumer Behaviour. Pearson Education, New Jersey, USA.

Spil, T. A. M., & Schuring, R. W. (eds.). Ehealth systems diffusion and use: The innovation , the user and the Use IT model. Hershey, PA, USA.

Straub, D. W., Keil, M., & Brenner, W. H. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management* 33 (1): 1–11.

Strauss, A., & Corbin, J. (1990). Basics of Qualitative Research: Grounded theory procedures and techniques. Newbury Park, CA: SAGE.

Swick, H.M. (1998). Academic medicine must deal with the clash of business and professional values.Academic Medicine:*Journal of the Association of American Medical Colleges,* July;73(7):751-5.

Talukdar, D., Sudhir, K., & Ainslie, A. S., "Investigating New Product Diffusion across Products and Countries", Yale SOM Working Paper No. MK-06. Available at SSRN: http://ssrn.com/abstract=286155 or DOI: 10.2139/ssrn.286155.

Tan, J. (2008). ICT provision to disadvantaged urban communities: A study in South Africa and Nigeria, Proceedings of the 41st Hawaii International Conference on System Sciences.

Taylor, S., & Todd, P. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research*, Vol.6, pp. 144--176.

Taylor, S., & Todd, P. (1995). Assessing IT usage: the role of prior experience. *MIS Quarterly*, v.19 n.4, p.561-570, Dec. 1995.

Taylor, S. (2011). The Merging of Male and Female. http://www.steventaylor.talktalk.net, May 15, 2011.

Tesch, R. (1990).Qualitative Research: Analysis types and software tools. New York:Falmer.

Tian, K.T., Bearden, W.O., & Hunter, G.L. (2001). Consumers' Need for Uniqueness: Scale Development and Validation. *Journal of Consumer Research,* Vol. 28, No. 1, pp. 50-66.

Trudel, M., Cafazzo, J.A., Hamill, M., Igharas, W., Tallevi, K., Picton, P., Lam, J., Rossos, P.G., Easty, A., & Logan, A. (2007). A mobile phone based remote patient monitoring system for chronic disease management. *Medinfo*, Vol.12.

Tulu, B., Horan, T., A., & Burkhard, R. (2005). Dimensions of Work Practice Compatibility and Influences on Actual System Use: Examining Physician Use of OnlineDisability Evaluation

System Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, USA August 11th-14th, 2005.

US & Foreign Commercial Service, US Department of State (2001). Malaysia: Healthcare Sector Overview. Available: http://www.exporthotline.com/upload/0980AF23-7535-4D60-A3F2- F6F6EA4393F4.html.

Umez, B.N. (2002). Educated to Feel Inferior:"Will Africa ever Catch Up?. 8th annual Convention of the World Igbo Congress, Houston, USA.

Uzoka, F, Shemi, A., & Seleka, G. (2007). Behavioural Influences on eCommerce Adoption in a developing country context. *The Electronic Journal of Information Systems in Developing Countries*, 31, 4, 1-15.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science* 46 (2): 186–204.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, Vol.7, No.3, pp. 425--478.

Venkatesh, V., & Morris, M.G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, v.24 n.1, p.115-139..

Walliman, N. (2005). Your Research Project. Sage Publications, second edition, London.

Walsh, G., Gwinner, K.P., & Swanson, S.R. (2004). What Makes Mavens Tick? Exploring the Motives of Market Mavens' Initiation of Information Diffusion. *Journal of Consumer Marketing*, 21, 109-122.

Wangberg, S.C., Andreassen, H.K., Prokosch H.U., Santana S., Maria V., Sørensen, T., & Chronaki, C. E. (2008). Relations between Internet use, socio-economic status (SES), social support and subjective health. *Health Promot Int*, Vol.23, iIssue 1.

Wenn, A., Tatnall, A., Sellitto, C., Darbyshire, P., & Burgess, S. (2002). A sociotechnical investigation of factors affecting I.T. adoption by rural GPs', in Information Technology in Regional Areas. Using IT: Make IT Happen. Online, Rockhampton, Queensland Australia.

Western, M., Dwan, K., Makkai, T., del Mar, C., & Western, J. (2001). Measuring IT use in Australian General Practice. University of Queensland, Australia.

WHO, Building Foundations for eHealth (2006). Report of the WHO Global Observatory for eHealth. World Health Organization.

WHO Regional Office for the Western Pacific (2005). Malaysia: National Health
Plan and Priorities. World Health Organisation. Available: http://www.wpro.who.int
/countries/05maa/national_health_priorities.htm

Woods, P. (2006). Qualitative Research. Faculty of Education, originally published by the Open University in Section 6 of its Study Guide for E835 *Educational Research in Action*, 1996.University of Plymouth, 2006.

Wooten, R., Patil, N., Scott, R., & Ho, K. (eds) (2009). Telehealth in the Developing World. Royal Society of Medicine Press, UK.

Wootton R. (1999). Telemedicine and isolated communities a UK perspective. *Journal of telemedicine and telecare*; 5 (Supplement 2): 27-34.
World Bank Economic Report. (2006). Health Financing in Developing Countries. June 2006. http://web.worldbank.org.

World Health Report (2006). Working together for Health World Health Organization, Geneva, Switzerland.

World Telecommunication Development Conference. (1994). Cited in International Telecommunication Union (ITU). http://www.itu.int/ITU-D/conferences/wtdc/index.html.

Wright, D. & Androuchko, L. (1996). Telemedicine and developing countries. *Journal of Telemedicine and Telecare*, 2: 63-70.

Wyatt, J.C. & Liu, J. L.Y. (2002). Basic concepts in medical informatics. *J Epidemial Coummunity Health*, 56: 808-812.

Yarbrough, A. K., & Smith T. B. (2007). Technology Acceptance among Physicians: A New Take on TAM. *Med Care Res Rev*., 64; 650 originally published online Aug 23, 2007

Yi, M., Jackson, Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management,* 43 (3): 350–63.

Yu, J., Ha, I., Choi, M., & Rho, J. (2005). Extending the TAM for t-commerce. *Information & Management ,*42 (7): 965–76.

Zeithaml, V., Bitner, M., & Gremler, D. (2006). Services Marketing: Integrating customer Focus Across The Firm. International Edition, Mcgraw Hill, New York.

Zhang, X., Prybutok, V. R., & Koh, C. (2006). The role of impulsiveness in a TAM-based online purchasing behavior model. *Information Resources Management Journal*,19 (2): 54–68. 672 Medical Care Research and Review.

Zolfo, M., Lorent, N., Bateganya, M.,Kiyan, C., Lequarre, F., Koole, O., & Lynen, L. (2011). Telemedicine in HIV/AIDS Care: A Users' Satisfaction Survey. Global Telemedicne and eHealth Updates, Vol.4.

Zurn, P., Dal Poz, M. R., Stilwell, B., & Adams, O. (2004). Imbalance in the health workforce, Human Resources for Health 2004, 2:13 doi:10.1186/1478-4491-2-13,17 September 2004, School of Information Systems, Curtin University of Technology, GPO Box U1987, Perth, WA 6845, Australia.

Zurn, P. (2002). Imbalances in the health Workforce: Briefing paper. Geneva: World Heath Organization.

Yarbrough A. K., & Smith T. B. (2007) Managing Health Services in Developing Countries: Between the Ethics of the Civil Servant and the Need for Moonlighting: Managing and Moonlighting Jean Macq, Paulo Ferrinho, Vincent De Brouwere, Wim Van Lerberghe.

Appendices

CONTENTS:

Apendix 1: Definitions of eHealth (Oh *et al.*, 2005)

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
1	1999	Mitchell (G)	A new term needed to describe the combined use of electronic communication and information technology in the health sector. The use in the health sector of digital data – transmitted, stored and retrieved electronically – for clinical, educational and administrative purposes, both at the local site and at a distance.
2	1999	Loman - First Consulting Group (G)	E-health – the application of e-commerce to healthcare and pharmaceuticals
3	2000	JHITA (G)	Internet-related healthcare activities
4	2000	McLendon (M)	Ehealth refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves. Ehealth includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. Simply stated, Ehealth is making healthcare more efficient, while allowing patients and professionals to do the previously impossible.
5	2000	Medical Business News	E-Health is a convergence between the Internet and the health care industry to provide consumers with a wide variety of information relating to the health care field
6	2000	GJW Government Relations (G)	A wide-ranging area of social policy that uses new media technologies to deliver both new and existing health outcomes
7	2000	Oracle Corporation (G)	Healthcare transactions, encounters, messaging, or care

	Year	**Source** (M = Medline, W = Wilson Business Abstracts, G = Google)	**Definition**
			provision occurring electronically.
8	2000	DeLuca, Enmark - Frontiers of Medicine [(W) (M)	E-health is the embryonic convergence of wide-reaching technologies like the Internet, computer telephony/interactive voice response, wireless communications, and direct access to healthcare providers, care management, education, and wellness.
9	2000	Pretlow (G)	E-health is the process of providing health care via electronic means, in particular over the Internet. It can include teaching, monitoring (e.g. physiologic data), and interaction with health care providers, as well as interaction with other patients afflicted with the same conditions.
10	2001	Baur, Deering and Hsu (G)	The broadest term is ehealth, with refers to the use of electronic technologies in health, health care and public health. The various functions of ehealth are: electronic publishing, catalogues, databases; self-help/self-care (online health information, support groups, health risk assessment, personal health records), Plan/provider convenience services (online scheduling, test and lab results, benefit summaries), consultation and referral (doctor-patient or doctor-doctor consultation via telemedicine systems, remote readings of digital image and pathology samples), E-health commerce (sales of health related product and services) and Public health services (automated data collection, data warehouses, online access to population survey data and registries, advance detection and warning systems for public health threats).
11	2001	Orlikoff & Totten (M)	The use of the Internet and related information systems and technology in all aspects of health care.
12	2001	Eysenbach (M)	e-health is an emerging field in the intersection of medical

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
			informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology
13	2001	Blake (M)	The combined use of electronic communication and information technology in the health sector. It is important to note that e-health is much more than business transactions. It encompasses everything from digital data transmission to purchase orders, lab reports, patient histories and insurance claims.
14	2001	Strategic Health Innovations (G)	The use of information technology in the delivery of health care.
15	2001	Robert J Wood Foundation (G)	EHealth is the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care.
16	2001	Wysocki (G)	e-Health refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves
17	2001	JP Morgan Partners (G)	The health care industry's component of business over the Internet
18	2001	Ontario Hospital eHealth Council (G)	EHealth is a consumer-centred model of health care where stakeholders collaborate utilizing ICTs including Internet

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
			technologies to manage health, arrange, deliver, and account for care, and manage the health care system.
19	2001	Tieman (M)	E-health is all that's digital or electronic in the healthcare industry
20	2001	DeLuca, Enmark (M)	E-health is the electronic exchange of health-related data across organizations, although every health care constituent approaches e-health differently.
21	2001	Ball – HIMSS (G)	Internet technologies applied to the healthcare industry
22	2002	Health e-Technologies Initiative (G)	The use of emerging interactive technologies (i.e., Internet, interactive TV, interactive voice response systems, kiosks, personal digital assistants, CD-ROMs, DVD-ROMs) to enable health improvement and health care services.
23	2002	Grantmakers in Health (G)	Use of ICT, especially (but not only) the Internet to enable health and health care.
24	2002	Kirshbaum (G)	There are many different definitions of eHealth • Electronic connectivity vehicle for improving the efficiency and effectiveness of healthcare delivery • Enabling consumers/patients to be better informed about their healthcare • Enabling providers to deliver better care in more efficient ways
25	2002	Wyatt and Liu (M)	The use of internet technology by the public, health workers, and others to access health and lifestyle information, services and support; it encompasses *telemedicine, telecare* , etc.

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
26	2003	Staudenmeir - Arthur Anderson (G)	Any use of the Internet or related technology to improve: the health and wellness of the population; the quality of healthcare services and outcomes; efficiencies in healthcare services or administration
27	2003	COACH (G)	The leveraging of the information and communication technology (ICT) to connect provider and patients and governments; to educate and inform health care professionals, managers and consumers; to stimulate innovation in care delivery and health system management; and, to improve our health care system.
28	2003	Rx2000 (G)	eHealth signifies a concerted effort undertaken by some leaders in healthcare and hi-tech industries to harness the benefits available through convergence of the Internet and healthcare. Access, cost, quality and portability have been concerns in the health care arena. It's evident from many recent surveys that both health consumers and healthcare professionals are frustrated with the maze of health care delivery. Some, therefore, are turning to the Internet for answers and cost effective solutions.
29	2003	Beaulieu & Beinlich - First Consulting Group (G)	eHealth (ē´helth), n. 1. The application of Internet principles, techniques and technologies to improve healthcare. 2. New way of conducting the business of healthcare enabling stronger and more effective connections among patients, doctors, hospitals, employers, brokers, payers, laboratories, pharmacies, and suppliers. 3. The "customer facing" e-revolution in healthcare. [1999]
30	2003	eEurope - eHealth2003 (G)	The application of information and communication technologies (ICT) across the whole range of functions which

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
			one way or another, affect the health of citizens and patients.
31	2003	Decker – HealthVision (G)	Corporate strategy and using the power of the Internet and emerging technology to redefine the delivery of health care.
32	2003	Miller - athealth.com (G)	E-health means any form of healthcare information made available over the Internet.
33	2003	Telehealth Victoria (G)	Term that is used to describe most aspects of healthcare delivery or management that is enabled by information technology or communications
34	2003	Ebrunel.com (G)	The provision of healthcare services available through the Internet - and particularly to the rash of health related web sites.
35	2003	Regional Office for the Eastern Mediterranean - World Health Organization (G)	E-health is a new term used to describe the combined use of electronic communication and information technology in the health sector OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance
36	2003	www.avienda.co.uk (G)	A generic field of information and communications technologies used in medicine and healthcare.
37	2003	Brommey	The use of electronic information and communications technologies to provide and support health care wherever the participants are located
38	2003	Southwest Medical Group (G)	e-health is an emerging field focused on medical information and health care services delivered or enhanced through advanced Internet or related technologies. In a broader sense, the term extends the scope of health care beyond its conventional boundaries. Conceptually, e-health enables patients to easily obtain medical related services online from

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
			health care providers
39	2003	HMS Europe (G)	The practice of leveraging the Internet to connect caregivers, healthcare systems and hospitals with consumers
40	2003	Nova Scotia Telehealth Network (G)	E-health is a broad term to describe the accessing of information, products and services on "e-health" sites
41	2003	Strengthening Support for Women with Breast Cancer (G)	The use of information and communication technology (ICT) to enhance health care.
42	2003	Vigneault (G)	The development and evolution of technical tools to support program delivery
43	2003	Policy on ICT Security (G)	Using the Internet and other electronic channels to access and delivery health and lifestyle information and services
44	2003	Health systems group (G)	eHealth is health promotion delivered and managed over the Internet
45	2003	Marcus and Fabius (G)	Ehealth is connectivity
46	2003	Silber (G)	eHealth is the application of information and communications technologies (ICT) across the whole range of functions that affect health.
47	2003	Ehealth Technologies (G)	The use of emerging information and communication technology, especially the Internet, to improve or enable health and healthcare thereby enabling stronger and more effective connections among patients, doctors, hospitals, payors, laboratories, pharmacies, and suppliers
48	2003	International Telecommunication Union (G)	Encompasses all of the information and communication technologies (ICT) necessary to make the health system work
49	2003	Baker] Modified from Gott (1993)	The promotion and facilitation of health and well-being with individuals and families and the enhancement of professional

	Year	Source (M = Medline, W = Wilson Business Abstracts, G = Google)	Definition
		(G)	practice by the use of information and communication technology
50	2004	Sternberg (M)	New business models using technology to assist healthcare providers in caring for patients and providing services.
51	2004	Watson (M)	The integration of the internet into health care.

Appendix 2: e-Readiness rankings

2008	2007	Country
1	2	United States
2	4	Hong Kong
3	2	Sweden
4	9	Australia
5	1	Denmark
6	6	Singapore
7	8	Netherlands
8	7	United Kingdom
9	5	Switzerland
10	11	Austria
11	12	Norway
12	13	Canada
13	10	Finland
14	19	Germany
15	16	South Korea
16	14	New Zealand
17	15	Bermuda
18	18	Japan
19	17	Taiwan
20	20	Belgium
21	21	Ireland
22	22	France
23	24	Malta
24	23	Israel
25	25	Italy
26	26	Spain

2008	2007	Country
27	27	Portugal
28	28	Estonia
29	29	Slovenia
30	32	Greece
31	31	Czech Republic
32	30	Chile
33	34	Hungary
34	36	**Malaysia**
35	33	**United Arab Emirates**
36	39	Slovakia
37	37	Latvia
38	41	Lithuania
39	35	South Africa
40	38	**Mexico**
41	40	Poland
42	43	Brazil
43	42	Turkey
44	**44**	**Argentina**
45	45	Romania
46	46	**Saudi Arabia**
47	49	Thailand
48	48	Bulgaria
49	46	Jamaica
50	--	Trinidad & Tobago*
51	51	Peru
52	50	Venezuela
53	52	**Jordan**
54	54	India

2008	2007	Country
55	54	Philippines
56	56	China
57	58	Egypt
58	53	Colombia
59	57	Russia
60	61	**Sri Lanka**
61	60	Ukraine
62	62	Nigeria
63	59	Ecuador
64	63	**Pakistan**
65	65	Vietnam
66	64	**Kazakhstan**
67	66	Algeria
68	67	Indonesia
69	68	**Azerbaijan**
70	69	Iran

* New to the annual rankings in 2008. Source: Economist Intelligence Unit, 2008

Appendix 3: Medical Professionals per Capita

Country	Physicians		Nurses		Midwives		Total expenditure on health	General government expenditure on health
	Number	Density per 1000	Number	Density per 1000	Number	Density per 1000	as % of GDP	as % of healthcare
Bhutan	118	0.05	330	0.14	185	0.08	3.1	83.5
Kazakhstan	12902	2.51	31557	6.14	8018	0.52	3.5	57.3
Malaysia	16146	0.7	31129	1.35	7711	0.34	3.8	58.2
Mexico	195897	1.98	88678	0.9		na	6.2	46.4
Pakistan	116298	0.74	71764	0.46		na	2.4	27.7
Saudi Arabia	34261	1.37	74114	2.97		na	4.0	75.9
Sri Lanka	10479	0.55	30318	1.58	3113	0.16	3.5	45
Togo	225	0.04	2141	0.43	19	0.19	5.6	24.8
Uganda	2209	0.08	16221	0.61	3104	0.12	7.3	30.4
Mongolia	NA	NA	NA	NA	NA	NA	NA	NA
SOURCE: The World Health Report 2006 annex table 2								

Appendix 4: Interviewer- based Questionnaire - Exploratory Research

Welcome. Please read the following description:

As a potential user, could you please take a moment to answer the following brief, confidential survey? It should only take you about 10-15 minutes and your input will be greatly appreciated. Please complete all items by making a check in the box next to the answer that is most appropriate or by recording your answer in the space provided. Thank you.

Before answering this questionnaire, please read a short introduction on eHealth.

What is eHealth?

eHealth is a recent term for healthcare practice which is supported by electronic processes and communication. eHealth is an emerging field in public health and business referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.

The term can encompass a range of services that are at the edge of medicine/healthcare and information technology:

- **Electronic Medical Records**: enable easy communication of patient data between different healthcare professionals (GPs, specialists, care team, pharmacy)
- **Telemedicine**: includes all types of physical and psychological measurements that do not require a patient to travel to a specialist. When this service works, patients need to travel less to a specialist or conversely the specialist has a larger catchment area.
- **Evidence Based Medicine**: entails a system that provides information on appropriate treatment under certain patient conditions. A healthcare professional can look up whether

his/her diagnosis is in line with scientific research. The advantage is that the data can be kept up-to-date.

- **Consumer Health Informatics** (or citizen-oriented information provision): both healthy individuals and patients want to be informed on medical topics.
- **Health knowledge management** (or specialist-oriented information provision): *e.g.* in an overview of latest medical journals, best practice guidelines or epidemiological tracking.
- **Virtual healthcare teams**: consist of healthcare professionals who collaborate and share information on patients through digital equipment.

eHealth describes the application of information and communications technologies across the whole range of functions that affect the health sector, from the doctor to the hospital manager, via nurses, data processing specialists, administrators and of course the patients.

eHealth allows physicians and health care specialists to diagnose and treat patients through electronic means over distances – whether that span is across a street, a city, a region or an ocean. eHealth can prevent uncomfortable delays, high travel expenses and family separation by bringing specialized medical care directly to the people who need it. It is being practiced in rural areas, school districts, home-health settings, nursing homes, cruise ships, and on NASA space missions...."

It is important to mention that at its fifty-eighth Session in May 2005, the World Health Assembly officially recognized eHealth and adopted **Resolution WHA 58.28** establishing eHealth Strategy for the World Health Organization and "…stressing that **eHealth is the cost-effective and secure use of information and communication technologies in support of health and health-related fields…"**

ICT (Information and Communication Technology) can build the know-do bridge by removing distance and time barriers to the flow of information and knowledge for health, and providing just-in-time, high quality, relevant information to health professionals. The ability of eHealth/telemedicine to facilitate health-care irrespective of distance and availability of on-site personnel makes it attractive to developing countries.

1. Please identify the one that best describes you:

    (1) _____ Nurse

    (2) ____ Doctor

    (1) _____ Head of Public Health Clinic

    (2) _____ Head of Private Health Clinic

    (3) _____ Other. Please specify_____

2. Have you heard of eHealth prior to this survey?

    (1) _____Yes

    (2) _____No

    (3) _____Not sure

3. Where have you heard about eHealth?

    (1)_____ during medical training

    (2)_____ continuous medical education

    (3)_____ medical journals

    (4)_____ newspaper

    (5)_____ TV

    (6)_____ conferences/seminars

    (7)_____ from colleagues

    (8) _____ Other (please specify)_____

4. In general, how do you think doctors and health care practitioners would like to hear about eHealth?

    (1) _____ Medical University/college

    (2) _____ Continuous medical training

    (3) _____ E-mail

    (4) _____ Postal mail

    (5) _____ Advertisement on TV

(6) _____ Advertisement in medical journals

(7) _____ Advertisement in general news magazines

(8) _____Advertisement in newspaper

(9) _____Medical conferences/seminars

(10)_____   other   (*please*   *specify)*

_____

5.   What is your own opinion about eHealth services for developing countries?

       (1) _____ useful in general

       (2) _____ useful for your hospital/healthcare organization

       (3) _____ useful for your medical practice

       (4) _____ not useful

       (5) _____ no opinion

6.   According to your opinion, what would be necessary to do in order to introduce eHealth services in medical practice?

       (1) _____ goodwill of health administration

       (2) _____ more information on successful eHealth projects

       (3) _____ training

       (4) _____ financial support

       (5) _____   Others   (please specify)_____

_____

7.   What would motivate you to use eHealth based on the description on the top of the survey?

You can check more than one response.

       (1) _____Self education

       (2) _____Better Diagnosis

       (3) _____Better Treatments

       (4) _____Improved longevity rates

(5) _____Quicker diagnosis

(6) _____More Accurate diagnosis

(7) _____More accurate treatments

(8) _____I don't know

(9) Other *(list here)* _____

8.   How many patients do you treat on a daily basis?

(4) _____ 1-5

(5) _____ 6-10

(6) _____ 11-15

(7) _____ 16-20

(8) _____ more than 20

9.   What are your patients' most common illnesses?

(1)_____Malaria

(2)_____Tuberculosis

(3)_____AIDS

(4)_____Diarrhoea

(5)_____ Heart

(6)____ Skin disorders

(7)_____ Cancer

(8)_____ Other, please specify_____

10.   Could you use more expertise advice in your diagnosis?

(1)_____ Yes

(2)_____ No

11. If yes, thinking of all your diagnoses issues, what are the two things that you most want to know more about?

Number One: *(Please fill in.)* _____

Number Two: *(Please fill in.)* _____

12.   How prepared are you for diagnosis?

(1) _____Totally prepared

(2) _____Quite well prepared

(3) _____Pretty well prepared

(4) _____Only slightly prepared

(5) _____Not really prepared at all

(6) _____Not sure

13.   How prepared are you for treatments?

(1) ____ Totally prepared

(2) _____Quite well prepared

(3) _____Pretty well prepared

(4) _____Only slightly prepared

(5) _____Not really prepared at all

14.   Do you have access to the Internet?

(1)_____ Yes

(2)_____ No

(3)_____ In the near future

15.   Have you used an on-line database for initial diagnosis?

(1) _____ Yes

(2) _____ No

(3) _____ Not sure

Comments: (Which database did you buy?) _____

16. Where would you go to get additional expert advice? *(Check and complete all appropriate answers)*

(1) _____Other doctors (please list which one)_____

(2) _____Medical books: (please list favorite book)_____

(3) _____Internet   site   (please   list   top   site)

_____

(4) _____Library

(5) _____Other (please specify) _____

17. Of the sources listed above (doctors, medical books, internet site, library), which is the one you would be *most likely* to go to for medical information?

    _____

18. Why? _____

19. Whose recommendation (s) is (are) important to you in buying an eHealth service?

    (1) _____Doctor

    (2) ____ Clinic

    (3) _____Famous medical experts

    (4) _____Businessman

    (5) _____Politician

    (6) _____Government

    (7) _____Spouse / Partner

    (8) _____Family Member, such as mother or father

(9) _____Friend

(10) ____Other (*please specify*): _____

20. If you were going to introduce an eHealth service, which of following aspects would be important to you?

	(1) Extremely Important	(2) Important	(3) Somewhat Important	(4) Not	(5) No Important
Comment					
20.1) More accurate Diagnosis	(1) ☐	(2) ☐	(3) ☐	(4) ☐	(5) ☐
20.2) Better treatment solutions	(1) ☐	(2) ☐	(3) ☐	(4) ☐	(5) ☐

20.3) How to build good patient relationships

(1) ☐   (2) ☐   (3) ☐   (4) ☐   (5) ☐

20.4) Strong patient satisfaction   (1) ☐   (2) ☐   (3) ☐   (4)   ☐

       (5) ☐

20.5) Strong personal satisfaction   (1) ☐   (2) ☐   (3) ☐   (4) ☐   (5) ☐

20.6) Ability to treat more patients   (1) ☐   (2) ☐   (3) ☐   (4) ☐   (5) ☐

20.7) Ability to save more lives   (1) ☐   (2) ☐   (3) ☐   (4)   ☐

       (5) ☐

Additional Comments: _____

21.   Are there any enhancements that you would need in your introduction of eHealth services that we've not mentioned?

22.   If an eHealth service was available for sale addressing the aspects you are most interested in, how likely is it that you would buy this eHealth service?

(1) _____Extremely Likely

(2) _____Likely

(3) _____Somewhat Likely

(4) _____Not Likely At All

(5) _____ Not sure

23.   Please rank from your point of view, the following uses of ehealth in order of importance (1 =lowest, 4=highest)

       (1)_____diagnosis

       (2)_____treatment

(3)_____education

       (4)_____All of the above

24. Please rank from your point of view, the following areas of ehealth in order of importance

(1 =lowest, 4=highest)

      (1) _____Heart

      (2) _____Skin

      (3) _____Cancer

      (4) _____Diabetes

25.   Please tell us something about you. How long have you been in health care?

(1) _____ Under 5 years

(2) _____ 6-10 years

(3) _____ 11-25 years

(4) _____ more than 25 years

26.   Where do you live?

(1) _____Within the City (*please state which city here*) _____

(2) _____In   the   countryside   *(please   identify   your   village)*

    _____

27.   What is your occupation?

(1) _____ Doctor

(2) _____ Radiologist

(3) _____ Head of Clinic

(4) _____ Other, please specify_____

28.   Identify your highest educational level completed:

(1) _____ Some college or associate's degree

(2) _____ Bachelor's degree

(3) _____ Master's degree

(4) _____ Doctorate degree

(5) _____ Other (please specify): _____

29. *Additional Comments:*_____

Thank you so much for your help! Should you have any additional comments, you may address them directly to patrice.nuq@bluemail.ch.

Appendix 5: Quantitative Pre-test or Pilot Study Questionnaire

Welcome. Please read the following description:

eHealth: "e-health is a new term used to describe the combined use of electronic communication and information technology in the health sector" OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance.

The purpose of this questionnaire is to help us speed up the introduction of eHealth services.

Thank you for taking the time to respond.

Questionnaire on eHealth services

1. Have you heard of eHealth?   □Yes □No

If yes,

2. Have you seen demonstrations of eHealth?   □Yes □No

3. Have you already tried to use eHealth? □   □Yes □No

4. Did you follow training sessions on eHealth?   □Yes □No

5.

Please rate the degree to which you agree with the following statements				
	Strongly disagree	Disagre	Neither agree /nor disagree	Agree	Strongly agree
6. I would find eHealth useful in my job. □1	□2	□3	□4	□5

7. Using eHealth would enable me to accomplish tasks more quickly.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
8. Using eHealth would decrease my productivity.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
9. If I would use eHealth, I would increase my chances of earning more money.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
10. If I would use eHealth, I would diagnose patients more accurately.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
11. If I would use eHealth I would provide treatments more accurately.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
12. I would find eHealth easy to use.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
13. It would be difficult for me to become skillful at using eHealth.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
14. Learning to use eHealth would be easy for me.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
15. Using eHealth is a bad idea.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
16. eHealth would make work more interesting.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
17. Working with eHealth would be fun.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
18. I would not like working with eHealth.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$

19. People who are important to me think that I should use eHealth.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
20. Senior management's opinion would be helpful in the use of eHealth.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
21. In general, the organization would support the use of eHealth.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
22. I would not have the resources necessary to use eHealth.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
23. I would have the knowledge necessary to use eHealth.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
24. A specific person (or group) would not be available for assistance with eHealth system difficulties.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
25. I could complete a job or task using eHealth: If there was no one around to tell me what to do as I go.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
26. I could complete a job or task using eHealth: If I could call someone for help if I got stuck.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$
27. Awareness of the government's eHealth strategic implementation plan is not important for eHealth use.	$\Box_1$ $\Box_2$	$\Box_3$	$\Box_4$	$\Box_5$

28. I would use eHealth if I perceived a positive government eHealth policy.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
29. I would use eHealth if government gave financial incentives to use eHealth.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
30. I would use eHealth if government gave access to Internet.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
31. I would use eHealth if I perceived government health officials as using eHealth.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
31. Introduction to eHealth within my University medical education would make it easier to use eHealth in practice.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
32. Learning the benefits of eHealth within my University medical education would give me a positive attitude towards eHealth.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
33. I would use eHealth if I received training within my University medical education.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$

34.I would not use eHealth if I received continuous training after Medical University.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
35.Using eHealth would make me feel more competent.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
36.Using eHealth would give me more knowledge in international medical experience.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
37.It is important to have local volunteers amongst medical staff using eHealth.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
38.I would try eHealth if I see others using it positively.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
39.Having successful local eHealth pilot projects is not important to me.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$
40.eHealth would provide more accurate diagnosis through consultation at a distance with other medical staff.	$\square_1$ $\square_2$	$\square_3$	$\square_4$	$\square_5$

41.In your opinion, what would be the main obstacle to widespread use of eHealth? ☐Lack of Government Policy ☐Lack of financial support ☐Lack of infrastructure including Internet access ☐ Lack of Training ☐ Lack of information on successful eHealth implementations

Other (please specify)_____

ABOUT YOU

2.1 What is your current professional role?

☐Doctor-General Practice ☐ Nurse

☐Doctor-Specialist ☐Hospital Administrator

☐Hospital, Information Technology staff

☐ Other_____

2.2 How would you describe your current place of work.

☐Hospital ☐Private Practice

☐Medical Clinic/Center ☐Health Department/government service

☐Medical University

☐Private Clinic/ Hospital ☐Other, please specify_____

2.3a How would you describe your current working environment?

☐Rural ☐Urban Other_____

2.3b Name of your location/Country _____

Name of Hospital/ Clinic_____

Your current position_____

2.4	**Gender**: Male	☐	Female	☐

2.5	**Age**:	Aged under 25	☐	Between 45-54	☐
		Between 25-34	☐	Between 55-64	☐
		Between 35-44	☐	Aged 65 and over	☐

2.6 What is the highest level of education that you have achieved?

High school, general / professional	☐	Post-graduate / PhD	☐
Graduation from university	☐	Professional (please state)	☐

2.7 This survey has been about eHealth and how its use can be encouraged. Do you have further comments to make on this subject?
_____

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

245

Appendix 6: Questionnaire - Final Quantitative Study

The purpose of this survey is to understand medical professionals' attitudes towards technology in healthcare, in particular "ehealth". This survey is part of a research study undertaken by the International University in Geneva, Grenoble Graduate School of Business in France and Newcastle University in the United Kingdom.

All information will be treated confidentially.

Thank you very much for your time for answering the questions.

The following is information about eHealth if you are unfamiliar with this subject:

eHealth Information Sheet

eHealth is an integrated system of health care delivery that employs information and telecommunications technology as a substitute for face to face contact between medical staff and patient. It includes many applications such as telemedicine, electronic medical records, medical consultation at a distance, medical consultation between rural medical centres and urban hospitals, etc. e-Health provides transmission, storage and retrieval of medical information in the digital form between doctors, nurses, other medical staff and patients for clinical, educational and administrative purposes, both at the local site (your workplace) and at a distance (remote workplaces).

Telemedicine (eHealth at a distance) is a rapidly developing application of clinical medicine where medical information is transferred via telephone, the internet or other networks for the purpose of consulting and medical examinations. Telemedicine may be simple as two health professionals discussing a case over the telephone, or as complex as using satellite technology and video-conferencing equipment to conduct a real-time consultation between medical specialists in two different countries.

Teledicine Network Generic Structure
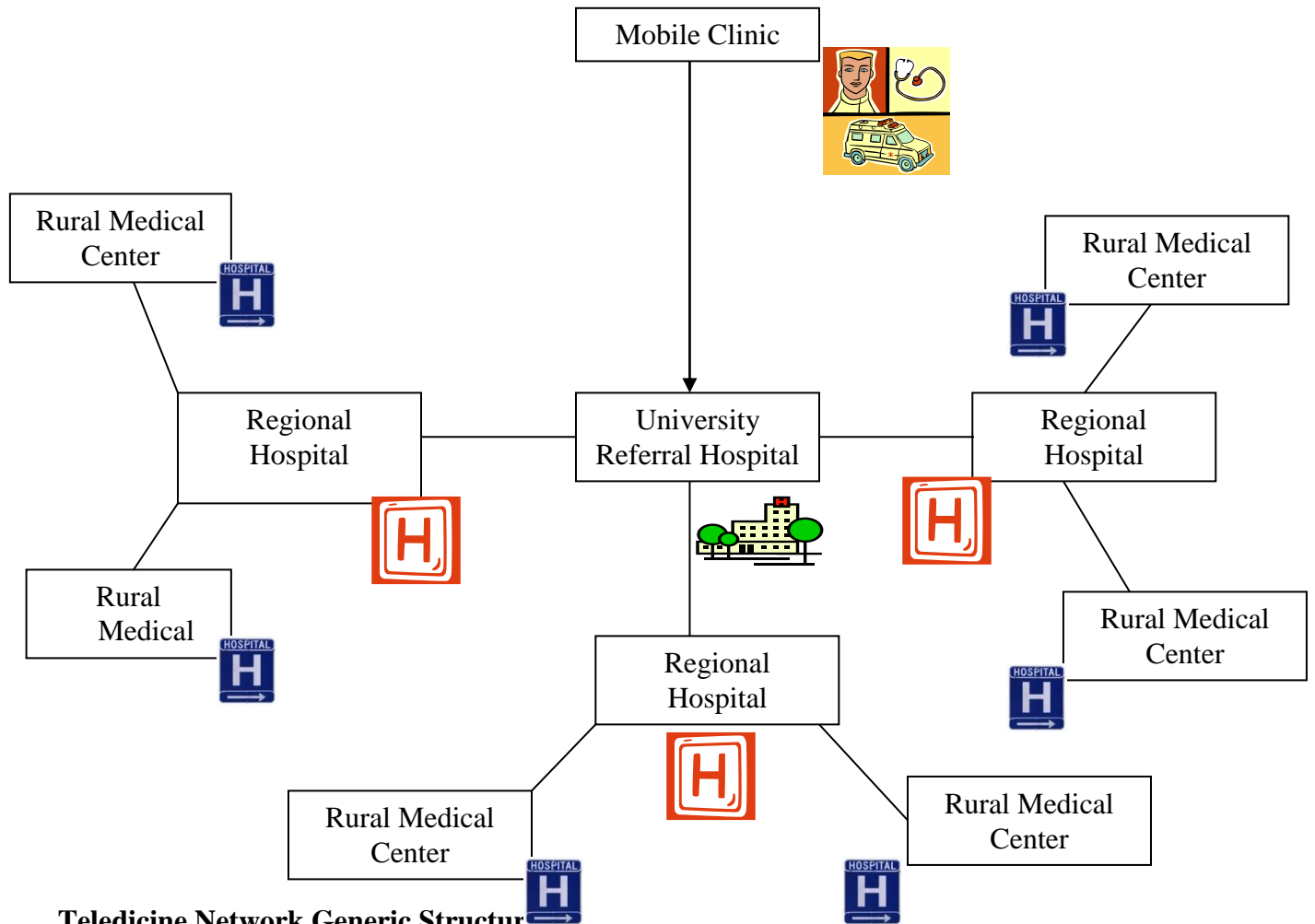
Questionnaire on eHealth services

Welcome to a survey on eHealth services. Thank you for taking the time to respond.

1. Have you heard of eHealth before reading the above description? ☐ Yes ☐ No

If yes,

2. Have you seen demonstrations of eHealth? ☐ Yes ☐ No

3. Have you already tried to use eHealth? ☐ ☐ Yes ☐ No

4. Did you follow training sessions on eHealth? ☐ Yes ☐ No

5. Are there any implementation plans of eHealth services in your organization?

☐Yes ☐No

6. Where did you obtain your information about eHealth?
   a. Medical University/College/Medical School ☐Yes ☐No
   b. Continuous medical education courses   ☐Yes ☐No
   c. Conferences/seminars   ☐Yes ☐No
   d. Medical Journals   ☐Yes ☐No
   e. Media/TV/Newspaper   ☐Yes ☐No
   f. Colleagues   ☐Yes ☐No

Please rate the degree to which you agree with the following statements

	Strongly disagree	Disagree	Neither agree /nor disagree	Agree	Strongly agree
7. I would find eHealth useful in my job.	☐1	☐2	☐3	☐4	☐5
8. Using eHealth would decrease my productivity, serving less patients.	☐1	☐2	☐3	☐4	☐5
9. If I would use eHealth, I would increase my chances of earning more money.	☐1	☐2	☐3	☐4	☐5
10. I would use eHealth because I can consult patients from rural and remote areas at a distance.	☐1	☐2	☐3	☐4	☐5

	Strongly disagr	Disagree	Neither agree /nor	Agree	Strongly agree

	ee		disagre e		

11. eHealth would provide diagnoses and treatments more accurately through consultation at a distance with other medical staff. ☐1 ☐2 ☐3 ☐4 ☐5

Please answer the following questions regarding usage:

12. Learning to use eHealth would be easy for me. ☐1 ☐2 ☐3 ☐4 ☐5

13. It would be difficult for me to become skillful at using eHealth without proper training. ☐1 ☐2 ☐3 ☐4 ☐5

14. I would use eHealth if telemedicine infrastructure/equipment/workstation would be user-friendly. ☐1 ☐2 ☐3 ☐4 ☐5

15. Urban health institutions have adequate access to phone services, whether fixed or mobile phone service. ☐1 ☐2 ☐3 ☐4 ☐5

16. Rural health institutions have adequate access to phone services, whether fixed or mobile phone service. ☐1 ☐2 ☐3 ☐4 ☐5

17. Policies focusing on security, privacy, and confidentiality of data would be necessary for eHealth services. ☐1 ☐2 ☐3 ☐4 ☐5

18. Policies focusing on security, privacy, and confidentiality of health data would be necessary for eHealth ☐1 ☐2 ☐3 ☐4 ☐5

services.

	Strongly disagree	Disagree	Neither agree /nor disagree	Agree	Strongly agree
19. Urban health institutions have adequate access to internet services.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
20. Rural health institutions have adequate access to internet services.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
21. Using eHealth is a bad idea.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$

	Strongly disagree	Disagree	Neither agree /nor disagree	Agree	Strongly agree
22. My general opinion of eHealth is favourable.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
23. Doctors and medical staff perceive telemedicine as an additional burden since they are overworked and stressed.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
24. Medical experts who are important to me think that I should use eHealth.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$
25. Senior management's opinion would be helpful in the use of eHealth.	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$

26. It is important to have local volunteers amongst medical staff using eHealth. □₁ □₂ □₃ □₄ □₅

27. I would not try eHealth if I see other medical staff using it positively. □₁ □₂ □₃ □₄ □₅

28. Having successful local eHealth pilot projects is important to me. □₁ □₂ □₃ □₄ □₅

Please answer the following questions regarding support:

29. In general, your organization would support the use of eHealth. □₁ □₂ □₃ □₄ □₅

30. I would not have the resources necessary to use eHealth. □₁ □₂ □₃ □₄ □₅

31. I would have the knowledge necessary to use eHealth. □₁ □₂ □₃ □₄ □₅

	Strongly disagree	Disagree	Neither agree /nor disagree	Agree	Strongly agree
32. Technical support would not be available for assistance with eHealth system difficulties.	□₁	□₂	□₃	□₄	□₅

33. If there is no one around to assist me in patient diagnostics and treatment, I could complete my task using eHealth. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

34. Awareness of the government's eHealth strategic implementation plan is not important for eHealth use. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

35. I would use eHealth if I perceived a positive government eHealth policy. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

36. I would use eHealth if government provided financial incentives to use eHealth. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

37. I would use eHealth if government/administration installed the necessary Information and Technology infrastructure. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

Please answer the following questions regarding medical education:

38. Introduction to eHealth within my medical education (University/College/Nursing school, Continuous Medical Education (CME) etc.), would make it easier to use eHealth in practice. $\square_1$ $\square_2$ $\square_3$ $\square_4$ $\square_5$

	Strongly disagree	Disagree	Neither agree /nor disagree	Agree	Strongly agree
39. Learning the benefits of eHealth within my medical education (University/College/Nursing school, CME, etc.) would give me a positive attitude towards eHealth.	☐1	☐2	☐3	☐4	☐5
40. I would use eHealth in practice if I received training within my medical education (University/college/Nursing school, CME, etc.).	☐1	☐2	☐3	☐4	☐5
41. I would use eHealth if I received continuous training in eHealth after Medical University/college/Nursing school, CME, etc.	☐1	☐2	☐3	☐4	☐5
42. Using eHealth would give me more prestige over those who do not use it.	☐1	☐2	☐3	☐4	☐5
43. Using eHealth would make me feel less competent.	☐1	☐2	☐3	☐4	☐5
44. Using eHealth would give me more knowledge in international medical experience.	☐1	☐2	☐3	☐4	☐5

	Strongly disagree	Disagree	Neither agree/nor disagree	Agree	Strongly agree
45. Overall, I am favourably disposed to eHealth.	☐1	☐2	☐3	☐4	☐5
46. I am willing to use eHealth.	☐1	☐2	☐3	☐4	☐5
47. Lack of Government Policy would be the main obstacle to widespread use of eHealth.	☐1	☐2	☐3	☐4	☐5
48. Lack of financial support would be the main obstacle to widespread use of eHealth.	☐1	☐2	☐3	☐4	☐5
49. Lack of information and telecommunication infrastructure including Internet access would be the main obstacle to widespread use of eHealth.	☐1	☐2	☐3	☐4	☐5
50. Lack of Training would be the main obstacle to widespread use of eHealth.	☐1	☐2	☐3	☐4	☐5

51. Lack of information on successful eHealth implementations would be the main obstacle to widespread use of eHealth.	☐1	☐2	☐3	☐4	☐5

ABOUT YOU

2.1   What is your current professional role?

☐ **Doctor-General Practice**   ☐ **Nurse**

☐ **Doctor-Specialist**   ☐ **Hospital Administrator**

☐ **Healthcare Organization, Information Technology staff**

☐ **Other**_____

2.2   How would you describe your current place of work.

☐ **Hospital**   ☐ **Private Practice**

☐ **Medical Clinic/Center**   ☐ **Health Department/government service**

☐ **Medical University/College**   ☐ **Private Clinic/ Hospital**

☐ **Other, please specify**_____

2.3a   How would you describe your current working environment?

☐ **Rural**   ☐ **Urban**   **Other**_____

2.3b   Name of your location/Country _____

Name   of   Hospital/Clinic/Healthcare   _____
Organization_____

Your current position_____

2.4   Gender: Male   ☐   Female   ☐

2.5	**Age**:	Aged under 25	☐	Between 45-54	☐
		Between 25-34	☐	Between 55-64	☐
		Between 35-44	☐	Aged 65 and over	☐

2.6 What is the highest level of education that you have achieved?

High school, general / professional ☐ Post-graduate / PhD ☐

Graduation from university ☐ Professional (please ☐

state)_____

2.7 Do you have further comments to make on this subject?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix 7: Medical Establishments in Quantitative Study

The sites for this study were medical hospitals and medical universities in both urban and rural settings.

Country	Institution
Argentina	Hospital Ramos Mejia in Buenos Aires, Clinica Olivos in Buenos Aires, Hospital Fernàndez in Buenos Aires, Instituto C Milstein, and the FLENI center in Buenos Aires.
Malaysia	Hospital Kuala Lumpur; Hospital Besar, Kuala Lumpur Intan Home, Penang, University Putra Malaysia in Kuala Lumpur Perak Medical Center, Ipoh, Perak; Konta Medical Center, Perak, BP Diagnostic Centre, Perak Hospital Raja Permaisuri Bainun Hospital, Ipoh, Perak Teluk Intan Hospital, Jalan Changkat Jong, Perak and the Serday Hospital
Saudi Arabia	Clinic in Jeddah, Al-Salam International Hospital in Jeddah, Bakhsh Hospital, Jeddah, King Abdulaziz Hospital & Oncology Centre (Ministry of Health), King Fahad Hospital (Ministry of Health), Harasami Clinic in Jeddah, King Khaled National Guard Hospital, Nakheed Center in Jeddah, Jeddah International Medical Center, First Clinic, Eyes of Dhban Clinic, Dhban
Kazakhstan	Urban Clinic and the Special Center for Pregnant Women in Astana
Sri Lanka	Government Hospitals in Wellawa, in Polgahawela, in Haloluwa, and in Kuliyapitiya

	General Hospitals of Kandy, Ragama, and Kurunegala. Also, data were collected at the teaching hospitals in Kandy, Colombo, Kurunegala, Ragana, Kalubouila, and Peradeniya as well as a specialized children's hospital in Sirimao Bandaranayake
Mongolia	Clinical Center of Songion Khairkhan District, Ulaanbaatar, Health Centre of Songinokhairkhan District in Ulaanbaatar, Maternity and Infant Medical Research Center in Ulaanbaatar, Hospital #1 and Hospital #2 in Ulaanbaatar.

Appendix 8: Case Studies: Jordan and Azerbaijan

Telecommunication

Development Sector

Regional ITU Meeting on e-Health

Tokyo, Japan, 10-11 March 2011

SOURCE	Rapporteur of ITU-D Study Group 2, Question 14
TITLE	How medical staff in developing countries are aware of e-Health technology and applications. Case studies for Jordan and Azerbaijan

Abstract:

Despite Governments', International Organizations', and many companies' growing interest in e-Health Services, research in developing countries remains relatively scarce. This paper aims to present two case studies from Jordan and Azerbaijan. These case studies will include the attitude of medical professionals and the role of the government sector in e-Health acceptance.

Based on a survey developed by the research team within the International University in Geneva, the collection of primary data related to the opinion of medical staff about the role of information technology in healthcare is evaluated. It is important to note that the opinion of medical staff about e-Health technology also influences the selection of e-Health services.

1. Introduction

Despite the growing interest in e-Health Services of Governments, International Organizations, and many companies, the research in this field in developing countries remains relatively scarce. The introduction of Information and Communication Technology (ICT) within healthcare is known as e-Health. The important role of e-Health was officially recognized by the World Health Organization in its Resolution on e-Health approved by the Fifty-eighth World Health Assembly in May 2005. This Resolution stated that "e-Health is the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research." e-Health has the potential to extend medical care efficiently to nearly 40% of the population of the developing world, where healthcare is almost non-existent.

This paper aims to present some results of two case studies in Jordan and Azerbaijan dealing with the collection attitudes and opinions with regard to e-Health acceptance of medical staff. It was based on a survey developed by the research team within the International University in Geneva. The questionnaire consisted of 50 questions in six sections.

1. The first section has 6 questions asking whether the person has heard about e-Health and if so, from which sources.

2. The second section of the survey has 5 questions and indicates if the person is aware of the benefits of e-Health and whether he or she agrees with them.

3. The third section includes 16 questions about the usage of e-Health, asking the person if he or she would be able to use the telemedicine system, if there is a possibility and interest from their hospital administration to install a Health Management Information System (HMIS).

4. The fourth section addresses the topic of supporting e-Health, not only from the technical side of their hospital, but also concerning the person's personal opinion about whether or not he or she would support the implementation of e-Health at their workplace.

5. The fifth section is regarding the education of e-Health. It has questions that reveal if the person has had some education in e-Health and if he or she thinks it would be useful for their daily working environment.

6. The last section is about the personal data of the respondents.

Due to the limited size of this paper, only partial results of the study are presented.

2. Jordan

Jordan was one of the countries in the Arab world which recognized the importance and huge potential value of information technology applications in the healthcare sector. A group of doctors and telecommunication specialists, together with two hospitals in Amman, set up in 1997 a private company called Heartbeat Jordan. Today, the Government of Jordan is giving much needed attention to the improvement of healthcare services in order to benefit from innovative information and telecommunication technologies.

His Majesty King Abdullah II launched the National e-Health Programme "Hakeem" on the 27th of October, 2009 in Prince Hamzah Hospital. This Programme will bring a modern information technology system into Jordan's healthcare sector. Its main goal is to facilitate efficient and improved healthcare to patients through the delivery of high quality, immediate, accurate, and specialized healthcare throughout the country.

In Jordan, 72 questionnaires were distributed and 49 responses were obtained. Let us start with Question 10 and 11 as follows:

Question 10 (blue). "I would use e-Health because I can consult patients from rural and remote areas at a distance." We got 41 responses from a total of 49 who supported this statement. It means 84%. There was no one against this statement. The majority of medical staff agreed that e-Health can contribute to better treatment of patients from rural and remote areas.

Question 11(red). "e-Health would provide diagnoses and treatment more accurately through consultation at a distance with other medical staff." Only 6 from 49 answers agreed with this statement. It means 12%. 88% were neutral. It is important information for the development of a marketing strategy. The majority of medical staff was not sure that consultation at a distance will help them to make more accurate diagnoses. In this case, marketing has to use more evidence-based information to clearly show medical staff where and how the consultation at a distance is helpful and useful.
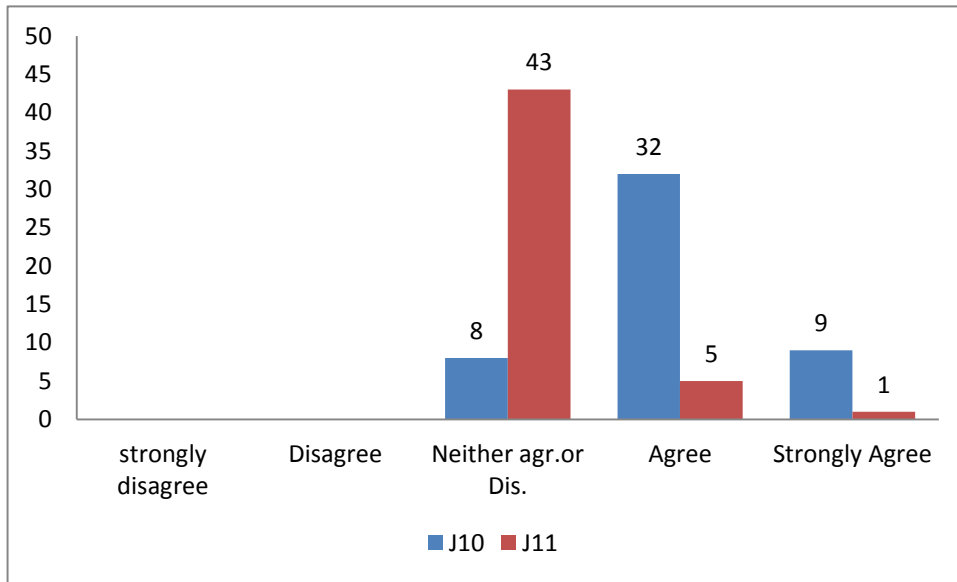
Question 23(blue). "Doctors and medical staff perceive telemedicine/e-Health as an additional burden since they are overworked and stressed."

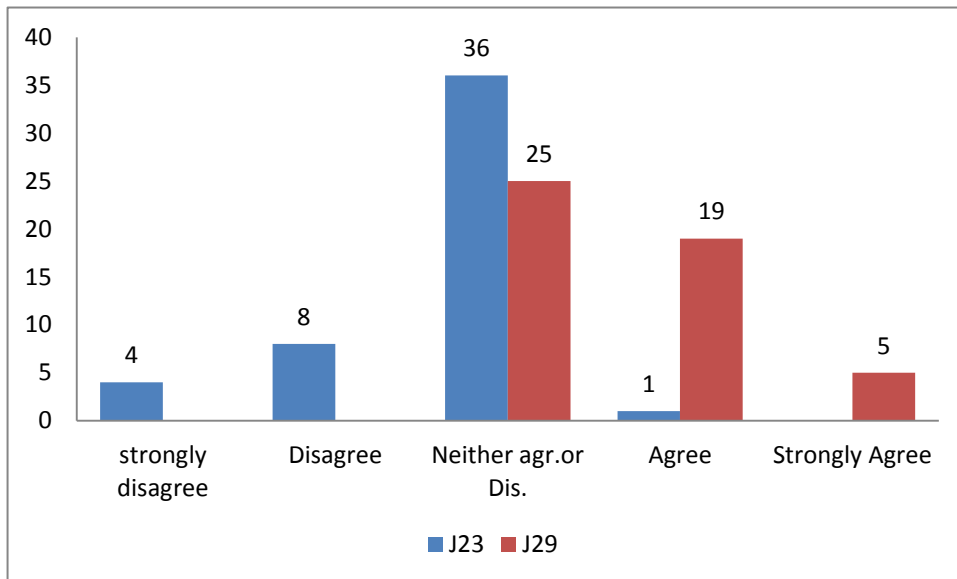*Question 29(red). "In general, your organization would support the use of e-Health."*

Fig. 2.

There is a common opinion that doctors would not accept e-Health because they are very busy and overloaded. Now, looking at the answers of Question 23, we can see that there is no one who agreed with this statement. The majority are neutral and even 25% disagreed with it. It means that medical staff will accept e-Health if they are convinced that it will be useful for their

practice. This study confirmed again that marketing has to include evidence- based information about the beneficial part of e-Health.

Question 38 (Fig.3,blue). "Introduction to e-Health within my medical education (University/College/Nursing school/Continuous Medical Education (CME), etc.) would make it easier to use e-Health in practice."

Question 40 (Fig.3,red). "I would use e-Health in practice if I received training within my medical education (University/College/Nursing school/Continuous Medical Education (CME)), etc."

It is not surprising to get strong support for education and training. Question 38 got 98%, and Question 40 got 94%. Future success for the introduction and acceptance of e-Health services depends very much on the education and training of medical staff in this field with practical demonstrations.

The Government of Jordan should include courses on e-Health technology in the medical curriculum. Some proposed useful courses are:

- Basic computer skills,

- e-Document flow introduction and development.

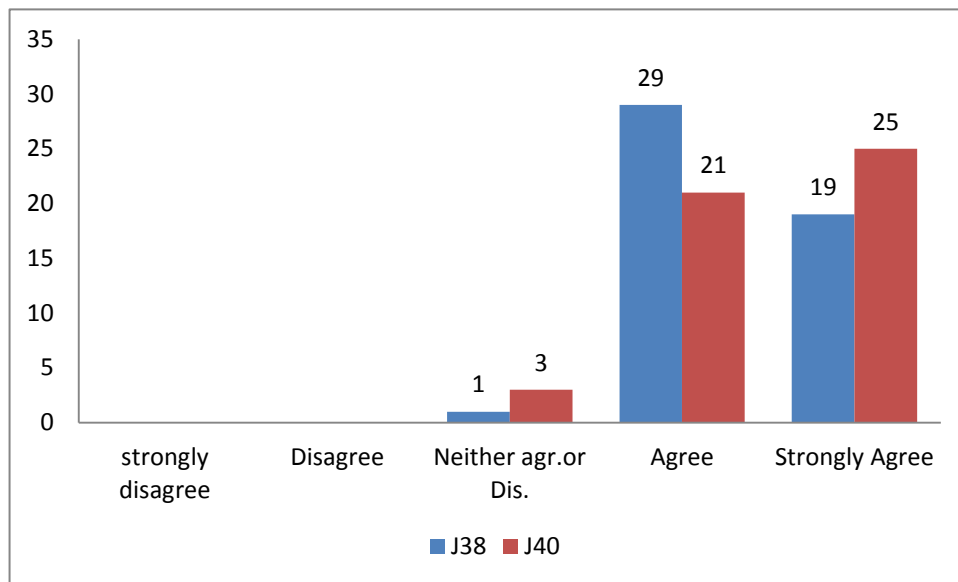- Information and communication technology in health care practice.

Fig. 3

As to the question, "Where are the main obstacles for the implementation of e-Health services?" The responses were as follows:

- Lack of Government Policy related to e-Health.

- Lack of financial resources for promotion, training and implementation.

- Lack of information on successful e-Health implementations in other countries and particularly, in Jordan.

3. Azerbaijan

In order to understand how aware or not aware the working personnel in Azerbaijan hospitals about e-Health and its benefits, the same questionnaire was used and 100 responses were obtained. Knowledge gained from the survey may assist policy-makers and healthcare leaders to increase the rate of e-Health adoption.

The majority of the people (95%) said they would find e-Health useful in their job; however, they are afraid that using e-Health could decrease their productivity by serving fewer patients, as they will need additional time for applying e-Health technology and innovative methods. The answers to two questions (23 and 29) are presented below.

Question 23. "Doctors and medical staff perceive telemedicine as an additional burden since they are overworked and stressed. 91% agreed with this statement."

Question 29. "In general, your organization would support the use of e-Health." It is interesting to know that in spite of some difficulties, the majority was in favor of e-Health and even 33% strongly supported e-Health.
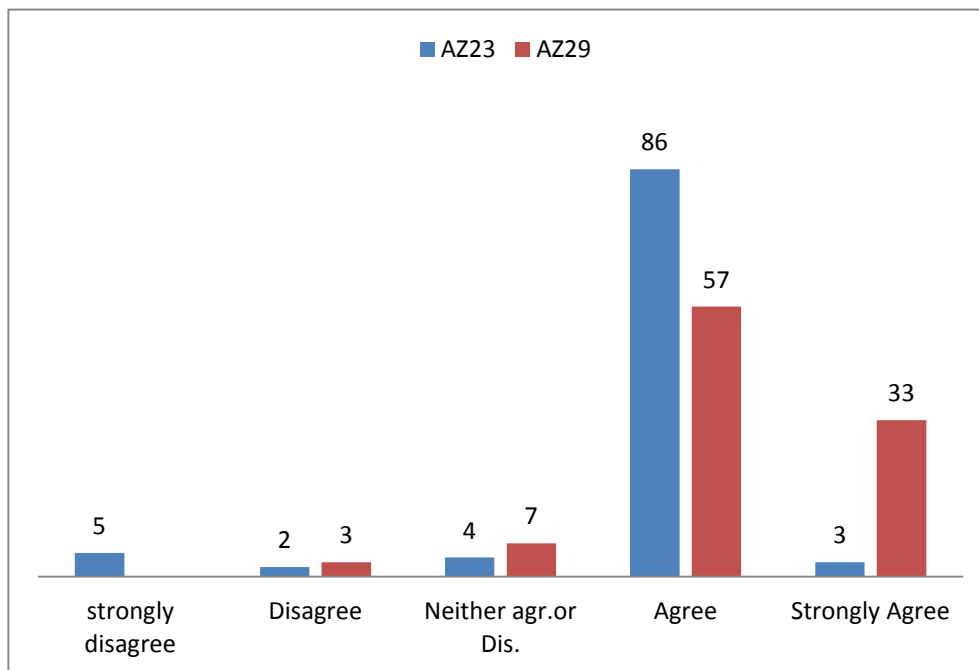

Fig. 4

85% agreed that if they would use e-Health, they would increase their chances of earning more money. They can consult patients from rural and remote areas at a distance. Also the majority agreed (85%) that e-Health would help to provide diagnoses and treatments more accurately through consultation at a distance with other more experienced medical staff.
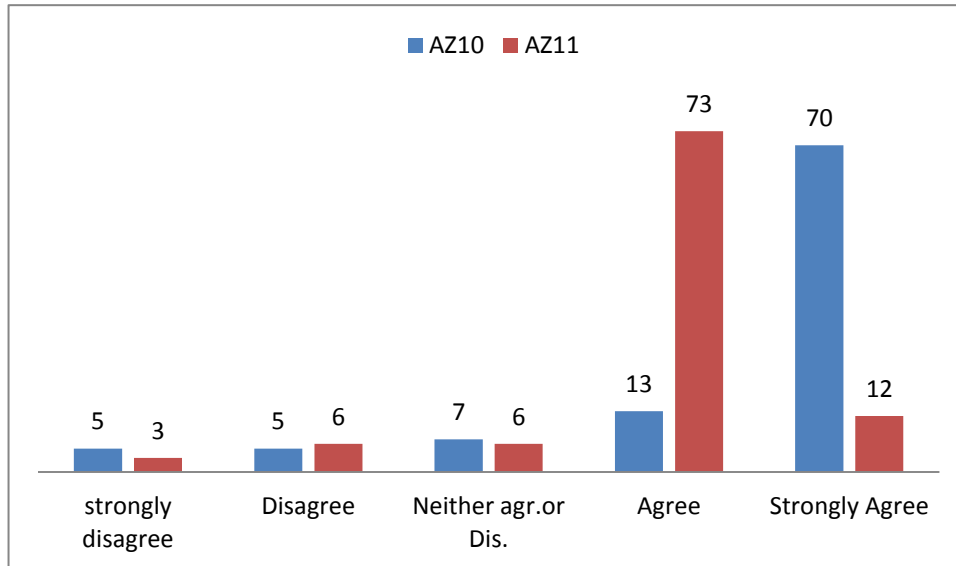

Fig. 5

Question 10. "I would use e-Health because I can consult patients from rural and remote areas at a distance."

Question 11. "e-Health would provide diagnoses and treatments more accurately through consultation at a distance with other medical staff."

Question 38. "Introduction to e-Health within my medical education (University/College/Nursing school/Continuous Medical Education (CME), etc,) would make it easier to use e-Health in practice."

Question 40. "I would use e-Health in practice if I received training within my medical education.
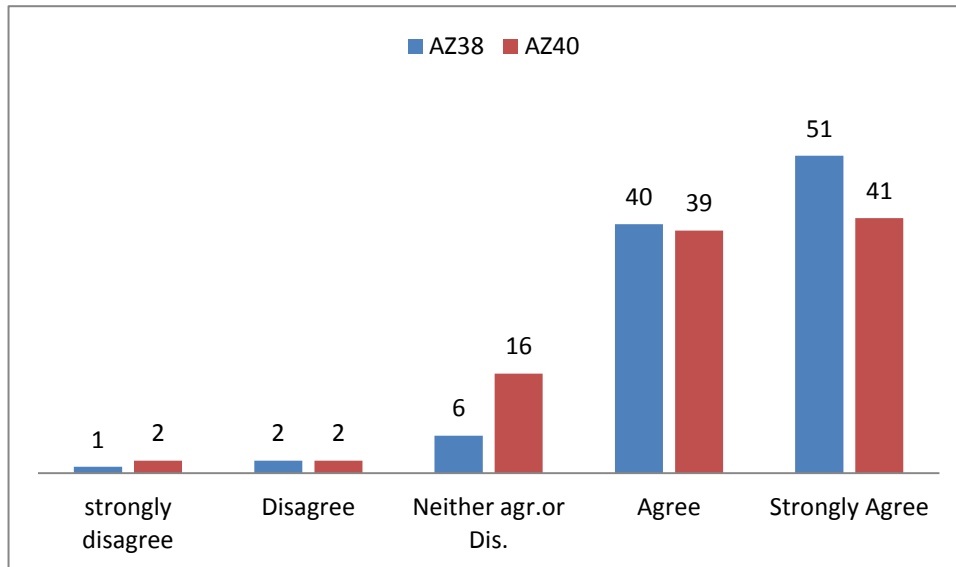
The answers are presented below."

Fig. 6

We obtained nearly the same answer on these two questions. 91 out of 100 people think that the introduction of e-Health within their medical education would make it easier to use e-Health in practice. 80% think they would use e-Health in practice if they received training within their medical education and 79% think they would use e-Health if they received continuous training in e-Health after graduating Medical University/College/and /or Nursing schools.

Based on the result of this survey, several recommendations for the preparation of a marketing strategy for e-Health in Jordan and Azerbaijan are developed as follows:

- Key role of the Government and the Ministry of Health (Questions 35, 36, 37, 47)

- Understanding of e-Health benefits for hospital administration (Questions 25, 37)

- Some medical staff have heard about e-Health, but they do not know many important details (Question 39). Medical staff are largely computer illiterate and they are reluctant to use e-Health solutions as they are perceived to require extra work (Question 23)

- Special attention has to be given to security, privacy, and confidentiality of patient' data (Question 17)

- Training and dissemination of information about best practice will play extremely important role (Questions 38, 39, 40, 41, 50), there is a shortage of medical staff experienced in e-Health

- Importance of e-Health' pilot projects (Questions 28, 51).

266

———————

Appendix 9: RESOLUTION 183 (Guadalajara, 2010)

Telecommunication/ICT applications for e-health

The Plenipotentiary Conference of the International Telecommunication Union (Guadalajara, 2010),

considering

a) the definition of e-health made by Resolution 58/28 of the World Health Assembly, Geneva 2005 as "... the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research";

b) that WTDC (Doha, 2006) recommended that ITU continue to study the potential of using telecommunications for e-health in order to meet the needs of developing countries;

c) Resolution 65 (Hyderabad, 2010), on improving access to healthcare services by using information and communication technologies (ICTs),

considering further

a) that WHO and ITU have a key role to promote stronger coordination among the key players in all technical areas of e-health standardization;

b) the need to provide effective, efficient and patient-safe clinical care using e-health ICTs;

c) that e-health applications and telecommunication/ICT applications supporting them are already extensive, but far from fully optimized and integrated;

d) the importance of maintaining momentum so that the potential advantages of telecommunication/ICT technologies in the healthcare sector are supported by appropriate regulatory, legal and policy frameworks in both the telecommunication and the health sectors,

recognizing

a) the ongoing work of ITU-D Study Group 2 through Question 14-3/2, on information and telecommunications for e-health;

b) that there are European regional initiatives to share best practices in the implementation of e-applications, including e-health;

c) that healthcare ICT standards was considered a high-interest subject at GSC 13;

d) that healthcare ICT standards need to be adapted, as necessary, to fit the context of each Member State, and that this requires a strengthening of capacity building and support;

e) the ongoing work in ITU-D to bridge the digital e-health divide;

f) the publication under ITU-D Study Group 2 Question 14-2/2 entitled "Mobile e-health solutions for developing countries",

resolves to instruct the Secretary-General

1 to give priority consideration to the expansion of telecommunication/ICT initiatives for e-health in the work of ITU and to coordinate e-health-related activities between ITU-R, ITU-T, ITU-D and other relevant organizations;

- 2 -

2 to continue and further develop ITU activities on telecommunication/ICT applications for ehealth in order to contribute to the wider global efforts concerning e-health,

instructs the Secretary-General, in consultation with the Directors of the Bureaux

1 to identify and document examples of best practice for e-health in the field of telecommunication/ICT for dissemination among ITU Member States and Sector Members;

2 to report information and developments to Member States through an appropriate mechanism;

3 to coordinate on e-health-related activities with ITU-R, ITU-T and ITU-D, and in particular, to promote awareness, mainstreaming and capacity building in the creation of telecommunication/ICT e-health standards, reporting findings to the Council as appropriate;

4 to work collaboratively on e-health-related activities with WHO and ITU-R, ITU-T and ITU-D and, in particular, developing programmes that enable developing countries to introduce e-health services safely and effectively,

invites Member States

to consider developing appropriate legislation, regulations, standards, codes of practice and guidelines to enhance the development and application of e-health telecommunication/ICT services, products and terminals,

encourages Member States and Sector Members

to participate actively in e-health-related studies in ITU-R, ITU-T and ITU-D through contributions and by other appropriate means.

Appendix 10: RESOLUTION 65 (Hyderabad, 2010)

Improving access to healthcare services by using information and communication technologies

The World Telecommunication Development Conference (Hyderabad, 2010),

considering

a) that the World Telecommunication Development Conference (Doha, 2006) recommended that ITU continue to study the potential of using telecommunications for e-health in order to meet the needs of developing countries;

b) that the World Health Organization approved in May 2005 Resolution WHA58.28 on e-health, stressing "… that e-health is the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research";

c) that the World Summit on the Information Society (WSIS), which was held in two phases in Geneva, 10-12 December 2003 and in Tunis, 16-18 November 2005, included e-health in the Geneva Plan of Action as one of the important ICT applications, and stated the following: "Promote collaborative efforts of governments, planners, health professionals, and other agencies along with the participation of international organizations for creating reliable, timely, high-quality and affordable healthcare and health information systems and for promoting continuous medical training, education, and research through the use of ICTs, while respecting and protecting citizens' right to privacy. Encourage the adoption of ICTs to improve and extend health care and health information systems to remote and underserved areas and vulnerable populations, recognizing women's roles as health providers in their families and communities",

considering further

a) the importance of maintaining momentum so that the potential advantages of information and communication technologies in the healthcare sector in developing countries are not compromised by barriers of a legal, technical, economic or any other nature;

b) revised Question 14/2 on what measures should be taken to facilitate the introduction of mobile e-health services in developing countries so that individuals, society and the economy all benefit from such initiatives,

recognizing

that e-health solutions and applications can play a very important role in healthcare delivery, in particular in developing countries, where the acute shortage of doctors, nurses and paramedics is directly proportional to the enormous unsatisfied demand for health services,

resolves to instruct the Director of the Telecommunication Development Bureau

1 to continue its efforts to raise awareness among decision-makers, regulators, telecommunication operators, health professionals, partners, beneficiaries and other key players of the benefit of telecommunications/ICTs for e-health applications;

2 to continue to support e-health projects in developing countries in collaboration with government, public, private, national, regional and international partners – in particular with the World Health Organization (WHO) – and to encourage collaboration on e-health projects at national and regional level;

3 to work with the health sector and other partners to identify and develop models for sustainability of e-health applications, particularly in remote and rural areas of developing countries, using the potential of mobile e-health either via mobile phones or via mobile medical centres wirelessly connected to nearby hospitals/clinics;

4 to assist developing countries in the development of their national e-health master plans;

5 to continue to promote, facilitate and provide technical support and training in information and communication technologies for e-health;

6 to continue to promote the development of telecommunication standards for e-health network solutions and interconnection with medical devices in the environment of developing countries, in conjunction with ITU-R and ITU-T in particular,

invites

1 Member States to consider the development of their national e-health strategy or "e-health master plan", with close cooperation between telecommunication and healthcare sectors, as a strategically important step forward to the introduction of e-health services;

2 international financial institutions and donor agencies to assist in developing e-health/telemedicine applications, projects and programmes in developing countries;

3 private-sector entities to develop different business models and consider the introduction of e-health/telemedicine services in developing countries on the basis of public-private partnerships.

_____