FACTORS INFLUENCING THE BEHAVIOURAL INTENTION OF HEALTH WORKERS TO THE ADOPTION OF E-HEALTH SYSTEM: A CASE STUDY OF FORTIS HOSPITALS IN MAURITIUS

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Sameer Korumtallee

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This Thesis by Sameer Korumtallee has been approved by the committee members below, who recommend it be accepted by the faculty of Unicaf University in partial fulfillment of requirements for the degree of

Doctor of Business Administration (DBA)

Thesis Committee:

Dr Vikram Niranjan, Supervisor

Dr Elena Papadopoulou, Chair

Dr Johnny Chalita Chaanine, External Examiner

Dr Shiferaw Mitiku, Internal Examiner

Abstract

FACTORS INFLUENCING THE BEHAVIOURAL INTENTION OF HEALTH WORKERS TO THE ADOPTION OF E-HEALTH SYSTEM: A CASE STUDY OF FORTIS HOSPITALS IN MAURITIUS

Sameer Korumtallee

Unicaf University

With the rise of chronic diseases and the recent outbreak of the COVID-19 pandemic, new challenges have been generated in the healthcare industry. Electronic health (e-health) is considered to be one of the stratagems, identified to overcome the challenges and to raise the standard of the medical system (Gagnon *et al.*, 2016). Researchers like Severinsen *et al.* (2019), stated that implementing an e-health system, could improve many aspects of medical practices, and make the healthcare system safer, and more efficient.

However, several studies have raised concerns regarding the adoption of e-health systems, especially among healthcare providers. Abdekhoda *et al.* (2016) stated that healthcare providers' adoption and use of an e-health system are still low and according to Alam *et al. (*2018), several e-health implementation projects were subject to resistance from users when they were deployed. According to Reiners *et al.* (2019), there is a disconnect between the anticipated improvements of the e-health system and the clinical reality. Despite the potential of e-health, many e-health implementations are either unsuccessful or are gradually losing steam.

Researchers like Kujala *et al.* (2020) stated that "The success of an e-health implementation depends on healthcare practitioners' acceptance of the technology; for this reason, it's necessary to research the elements that will influence the adoption of an e-health

system before it is put in place". Our research aims to explore the key factors that influence the behavioural intention of healthcare professionals, to adopt an e-health system in their daily routine. To identify the facilitators and barriers that affect e-health adoption among healthcare providers.

To analyse the determining factors affecting e-health adoption, The "Unified Theory of Acceptance and Use of Technology" (UTAUT) model of Venkatesh *et al.*, 2003, offers a thorough picture of the aspects impacting users' embracing and use of a technological system. Our research model is built based on the UTAUT model and the study of Venkatesh *et al. (*2003), which consisted of one dependent variable "Behavioural Intention" and seven independent variables "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Self-Efficacy", "Anxiety" and "Attitude Towards Using Technology".

The quantitative research method and a cross-sectional explanatory research design were used to determine the elements impacting e-health system adoption. A total of 800 healthcare providers from a private group of hospitals in Mauritius, namely the Fortis Wellkin Hospital and the Fortis Darné Hospital were randomly selected and invited to participate in our survey using a validated questionnaire, which has been adopted from the study of the UTAUT model of Venkatesh *et al.* (2003). The final sample of respondents to our survey is made up of 512 individuals.

The data was evaluated in two stages: the first was to assess the discriminant and convergent validity of the measuring tool, and the second was to inspect the correlations amongst the variables of the study model. Exploratory Factor Analysis and Linear

Regression Analysis were different kinds of statistical techniques used to analyse and validate the data.

Our results show that factors like "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Condition" and "Attitude Towards Using Technology", are direct determinants and significant factors affecting the "Behavioural Intention" for the adoption of the computerised health system. However, factors such as "Anxiety" and "Self-Efficacy" have no significant effect on healthcare professionals' adoption of the computerised health system.

The study has brought a much better thoughtful of the important aspects in the establishment of the e-health system by healthcare professionals of a private group of hospitals in Mauritius, which helps with developmental strategies to reduce the failure rate of e-health system implementations. Our research has helped to influence the body of knowledge on ICT adoption and e-health, it has also supplemented earlier studies on technology adoption by investigating the pertinence of the UTAUT model.

Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgement, the work presented is entirely my own.

Signature: 

Name: Sameer Korumtallee

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A special thank you to the UNICAF University personnel for their everlasting assistance and support, as well as my friends, co-workers, and family, who have stood by my side and encouraged me throughout this adventure with consistency and belief. Finally, I would like to thank all the people I did not mention who participated directly or indirectly in the realization of this thesis. Thank you all.

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List of Abbreviations

ANOVA = Analysis of Variance

AT = Attitude Towards Using Technology (Variable)

AN = Anxiety (Variable)

BI = Behavioural Intention (Variable)

CFA = Confirmatory Factor Analysis

COVID-19 = Corona Virus Disease 2019

CSE = Computer Self Efficacy

DOI = Diffusion of Innovation Theory

EE = Effort Expectancy (Variable)

E-HEALTH = Electronic Health

EOU = Ease of Use

FC = Facilitating Conditions (Variable)

HIS = Health Information System

ICT = Information and Communication Technology

IEEE = The Institute of Electrical and Electronics Engineers

IS = Information System

IT = Information Technology

KMO = Kaiser Meyer Olkin

MSA = Measure of Sampling Adequacy

PACS – Picture Archiving and Communication System

PBC = Perception of Behaviour Control

PC = Personal Computer

PCA – Principal Component Analysis

RNAO = Registered Nurse Association of Ontario

SCT = Social Cognitive Theory

SE = Self Efficacy (Variable)

SI = Social Influence (Variable)

SPSS = Statistical Package for Social Science

TAM = Technology Acceptance Model

TAM 2 = Technology of Acceptance Model 2

TIB = Theory of Interpersonal Behaviour

TPB = Theory of Planned Behaviour

TRA = Theory of Reasoned Action

UREC = Unicaf Research Ethics Committee

URL = Uniform Resource Locator

WHA = World Health Assembly

WHO – World Health Organisation

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CHAPTER 1: INTRODUCTION

1.1 Background of the Study

With the aging of the population and the increasing prevalence of chronic diseases, new challenges are being generated in the healthcare industry (Castillo *et al.,* 2010; Kujala *et al.,* 2020). These problems associated with the current economic factor, required a reorganisation of the healthcare system to perpetuate its continuation (Abbasgholizadeh *et al.,* 2017; Alam *et al.,* 2018; Karamagi *et al.,* 2022; Raymond *et al.,* 2015). One method for improving different areas of medical practises and making the healthcare system safer and more effective is the application of Information and Communication Technologies (ICT) in the healthcare sector (Severinsen *et al.,* 2019; Smith *et al.,* 2015). As per Gagnon *et al.* (2016), ICT, introduced "to sustain the major restructuring of health systems around the world, are in many ways an important change in the provision of care and health services to the population". By providing healthcare providers with safe, timely, and easily accessible information, ICT is acknowledged as a method for resolving challenges in the healthcare system (Kreif *et al.,* 2016; Kujala *et al.,* 2020).

The term Electronic Health (e-health) – with its equivalents: Telemedicine, Digital Health, E-health, Health Informatics, etc. refers to all the areas where ICTs are used in the healthcare sector. The World Health Organization (WHO), in its WHA58.28, a resolution conceded in 2015, defines e-health as "the cost-effective and secure use of ICTs in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research".

E-health refers to all health-related topics involving the usage of information and communication technologies (Brown *et al.,* 2020; Gagnon *et al.,* 2016; Karamagi *et al.,* 2022; Kujala *et al.,* 2020). E-health has for some years taken a momentum of development, telemedicine, mobile health, electronic medical record and computer-assisted surgery are increasingly frequent nowadays. Digital innovations, according to the World Health Organization (2015), contribute to sustainable development goals, including access to universal health coverage. According to Momani (2020); Nadri *et al.* (2018) and Pare *et al.* (2014), e-health would facilitate the sharing of data across healthcare delivery organisations across a continuum of care and all geographic areas, and their implementation should, theoretically, produce benefits for patients, and their families, professionals, organisations and the population as a whole.

E-health is similarly perceived as a means that would simplify "the exchange of knowledge and clinical decision-making among health professionals" (Hillestad *et al.,* 2005) by providing relevant, up-to-date and timely information to the healthcare professionals (Momani, 2020; Nadri *et al.,* 2018; Schoen *et al.,* 2012). With e-health, financial and technical barriers are falling, access to healthcare is becoming easier, especially for developing countries. In Africa, digital health is slowly becoming a reality; the technological changes in the field of health are beginning to be felt (Jones *et al.,* 2011; Karamagi *et al.,* 2022). According to the World Health Organization (2015), "e-health enforced the strengths of participation, accountability and good governance in the health sector in Africa". For example, in Ghana, the Mobile Midwife project informs women during pregnancy and encourages them to call or text for antenatal care. Cameroun has implemented the Genesis Telecare that allows patients to reserve and to be consulted remotely by doctors. In the Republic of Mauritius, the health service in public hospitals is free (Putteeraj *et al.,* 2022). "More than 70 percent of healthcare services in Mauritius are provided by the public health system", according to the MOH (2019). According to the Mauritian Ministry of Health Statistics Report of 2019, the Mauritian government plans to implement an e-health system to eliminate financial losses linked to a paper-based system.

E-health is increasingly widespread among healthcare professionals and has the potential to increase patient care. However, despite the significant advancements achieved in the field of computerising health services in recent years, it seems like not many researches have looked at how medical professionals feel about the implementation of electronic heath in their work (Karamagi *et al.,* 2022; Kesse-Tachi *et al.,* 2019; Urquhart *et al.,* 2016). The systematic review of Poissant *et al.* (2015) shows that the time required by healthcare professionals to feed computer systems is sometimes higher in comparison with the documentation required when using a conventional paper file. Poissant *et al.* (2015) examined the effect of electronic health records, and the time doctors and other healthcare providers took to insert the data into the system. They reported an increase in documentation time ranging from 11.2 percent to 40.6 percent.

This affirms, as it were, the suspicion and dubiousness that still reign in this area, and additionally the many-sided quality of the idea of the execution and acknowledgement of the e-health framework. It is consequently appropriate to proceed with in-depth research in this path and to take an interest, more, in the elucidation of the circumstances. Our research aims to explore, the main elements affecting healthcare professionals' decision about whether to adopt an e-health system. In this research, the term adoption refers to the "initial decision made by the individual to interact with the technology system" (Venkatesh *et al.,* 2003).

1.2 Statement of the Problem

With the increase in automation, Electronic Health (e-health) is considered to be the system that will improve healthcare's effectiveness, efficiency, and quality of care. According to Hillestad *et al.* (2005), "e-health has the potential to advance the quality of healthcare services; reduce medical errors; reduce healthcare costs; increase administrative efficiencies; reduce paper consumptions; and facilitate access to primary healthcare resources". E-health system offers a huge ability to increase productivity and quality of service (Karamagi *et al.*, 2022; Schoen *et al.*, 2012). However, there is a disconnect between the anticipated advantages and clinical reality (Reiners *et al.*, 2019). That's why, despite the potential of e-health, several studies on e-health implementation have shown that factors such as resistance of users are frequently cited as impediments to the e-health system's implementation (Gagnon *et al.*, 2016; Karamagi *et al.*, 2022). As stated by Castillo *et al.* (2010) and Karamagi *et al.* (2022) several computerization projects, particularly related to the implementation of e-health systems were the subject of resistance from users when they were deployed.

According to the Registered Nurse Association of Ontario (2017), it is estimated that more than 70 percent of e-health implementation projects in the province of Ontario in Canada have failed due to user resistance, with huge financial losses, which has contributed to a loss of confidence in information and communication technology (ICT) to support clinical processes, especially by healthcare providers. According to a report published in the year 2015 by the Ministry of Health of Mauritius, out of nine (9) e-health systems deployed in different public hospitals in Mauritius, only one (1) system is partially being used due to user resistance and system unfriendliness. Therefore, it is crucial to examine all potential elements influencing the adoption of the e-health system, starting with systemic constraints at the macro-level and ending with individual obstacles at the micro-level (Pare *et al.*, 2014).

According to Karamagi *et al.* (2022), “many studies have used the Theory of Reasoned Action, the Theory of Planned Behaviour, or the Theory of Technology Acceptance Model to analyse e-health adoption in the past”. However, these models have limited ability to explain an individual's intention to adopt a system, which ranges from 30 percent to 40 percent (Kesse-Tachi *et al.*, 2019). On the other hand, according to Razzak *et al.* (2021) “the Unified Theory of Acceptance and Use of Technology model may account for up to 70 percent of the variation in behavioural intention to adopt”. The UTAUT model blends eight theories of technology adoption and offers a thorough understanding of the elements influencing users' adoption behaviour with regard to the adoption of ICT in any context. According to Karamagi *et al.* (2022); Kesse-Tachi *et al.* (2019) and Urquhart *et al.* (2016), the UTAUT model has been employed in the majority of investigations carried out in developed countries and outside of medical care settings. Given this context, it is crucial to examine the viability and relevance of the UTAUT paradigm in a non-western society to understand healthcare providers' adoption of an e-health system.

Mauritius is a developing island in the Indian Ocean which is best known around the world as a tourist destination. As per the World Bank (2017) report on the Ocean Economy, Mauritius is known to be the leader of innovation and technology in the Indian Ocean. According to the Health Statistic Report, published by the Ministry of Health Mauritius in the year 2019, the Government of Mauritius is relying on the usage of the e-health system to eliminate the losses that the state brings consistently due to paper-based system in the health division. The United Nations Development Program signed a portfolio document on e-health initiatives with the Mauritius Ministry of Health in the year 2022, it is stated that the Mauritian Government’s objective for e-health is as follows: To include the creation of a single, integrated source of information and a focal point of reference on all matters related to health. Mauritius is pursuing a transformational process to improve its healthcare facilities and promote its image as a medical tourism destination. The Mauritian government is pushing private hospitals to enter into this endeavour (Putteeraj *et al.*, 2022).

Fortis Mauritius Hospitals is a Mauritius-based private healthcare company that owns and operates two primary private healthcare facilities in Mauritius, namely, Fortis Clinique Darné and Fortis Wellkin Hospital. The Fortis Hospital Mauritius' governing bodies decided to assist medical practises using IT in order to support Mauritian Government initiatives. The organisational adoption of IT changed the nature of practices and strongly influenced the healthcare process at the Fortis Hospitals in Mauritius. For more than ten years, Fortis Hospital (Mauritius) has placed IT on the agenda of its organisational priorities. The implementation of the e-health system has become, for its health professionals, a major and essential component to ensure the continuity and quality of medical activity at the organisation. Adopting a legitimate e-health system can reinforce health frameworks by improving the accessibility, opening up vast opportunities for overcoming distances and time barriers, improving the quality and use of data, and reducing fragmentation through greater operational integration of health systems. However, a key issue and obstacle to the effective deployment of the e-health system at

Fortis Hospitals Mauritius is the shortage of healthcare professionals who can adopt the e-health system.

In the e-health arena, several studies have been focused on analysing the determinants of post-adoption factors (Gagnon *et al.,* 2016; Karamagi *et al.,* 2022; Kootstra, 2004; Kvedar *et al.,* 2014). However, analysis of the concept of acceptability shows that adoption is a dynamic process that begins in pre-adoption and continues into post-adoption throughout the life cycle of the system (Abbasgholizadeh *et al.,* 2017). Researchers like Ravì *et al. (*2016) and Wilson *et al.* (2021) have investigated the pre-adoption of e-health systems and concluded that many healthcare organisations are still experiencing low levels of e-health system adoption by healthcare providers. Furthermore, studies by Shachak *et al.* (2019); Su *et al.* (2021) and Bawack and Kamdjoug (2018) on the implementation of e-health in developing nations revealed that there are very little studies done on pre-adoption factors in the e-health arena. Based on the discovered gaps, it is vital to recognise and determine the success indicators that influence the pre-adoption behavioural aspects process. Considering that adoption is a dynamic and constantly changing process, it becomes crucial for the survival of e-health in the clinical routine that pre-adoption phenomena are analysed and understood to ensure the organisational sustainability and system acceptability.

1.3 Purpose of the Study, Research Aims and Objectives

Finding and analysing the key elements associated with the adoption of a digital health system project by the healthcare providers as part of the primary care in their daily routine is the goal of this research project. Since e-health is perceived to be the key solution that can help the healthcare sector to improve and provide efficient quality of care, a thorough examination of the important variables affecting physicians' adoption of an e-health system could lead to better design of outreach strategies that could optimize the impact of implementation projects, particularly concerning the reduction of the failure rate and better control of project costs.

This study has a quantitative research approach as it analyses the different variables based on the UTAUT model such as "Performance Expectancy", "Effort Expectancy", "Facilitating Conditions", "Social Influence" which affect the e-health adoption among the healthcare providers. This empirical research is essentially based on measurable data that is obtained through questionnaires survey from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius.

Examining the most important elements influencing healthcare professionals' choice to employ an e-health system is the purpose of this study. The objectives of the research project are to identify the facilitators and barriers which affect e-health adoption among healthcare providers, to determine individual factors that predict the intention of healthcare professionals to adopt the e-health system in their clinical activities and to analyze healthcare providers' perceptions of digital transformation towards e-health. To do so, healthcare professionals' perceptions are studied & evaluated about the advantages and disadvantages of using the e-health system in their practice, the appealing qualities of a digital health system adoption to individuals and groups, as well as any potential barriers to it. The results of this research described some strategies to help organizations and decision-makers working in the health sector to facilitate the transition of their personnel from health to e-health and to promote its usage.

1.4 Nature and Significance of the Study

1.4.1 Nature of the Study

The current research is based on the acceptability factors affecting the e-health adoption among healthcare providers, a synthetic comparative research strategy will be used to explain and predict complex behaviours or phenomena, examine the set of relationships that simultaneously involve several dependent variables and several independent variables in a model of interrelated relationships (Brousselle *et al.* (2006). This type of strategy is appropriate for explaining the phenomenon of technological dropout in the health sector among healthcare providers (Kreif *et al.*, 2016)

This research is part of a positivist paradigm, assuming the existence of a fixed reality that can be explained by analysing the factors associated with the phenomena to be studied. As stated by Orlikowski and Robey (1991) "researchers who adopt a positivist perspective assume the existence of a priori fixed relationships within a phenomenon whose nature can be relatively un-problematically apprehended, characterized, and measured".

A quantitative research approach will be used for this research as it is usually the tool of researchers who examine phenomena from a positivist perspective (Ali *et al.*, 2020; Howlett, 2013) as we assume the existence of a fixed reality that can be explained by analysing the factors associated with the phenomena. Quantitative research has been defined as a systematic attempt to define, measure, produce and analyse data on the relations between the factors of a phenomenon (Patton, 2014). As indicated by Boonstra and Broekhuis (2010), in the medical industry there are predominantly two kinds of information data collection devices that are utilized as a part of the examination of variables that impact the use of Information Technology: an elucidating study and cross-sectional investigations gathering quantitative information through questionnaires. The most commonly used mode of primary data collection in quantitative research is the questionnaire (Gratton & Jones, 2004).

As far as this research is concerned, data collection is obtained through a close-ended questionnaires survey from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius. The questionnaire has been adopted from the "Unified Theory on Acceptance and Use of Technology" (UTAUT) model, which provides a comprehensive view of the factors affecting users' adoption and it integrates eight (8) theories of technology adoption, namely, (1) "Theory of Reasoned Action" (TRA), (2) "Theory of Planned Behaviour" (TPB), (3) "Social Cognitive Theory" (SCT), (4) "Technology Acceptance Model" (TAM), (5) "Combined TAM and TPB" (C-TAM-TPB), (6) "Diffusion of Innovation" Theory (DOI), (7) "Motivational Model" (MM), and (8) The "Model of PC Utilisation". Probability sampling is the chosen method to be used in this type of research. Probability sampling consists in randomly selecting participants within a sampling frame so that each individual in this experiment setting has an equal chance of getting chosen (Raghunath, 2017).

The current number of healthcare employees at Fortis Mauritius Hospitals is around 1575. The sample size is predicted to be 310 individuals with a 95 percent confidence level and a 5 percent margin of error. Based on a 50 percent desired response rate, the entire number of respondents to be surveyed is 620. Given that the population of our research comprises different categories of users of the e-health system at Fortis Hospitals, the stratified sampling method will be used to ensure that all the different categories of the users of the system such as nursing officers, doctors, technicians, pharmacy officers, record officers, etc. are included in the study.

A stratified sample is used when the selection fraction differs according to certain characteristics of the population (Raghunath, 2017). The sampling of the section itself can be random simple or systematic but is done independently for each of the subpopulations (strata) defined. In our case, it will be the different categories of users of the e-health system. We used stratification to make sure that the population of interest was sufficiently portrayed across all categories.

1.4.2 Significance of the Study

E-health is becoming a reality in the practice of healthcare providers and can have beneficial advances (Pare *et al.*, 2014). Nevertheless, it appears that relatively few research have examined how healthcare practitioners perceive the introduction of electronic health in their reality, despite the rapid developments achieved in the field of computerization of health services in recent years (Kesse-Tachi *et al.*, 2019; Urquhart *et al.*, 2016).

This study intends to pinpoint and examine the elements that either encourage or inhibit the adoption of e-health systems by physicians as part of a primary care organization. The results of this research will shed light on some strategies to help organizations and decision-makers working in the health sector to facilitate the transition of their personnel from health to e-health and to promote its usage. In this regard, a deeper comprehension of the crucial elements affecting healthcare providers' engagement towards the e-health system may lead to better design of implementation strategies for front-line care organizations (Abdekhoda *et al.*, 2016).

The effectiveness of implementation projects might be maximised by having a better grasp of the crucial elements in the deployment of the e-health system, particularly in connection with the reduction of the failure rate and better control of the costs associated with the projects (Momani, 2020; Nadri *et al.,* 2018; Poissant *et al.,* 2015). This could also translate into more extensive use of the e-health system by professionals and thus ensure better performance of the health system. In order to deliver just-in-time, accessible, and safe healthcare, it is believed that using ICT is one of the strategies that must be uncovered (Kreif *et al.,* 2016). According to the knowledge of the researcher no prior study on e-health adoption has been conducted in the context of Mauritius, the thesis is part of an exploratory process whose goal will be to develop hypotheses and relevant propositions that can be the subject of future research.

1.5 Research Questions

The goal of this study is to recognise, understand, and explore the influencing elements that influence healthcare providers' behavioural intentions to embrace an e-health system. In other words, it tries to determine the important elements influencing e-health acceptability and how this knowledge can be applied to improve the diffusion and adoption process. To attain this purpose, the "Performance Expectancy", "Effort Expectancy", "Social Influence", and "Facilitating Conditions" elements from UTAUT model are the four key constructs employed in this study. The study of Venkatesh *et al.* (2003) had three additional independent variables which were noted as not directly influencing "Behavioural Intention" for adoption, they are "Self-efficacy", "Anxiety" and "Attitude towards using Technology". Researchers like Thomas *et al.* (2013) and Nadri *et al.* (2018), stated that, when using the UTAUT model outside the Western cultural setting, it is encouraged that all dimensions and variables from the Venkatesh *et al. (*2003) research be included in the study, which incorporates and includes also the three variables that were not identified as direct predictors of "Behavioural Intention". As a result, the following questions have been identified to assist in the achievement of the desired goals.

Q1. What is the relationship between performance expectancy and healthcare provider's behavioural intention to adopt the e-health system?

Q2. What is the relationship between effort expectancy and healthcare provider's behavioural intention to adopt the e-health system?

Q3. What is the relationship between social influence and healthcare provider's behavioural intention to adopt the e-health system?

Q4. What is the relationship between facilitating conditions and healthcare provider's behavioural intention to adopt the e-health system?

Q5. What is the relationship between self-efficacy and healthcare provider's behavioural intention to adopt the e-health system?

Q6. What is the relationship between anxiety and healthcare provider's behavioural intention to adopt the e-health system?

Q7. What is the relationship between attitude towards using technology and healthcare provider's behavioural intention to adopt the e-health system?

CHAPTER 2: RELATED LITERATURE REVIEW: ELECTRONIC HEALTH (E-HEALTH) FUNDAMENTALS

2.1 Introduction

The Covid-19 outbreak pandemic has increased mortality and morbidity levels, causing social disturbance and economic losses (Donders *et al.*, 2020; World Health Organization, 2020). E-health system, making use of ICT has helped to lessen the pandemic's impact by improving epidemiological monitoring and control, such as rapid case reporting, improved medical practise performance, and efficient documentation (Donders *et al.*, 2020; Pappot *et al.*, 2020).

Many health organisations across the world are embracing e-health in the hopes of improving service delivery for patients as well as increasing effectiveness and efficiency in the healthcare industry (Gagnon *et al.*, 2016; Jones *et al.*, 2011; Schoen *et al.*, 2012). E-health signifies a fundamental shift in the structure, values, culture, and methods of providing medical treatment within the healthcare system (Gagnon *et al.*, 2016; Wilson *et al.,* 2021). This chapter aims to examine prior work on e-health and offer vital background knowledge on the study topic. Furthermore, this chapter explored several facets of e-health, as well as the state of e-health in Mauritius.

2.2 Overview of E-health

For years, doctors have frequently lacked insufficient data knowledge to treat their patients (Touria & Adédiran, 2017). Today, information is everywhere, yet paper records and archives are difficult to acquire and organise properly, and these pieces are frequently unavailable when needed. The utilisation of technological advancements inside the health system is the solution to this challenge (Hossain *et al.*, 2019; Raymond *et al.*, 2015;

Roztocki & Weistroffer, 2015). The use of ICT is expanding across practically all professional fields, the healthcare sector has not been left out in this revolution that is sweeping virtually every field and profession. Almost all economic sectors today use ICT to increase their efficiency (Hossain *et al.,* 2019). The successful development of most industries, including healthcare, depends on electronic communication. The ability to obtain and use the right data or information is crucial for managing healthcare to maintain a system that provides high-quality care (Ravì *et al.,* 2016; Wilson *et al.,* 2021). The use of ICT in the health sector is one method of assisting in the transformation of our healthcare system. E-health can revolutionise and improve the healthcare system (Raymond *et al.,* 2015). However, there isn't a single, widely agreed-upon definition of e-health, and a variety of terminologies are used to describe this tool (Elliott *et al.,* 2016; Ravì *et al.,* 2016; Raymond *et al.,* 2015; Touria & Adédiran, 2017).

E-health is a wide field that refers to the use of ICT to the complete variety of health tasks, from hospital directors, information processing to welfare benefits of patients (Gagnon *et al.,* 2016; Reiners *et al.,* 2019; Schoen *et al.,* 2012). The main objective of e-health is to enhance the quality of healthcare, accessibility of data, and effectiveness for everybody by providing healthcare providers with safe, timely, and easily accessible information (Gagnon *et al.,* 2016; Jones *et al.,* 2011; Reiners *et al.,* 2019; Schoen *et al.,* 2012). Greater access to data and information is made possible by e-Health, which could improve the standard of healthcare services. The term e-health refers to the cooperative use of electronic data and correspondence, technological advancements in the healthcare industry, and the use of digital data that is transmitted, stored, and recovered electronically for clinical, educational, and administrative purposes both locally and remotely (Hossain *et al.*, 2019).

Over time, e-health has expanded from departmental solutions to more expansive enterprise-level, and from standalone systems offering only localised and limited solutions to more networked ones offering complete and integrated solutions (Atallah, 2017). To enhance health systems, make optimal use of resources, and prepare for the gradual implementation of broad health coverage, e-health is being used more and more frequently in conjunction with tools that address capacity-building and care quality (Gagnon *et al.*, 2016). With the help of e-health, practitioners can now provide treatments to physically distant patients (Gagnon *et al.*, 2016; Wilson *et al.*, 2021). ICT tools, such as networks and decision support systems, can make it possible for practitioners with less expertise to remotely obtain expert advice to make better decisions. The current Covid-19 pandemic outbreak has accelerated digitization in the healthcare industry. By sharing treatment-relevant data among healthcare providers within data privacy laws and by offering documents that are especially suited to the requirements of telecare for COVID-19 patients (Donders *et al.*, 2020; Pappot *et al.*, 2020).

The potential of e-health applications is enormous, but it is distributed across sectors that need distinct business processes. Usually, various terminologies have been used for e-health; most of them have about the same meaning and consideration, but they differ somewhat from one another (Raymond *et al.*, 2015; Roztocki & Weistroffer, 2015). Examples of some e-health terminologies currently being used are E-health, Electronic Health, Health Informatics, Telemedicine, Electronic Medical Records, Electronic Health Records, M-Health, Hospital Information Systems, Clinical Information Systems, etc.

2.3 E-health Definition

The term e-health – as well as its equivalents: Electronic Health, Health Informatics, Telemedicine, Electronic Medical Records, Electronic Health Records, M-Health, Hospital Information Systems, Clinical Information Systems, Radiology Picture Archiving and Communication System (PACS) etc. - designates all the fields where ICT are put at the service of health (Atallah, 2017; Elliott *et al.,* 2016; Kootstra, 2004; Pappot *et al.,* 2020; Ravì *et al.,* 2016). As stated by the World Health Organization (2015), e-health is defined 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".

The first use of e-health goes back in the year 1999 (Atallah, 2017; Ravì *et al.,* 2016). In a presentation at the 7th International Telemedicine Congress, John Mitchell, an Australian consultant defines e-health as the combined usage of the Internet and technology information for clinical, educational and administrative, both locally and remotely (Atallah, 2017; Kitchens, 1998; Ravì *et al.,* 2016). According to Jones *et al.* (2011), "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 word "e-health" describes not just a technological advancement but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using ICT (Hassenzahl *et al.,* 2010).

More generally, e-health is used to explain the application of ICT to all health-related activities in its broadest acceptance (Gagnon *et al.,* 2016; Jones *et al.,* 2011; Reiners *et al.*, 2019; Schoen *et al.*, 2012). E-health is therefore inseparable from new technologies. It refers to all technologies and services for medical care based on the usage of ICT which include but are not limited to:

- Health information records systems, including information systems for healthcare and hospitals, online services such as electronic prescribing, online health promotion systems, laboratory systems, Picture Archiving and Communication System (PACS) for radiology and online consultation with a doctor (Atallah, 2017; Wilson *et al.*, 2021).
- Telemedicine systems and associated services, such as teleconsultation, teleradiology, and distance monitoring (Jones *et al.*, 2011; Reiners *et al.*, 2019; Roztocki & Weistroffer, 2015; Schoen *et al.*, 2012).
- Specialized tools for healthcare professionals and researchers such as robotics and advanced environments for diagnosis and surgery; tools for simulation; grids for health, tools for training (Jones *et al.*, 2011; Reiners *et al.*, 2019; Roztocki & Weistroffer, 2015; Schoen *et al.*, 2012).

2.4 Different Terms Used in E-health

The literature is full of expressions devoted to digital or electronic health. E-health encompasses many fields of application, including digital technologies applied to health in a broad sense (Granja *et al.*, 2018; Karamagi *et al.*, 2022; Kvedar *et al.*, 2014; Reiners *et al.*, 2019). They often include innovations that are more related to the notion of well-being than to specific questions of medical follow-up, but these can nevertheless provide a benefit in terms of prevention and individual control of one's health (Reiners *et al.*, 2019). E-health is a set of digital means applied to the health field which allows the transmission of a mass of important data, coded and decoded by the technological tools (Atallah, 2017).

2.4.1 Health Informatics

Although the phrase "health informatics" first figured in the research literature in the late 1960s, it wasn't widely utilised in the research literature until the 1990s (Rav *et al.*, 2016). The term "health informatics" is frequently used to describe how ICT is used in the healthcare sector, there is not one definition that is accepted globally. According to Elliott *et al.* (2016), “the development and evaluation of methods and tools for the collection, processing, and interpretation of patient data with the aid of research data is known as health informatics”.

In their study, Roztocki and Weistroffer (2015) stipulated, “health informatics is more than just a computer application, but rather information management in healthcare settings”. According to the previously mentioned authors, information systems must be used to support medical decisions because of “information overload in the healthcare sector and mistakes in medical decision-making processes” (Roztocki & Weistroffer, 2015), they also predicted that health informatics will alter the way of delivering healthcare. According to Granja *et al.* (2018), “health informatics is the use ICT in the field of health system to improve the standard of care, patients' health and well-being, and the welfare of their families, the healthcare professionals, and the general public”.

2.4.2 Digital Health

The term "digital health" refers to “the gathering, processing, and storage of health and medical data using electronic technology. It demonstrates the capability of the healthcare information system to provide accurate and pertinent information to healthcare users and professionals” (Mathews *et al.,* 2019). According to Mathews *et al.* (2019), digital health practices haven't yet realized their full potential and have generated little feedback. They argued that digital health systems still had a way to go before achieving their full potential. According to Shaw *et al.* (2017), healthcare facilities may employ digital health to address changes in lifestyle, such as diet, obesity, and inadequate physical activity. Digital health in healthcare can support the development of affordable self-management, lifestyle modification, and medication adherence strategies (Lupton, 2017).

2.4.3 Electronic Medical Records

Electronic Medical Records (EMRs) are computerised medical information systems that collect, store and display patient medical information (Boonstra & Broekhuis, 2010; Brown *et al.*, 2020). EMR refers to the electronic version of a physician’s paper file (Roztocki & Weistroffer, 2015). The EMR is the summary of a relationship between a patient and a health professional and belongs to a particular health facility or medical clinic and remains within the walls of that facility or clinic (Mathews *et al.,* 2019). The EMR contains all medical information recorded electronically as part of a physician's care provided to the patient which is stored in a given location (Roztocki & Weistroffer, 2015). "Electronic medical records" (EMR) and "Electronic Health Records" (EHR) are habitually thought-out as interchangeable synonyms in e-health (Boonstra & Broekhuis, 2010; Brown *et al.,* 2020). These terms seem to express the same concept but with slight differences in the types of presentation, collection and storage of the medical data.

One of the most essential aspects of e-health is electronic health records (EHRs). Pazzani (1989) coined the phrase "electronic health record" at The Annual AI Systems in Government Conference USA. In their widely recognised paper, Boonstra and Broekhuis

(2010), estimated that between 44000 and 98000 Americans die each year as a result of medical mistakes. In their literature study, Boonstra and Broekhuis (2010) said that over 400000 individuals die in hospitals in the United States as a result of medical mistakes. As a result, despite advancements in ICT in healthcare, the number of deaths due to medical mistakes is on the rise.

According to Chen *et al.* (2014), all diagnostic and treatment results and documentation should be clearly documented and accessible for communication amongst healthcare practitioners "if we want to increase efficiency and provide better healthcare". They stressed the importance of EHR. Roztocki and Weistroffer (2015) study also discussed the necessity to digitise patient data. According to Raymond *et al.* (2015), just collecting patient data is insufficient for an efficient EHR. Increased sophistication was advocated by the author to obtain more sophisticated EHR systems. According to Roztocki and Weistroffer (2015), a safe patient data transmission across stakeholders should be possible with an EHR system.

EHR typically includes more information from a wider range of sources than the EMR and is usually managed by a hospital, health authority or provincial/territorial health department (Roztocki & Weistroffer, 2015). The HER, therefore, includes various records provided by various professionals and organizations and is accessible by several authorised parties in several healthcare locations (Roztocki & Weistroffer, 2015). The EHR designates a person's medical record, which can be accessed online from a variety of compatible systems within the same network (Raymond *et al.*, 2015).

Other expressions do exist to designate similar systems, but they have limited scope. These include the Electronic Patient Record (EPR) that contains clinical information about a patient from a particular hospital or a general medical unit (Mathews *et al.*, 2019). The EPR focuses on periodic care data provided by an institution, and each healthcare provider can have a single EPR for each user (Boonstra & Broekhuis, 2010; Brown *et al.*, 2020).

2.4.4 Telemedicine

Telemedicine is another frequently used terminology in the e-health system (Mathews *et al.,* 2019; Raymond *et al.,* 2015; Roztocki & Weistroffer, 2015). Telemedicine is defined as the:

> "Delivery of healthcare services where distance is a significant factor, as a result it is utilising technological advancements by medical professionals in information and communication world for the exchange of trustworthy information for the prevention, treatment, and detection of illnesses and injuries, as well as for research and assessment, and for the ongoing education of healthcare professionals, all with the aim of achieving the goal of improving the health through distance" (Mathews *et al.,* 2019).

According to Pappot *et al.* (2020), telemedicine covers a very broad field and includes any system aimed at supporting, through electronic means, activities related to health, ranging from patient education to healthcare delivery. care, through the training of professionals and management of the health system. Telemedicine thus makes it possible to overcome geographic, temporal, social and cultural barriers to facilitate the exchange of information and the provision of health services (Mathews *et al.*, 2019; Raymond *et al.*, 2015).

E-health is an integral part of telemedicine since it essentially concerns the access of the general public and patients to the world of health thanks to the Internet (Karamagi *et al.,* 2022; Kvedar *et al.,* 2014). It results from the new services offered by the Internet and the interest of citizens in medical information (Pappot *et al.,* 2020). The term telemedicine is often used as a subset of telehealth (Atallah, 2017; Jones *et al.,* 2011; Kootstra, 2004; Pappot *et al.,* 2020; Roztocki & Weistroffer, 2015). Indeed, telemedicine refers to clinical applications and aims to update knowledge and skills among professionals. Telehealth, for its part, includes the fields of education and research and promotes access to quality services for the population (Jones *et al.,* 2011; Pappot *et al.,* 2020; Roztocki & Weistroffer, 2015).

Telemedicine has this particularity that the doctor and the patient can be in contact while being physically not at the same place (Roztocki & Weistroffer, 2015). It is understood that, from the definition itself, postal communication is not part of telemedicine. Telemedicine includes teleconsultation, tele-expertise, remote monitoring and Tele assistance (Jones *et al.,* 2011; Pappot *et al.,* 2020; Roztocki & Weistroffer, 2015). Telemedicine allows health professionals to communicate and promote a patient’s care as part of a diagnosis or therapy. It covers the activities of tele-diagnosis, tele-supervision, tele-staffs, tele-surveillance and tele-surgery (Pappot *et al.*, 2020). These practices make it possible to rationalize the division of the health & social map and to ensure, at a lower cost, quality medicine thanks to remote access to specialised advice. Disrupting the practice of medicine, this activity can be the source of many conflicts and practical and legal difficulties (Chang *et al.*, 2021).

The responsibility of telemedicine players (doctors, health-promoting establishments and technological third parties) presents a certain number of specificities. They are induced by the originality of the activities carried out and by the legal framework developed to organize and conduct medical procedures remotely. For the time being, telemedicine suffers from a real lack of legal qualification (Chang *et al.*, 2021). This is an essential element in determining the applicable liability regime. Thus, confronting the practice of telemedicine with the law of obligations allows, on the one hand, to orientate its reflections useful for the constitution of networks and the resolution of conflicts. On the other hand, it will prove to be important for drawing up legal and ethical rules which will have to be put in place in the future. According to Reiners *et al.* (2019), telemedicine constitutes both a health service and an information service within the context of European legislation. There are no universal laws governing healthcare and the practice of medicine across Europe. Numerous topics, particularly those about medical responsibility and medical leges, still lack universal legislation (Reiners *et al.*, 2019). However, with the Covid-19 pandemic, telemedicine and remote care have become popular (Chang *et al.*, 2021). New professions have been authorized to practice remotely so that the population can continue to seek treatment.

Tele-consultation is a medical consultation that links, the patient with one or more physicians and, where appropriate, other health professionals at a distance using ICT (Kootstra, 2004; Reiners *et al.*, 2019; Suliman, 2002). Tele-monitoring is the remote monitoring by a physician of data clinical, radiological or biological characteristics of a patient transmitted by making use of ICT, whether collected by the patient himself, a physician or other health professional for diagnostic or treatment purposes. Tele-assistance is a medical procedure performed by a doctor remotely with the help of another physician to carry out a medical or surgical procedure.

2.4.5 M-Health

M-health (or mobile health) is a rising field that uses mobile technologies to reinforce the achievement of health objectives (Mathews *et al.*, 2019; Reiners *et al.*, 2019). M-health is all the services related to healthcare that are permanently available via a mobile device connected to a network; the most widespread among the general public being the smartphones or the tablets. In other words, it can also be said that m-health is e-health accessible through a mobile phone or a tablet (Mathews *et al.*, 2019; Reiners *et al.*, 2019).

M-health refers to “the various health services provided via the ICT used by patients and healthcare professionals through a mobile device” (Pappot *et al.*, 2020). M-health encompasses many fields of application, including digital technologies applied to health in a broad sense. They often include innovations that are more related to the notion of well-being than to specific questions of medical follow-up, but these can nevertheless provide a benefit in terms of prevention and individual control of one's health. M-health is therefore a set of digital means applied to the health field which allows the transmission of a mass of important data, coded and decoded by the technological tools through mobile devices (Pappot *et al.*, 2020).

2.5 Technologies used in E-health

E-health is progressively thought to be the promising method for enhancing the general quality, security, and productivity of the health delivery system (Reiners *et al.*, 2019; Suliman, 2002). ICT can massively affect all parts of healthcare, extending from giving individuals the data they have to carry on with a solid way of life to providing new apparatuses accessible for designing future medication (Reiners *et al.*, 2019). In this manner, ICT ensure more proficient and responsive human services system routed to patients, by offering a variety of Health advancements and in particular at home advances. E-health is, in this manner, a developing and critical new worldwide application (Chang *et al.*, 2021).

The main attributes of e-health are its capability to be an incentive of progress and democratise data comprehension. It is due to the way e-health addressed the difficulties of new and existing models of healthcare (Boonstra & Broekhuis, 2010; Brown *et al.*, 2020; Reiners *et al.*, 2019). Particularly e-health support tolerant human-driven services administrations to supplement and empower the customary social insurance conveyance models and engage in e-care (Reiners *et al.*, 2019).

The Consumer Electronics Show (CES), a yearly exhibition of technological innovation, was held in Las Vegas in January 2017. According to the CES report, the space devoted to start-ups in the health sector increased by 40 percent between 2014 and 2016. It should nevertheless be noted that this technology of connected objects for health covers two distinct areas: well-being and medical (Reiners *et al.*, 2019). Well-being refers "to applications intended for people in good health, and who want to remain so (fitness, electrocardiogram, measuring physical exertion and weighing food or monitoring their nutritional values, etc.)" as per Brown *et al.* (2020). As opposed to well-being, the medical concerns electronic curative approaches, which impact the effectiveness of the medical management of pathologies (Reiners *et al.*, 2019).

The e-health application is an inspiring practice that appears more and more as a solution to the great challenges of our time, in particular the ageing of the population and the increasing burden of chronic diseases (cancer, hypertension, diabetes, heart failure, Parkinson's, etc.). Among other things, e-health enables real-time patient monitoring, efficient and optimal management of resources, faster and more precise diagnosis, improved treatment results and even faster detection of chronic diseases (Chang *et al.*, 2021).

Among the recent technologies recognised for having great potential in the health sector, there are:

- **Internet of Things (IoT)**: It is an information infrastructure that makes it possible to interconnect objects (physical or virtual) using a communication system (RFID chips, Bluetooth, Wi-Fi, etc.). The term “Internet of Things” commonly refers “to situations where internet access and computing power are extended to objects, instruments, and common equipment that aren't typically thought of as computers, enabling these devices to generate, trade, and absorb data with little assistance from humans” (Bhatt & Bhatt, 2017). In healthcare, IoT can be used to connect multiple devices and medical devices/machines, to provide real-time information to healthcare professionals. The benefits of incorporating Internet of Things (IoT) characteristics into medical equipment for healthcare are improved quality and effectiveness of care, with significant value for the elderly, patients with chronic diseases, and those who need constant attention (Bhatt & Bhatt, 2017). Studies are being done on ways to change the healthcare business by improving efficiency, reducing expenses, and refocusing on improved patient care. The healthcare sector is experiencing a paradigm shift thanks to the Internet of Things (Bhatt & Bhatt, 2017). One can collect an incredible amount of real-time, life-critical data using an intelligent system and strong algorithms, which are gathered and analysed to help individuals in advanced research, administration, and critical-care settings. A key element is providing patient care at a very low cost. The IoT produces large amounts of data that falls under what is commonly referred to as Big Data (Chang *et al.*, 2021).

- **Big Data**: Refers to a "a huge amount of data that a conventional information management tool cannot independently process. There are numerous different types of this data mass, including numerical figures, pictures, movies, and sounds" (Reiners *et al.,* 2019). The analysis of Big Data in health allows them to be contextualized to obtain a more precise idea of the medical problem being treated. The increasingly large volume of this data requires other than traditional means to process it, hence the contribution of artificial intelligence (Reiners *et al.*, 2019).
- **Blockchain Technology**: A blockchain is a specific kind of database by design. It is made as a database that can only be read once (Dimitrov, 2019). This indicates that blockchain databases are intended to never be changed or erased. "Data recorded in a blockchain decentralised record is a transactional type of data that takes less storage space and is inaccessible to anyone as long as the owner has the private keys" (Dimitrov, 2019). The use of blockchain technology in healthcare is justified by the fact that maintaining a typical healthcare information system requires several tasks, such as performing backup storage services, having recovery mechanisms in place, and making sure fields are up to date (Dimitrov, 2019). Since there is no single point of failure in a blockchain, data are dispersed throughout the network, creating a built-in backup system. Additionally, each blockchain node

copies the same version of the data. As a result, the workload on the healthcare ecosystem is reduced by the volume of transactions that take place between information systems (Dimitrov, 2019).

- **Artificial intelligence**: It refers to "a collection of methods used to enable computers to mimic human intellect and solve complicated issues. Different methods, such as deep learning and machine learning, can be used to do it" (Rajpurkar *et al.*, 2022). The latter makes it possible to mimic the neural functioning of the human brain to teach a machine how to identify and classify data on its own. It was previously necessary to define each of the rules that a tool had to follow to understand and classify information.

Due to artificial intelligence, the increasing volume of data and the computing power of computers, it is now possible to build algorithms to obtain automatic and more precise responses to a medical problem (Rajpurkar *et al.*, 2022; Secinaro *et al.*, 2021; Ziuziański *et al.*, 2014). The use of digital tools in the health and medico-social field improves the daily lives of health professionals and patients (saving time, diagnostic aid, etc.), promoting the quality and safety of care, improve the efficiency of the health system (for example by avoiding redundant procedures) and promote equal access to care at all points of the territory. E-health is therefore an opportunity, but it must be developed within a controlled framework (Secinaro *et al.*, 2021; Ziuziański *et al.*, 2014).

2.6 Method and Evolvement of E-health

According to Agbele *et al.* (2010), talk about the issues correlated to the quickly evolving utilisation of data as a currency of modern economies. Access to data has critical advantages that can be accomplished in numerous areas that include social-economic development, healthcare, education etc. (Ziuziański *et al.,* 2014). In social insurance, for instance, access to proper data can limit visits to doctors and times of hospitalisation for patients experiencing chronic conditions, for example, asthma, diabetes, hypertension and HIV (Agbele *et al.,* 2010; Wilson *et al.,* 2021). This has helped to reduce the cost of social insurance provision. This review looks at hypothetical and calculated parts of e-health as an lCT application area.

Medical and healthcare practices are being transformed by e-health. The discipline has experienced significant expansion, and the creation of new technology has made it easier to conduct medical research and practise personalised medicine (Cuff, 2023). How we diagnose, treat, manage, and prevent health disorders has been transformed by using e-health, which has also revolutionised the way healthcare is delivered. It is a complicated field with many participants, including physicians and researchers with knowledge in a variety of fields, including biomedical engineering, data technology, health informatics, and healthcare (Cuff, 2023).

The main goal of e-health is to optimize patient care (Granja *et al.,* 2018; Mathews *et al.,* 2019; Raymond *et al.,* 2015; Tosuntaş *et al.,* 2015). In the therapeutic protocol, it is around the comfort and benefit of the patient that e-health technologies are developing (Roztocki & Weistroffer, 2015). From this point of view, several benefits are associated with remote medicine. The first benefit is to allow the patient to be better followed, better advised, better-taken care of and, undoubtedly, at a lower cost (Granja *et al.,* 2018; Mathews *et al.,* 2019; Raymond *et al.,* 2015; Roztocki & Weistroffer, 2015; Tosuntaş *et al.,* 2015). The best care comes from networking and facilitating exchanges between researchers, experts and practitioners from different areas of the disease and on the evolution of treatment protocols. As for the best care, it comes from the personalization of care and pathologies, which increases patient comfort. The second benefit is in what Doolin (2016), called the transfer of skills, resulting from exchanges between professionals. Not only within the same category, but also between different health professionals, such as between a diabetologist and a therapeutic education nurse. The third advantage is in medical equipment: new technologies offer doctors new tools to practice their profession, especially in terms of making a diagnosis (Granja *et al.,* 2018; Mathews *et al.,* 2019; Raymond *et al.,* 2015; Roztocki & Weistroffer, 2015; Tosuntaş *et al.,* 2015).

E-health offers a considerable field of development where collaboration between information technology, nanotechnology research and Internet progress can lead to a marked improvement in the management of certain pathologies (Holden & Karsh, 2010; Wilson *et al.,* 2021). E-health tends towards empowering patients who no longer have to leave their homes to receive care (Mathews *et al.,* 2019). This robotization of health and this systematic application of the connectivity of objects to health is at the heart of telemedicine, which makes it possible to anticipate changes in health status by equipping patients with various connected objects allowing their physiological parameters to be monitored in real-time and from their homes (Holden & Karsh, 2010; Wilson *et al.,* 2021). Of course, these digital devices completely change the conditions for practising the profession of a doctor, which is based on close-to-hand consultation.

The increasing availability of smartphones and other objects connected to the Internet (tablets, etc.) has revolutionized many fields of activity thanks to digitization processes, the integration of certain sensors, etc. (Mathews *et al.,* 2019). In the early 1990s, the medical industry used ICT extensively across a variety of sectors, which served as a manifestation of the practise of information systems in wellbeing treatment (Sezgin & Yıldırım, 2014). With the advancement of ICT and the rise of certain mobile technologies such as connected objects (smartphones, tablets etc.) a digital revolution in the field of health and good-being has been observed and it has completely changed the offer of traditional health and well-being care (Touria & Adédiran, 2017). With the use of technology, the patient tends to become autonomous and to undertake personal preventive actions for his good health and well-being, while sometimes deeming it necessary to call a doctor in the event of a problem (Sezgin & Yıldırım, 2014).

The development of telehealth has made it possible to enhance patients' quality of life, particularly that of the aged, incapacitated individuals, and those suffering from ongoing medical conditions (Ravì *et al.,* 2016; Raymond *et al.,* 2015; Shaw *et al.,* 2017). "Telehealth is an expansion of telemedicine, which unlike the latter in addition to the curative aspects of the field, includes preventive aspects related to health and well-being" as per Touria and Adédiran, (2017). Telehealth provides healthcare by overcoming geographic, temporal, and even organizational barriers (Sezgin & Yıldırım, 2014). It addresses (1) issues with health services brought on by the rise in chronic diseases, (2) poor lifestyles brought on by unhealthy lifestyles, high costs of health services, (3) the need to empower patients so that they can better manage their health, and (4) the need to provide healthcare regardless of location or time. (Raymond *et al.,* 2015; Westerman, 2006).

The proliferation of mobile devices (connected objects) in the 1990s made it easier to download medical records, test results, scanners, patient information as well as medication (Raymond *et al.,* 2015). Due to these mobile devices (connected objects) such as mobile phones, tablets, mobile applications, and computers, patients can at any time and any place be informed of their diagnosis, ensure a follow-up and control their state of health, communicate with a health professional in an emergency, obtain personalized care and coaching, participate in discussions and online support groups concerning their general well-being, etc. (Karamagi *et al.*, 2022; Kvedar *et al.*, 2014; Touria & Adédiran, 2017). All these new services in the field of health were considerably at the origin of the emergence of a new term namely, 'mHealth' also called 'mobile health' or 'connected health'; which means access to health services through wireless mobile technologies (Karamagi *et al.*, 2022; Kvedar *et al.*, 2014; Touria & Adédiran, 2017).

Teleconsultation tools are thus defined as genuine crisis technologies, part of an emergency logic (Touria & Adédiran, 2017) where time is short, saved and rationalized. But while the literature questions this rationalization of medical time and sees it as a possible risk, especially concerning the lack of freedom to adapt medical practice, the health crisis has led doctors to favour these rationalization tools instead. In addition to the savings in consultation time, there are savings in certain medical tasks such as monitoring or administering daily care. Indeed, distance medicine induces a modification of skills which has been identified by research for several years (Karamagi *et al.*, 2022; Kvedar *et al.*, 2014; Touria & Adédiran, 2017).

2.7 Benefits of E-health

E-health is regarded as a critical component of the healthcare system, on which all procedures of care delivery rely (Gagnon *et al.*, 2016; Karamagi *et al.*, 2022; Kootstra, 2004; Kvedar *et al.*, 2014). The significance of these systems arises from their critical role in handling all patient data and information, including investigations, diagnoses, treatments, follow-up reports, and essential medical decisions. E-health can increase advantages to healthcare professionals, patients, and organisations (Jones *et al.*, 2011; Pappot *et al.*, 2020; Roztocki & Weistroffer, 2015). It can increase the condition of medical care and patient welfare by facilitating workflow (Jones *et al.*, 2011; Pappot *et al.*, 2020; Ravì *et al.*, 2016; Roztocki & Weistroffer, 2015; Shaw *et al.*, 2017).

E-health opens up a slew of possibilities for improving patients' service quality and meeting healthcare providers' and healthcare organisations' expectations and involvement. It enabled organisations to work together to improve services and cut operating costs when necessary (Jones *et al.*, 2011; Roztocki & Weistroffer, 2015). The idea of e-health emerged from the awareness was born out of the realisation that the efficacy and efficiency of healthcare service delivery may be greatly increased by utilising ICTs, notably through the Internet and providing distance consultation (Elliott *et al.*, 2016; Raymond *et al.*, 2015; Tosuntaş *et al.*, 2015).

Patient and public health data management (electronic health records), provision of remote healthcare services (telemedicine/telehealth), health information and services via mobile telephone technology (mHealth), health knowledge management, and distance learning for health workers are all examples of e-health applications in medicine and public health (Elliott *et al.*, 2016; Raymond *et al.*, 2015; Touria & Adédiran, 2017). Other uses include medical device connectivity (internet of things), enhanced healthcare planning, organisation, and management, notably at the subnational level, and the handling of huge public health data. Wearable gadgets that monitor, analyse, and send vital signs to personal or central repositories might be utilised to enhance personal (Granja *et al.*, 2018). E-health has been effectively used to avoid non-communicable illnesses such as cancer, maternity and child health, vaccination, HIV/AIDS management, vital medications, and medical product supply chain management, among other things (Gagnon *et al.*, 2016).

Other possible advantages include recognising and eliminating societal, physical, and financial impediments to fair access to healthcare, as well as the digitization of health insurance systems, which might improve their efficiency (Gagnon *et al.*, 2016). As a result, e-health has the potential to provide high-quality, low-cost healthcare to the final mile. However, when E-health is matched with national health priorities, development goals, and, more importantly, citizen demands, these advantages accrue and are fulfilled.

The World Health Organization (2016) has highlighted ICT application as one of the primary strategies to improve healthcare quality. Poor coordination of treatment as a result of information inaccessibility, as a result of the nature of paper-based medical records, has negative implications and adds to greater medical expenses (Gagnon *et al.*, 2016). E-health has the potential to improve healthcare coordination by making information electronically available and accessible at the time of service, particularly if broadly deployed. There are several advantages to physicians and healthcare professionals using and adopting a digital health system (Gagnon *et al.*, 2016; Heinsch *et al.,* 2016). These include aspects like efficiency, accuracy, care quality, information accessibility, and care administration.

2.7.1 Efficiency

E-health has enhanced workplace efficiency and work practises, saved time and enhanced production (Gagnon *et al.,* 2016). Many care coordination and documentation responsibilities can be handled by health information systems, freeing physicians to focus on other elements of their professions. For example, e-health can prevent the generation of duplicate records while yet allowing continual and easy access to patient data (Atallah, 2017; Heinsch *et al.*, 2016; Jones *et al.*, 2011; Pappot *et al.*, 2020). This implies that numerous requests for access to the same patient record can be made at the same time.

Simple automated operations can be used to replace complex everyday chores. E-health systems have enhanced clinical treatment by swiftly organising and merging various tactics, and they can generate trends and statistics almost instantly (Gagnon *et al.*, 2016). Electronic clinical notes offer more detailed information than traditional paper charts, which only supply roughly a third of the data needed when delivering patient care. E-health information systems make documentation particularly efficient (Atallah, 2017; Jones *et al.*, 2011; Pappot *et al.*, 2020).

Holding and accessing educational resources for patients via the e-health system is also more efficient and cost-effective than maintaining them on paper since it saves on paper, filing time, and data lookup (Gagnon *et al.*, 2016). Another important method e-health system boost efficiency is by combining clinical and administrative operations. As a result, communication across departments and services increases, which boosts efficiency (Gagnon *et al.*, 2016).

2.7.2 Accuracy

Medication mistakes are reduced, and drug management is improved, thanks to e-health system. It also makes it possible to keep track of drug allergies and keep more detailed records of all medications supplied (Reiners *et al.*, 2019; Schoen *et al.*, 2012; Yusif *et al.*, 2017; Zayyad & Toycan, 2018). Electronic records eliminate ambiguity and transcribing mistakes since they have superior presentation and readability, allowing for a higher degree of information. Nurses who recorded clinical information quickly created clinical notes that were more precise and complete since the information was not lost, according to Peterson (1995).

2.7.3 Care of high quality

The quality of care is improved by using health information systems. Staff can spend more time enhancing the quality of patient treatment or boosting patient throughput because of the enhanced efficiency (Yusif *et al.*, 2017). Health information systems are also seen as improving the treatment experience for physicians who previously only had access to their offices since they allowed them to spend more time with their patients (Wang *et al.*, 2015). They also enhanced the quality of care by making clinical information timelier and more comprehensive (Reiners *et al.*, 2019; Schoen *et al.*, 2012).

2.7.4 Information Accessibility

Health information systems improve the accessibility and availability of information by providing quick and simple access to clinical data (Schoen *et al.*, 2012; Yusif *et al.*, 2017; Zayyad & Toycan, 2018). Medical record accessibility and physical distance issues are no longer an issue. In terms of reporting, organising, and locating clinical information, it much outperforms the paper record. The absence of organisation in the paper record makes it difficult to locate specific information promptly (Yusif *et al.*, 2017; Zayyad & Toycan, 2018). For example, lacking current diagnostic information such as laboratory test results.

Computerized clinical notes have a standard structure that assures that critical facts are recorded for all consultations, resulting in a higher-quality record for the doctor, patient, and anyone else who needs to access the notes. In addition, this electronic medium is incredibly adaptable and dynamic. This flexibility includes the ability to change and reconfigure the system at any moment, as well as the ability to add new capabilities and customise the processes. Access to information regarding population health is also possible through e-health. This is useful for planning purposes. The availability of diagnostic data allows for a study of the population's health profile, and health outcome data may also help to better patient care (Yusif *et al.*, 2017; Zayyad & Toycan, 2018).

2.7.5 Care Administration

A health information system helps with care management by providing data for evaluation and payment of patient care services, continuing medical education, health services research, technology assessment, and policy analysis (Peterson, 1995). It also aids clinical decision-making, which is critical in care management. Information regarding the costs of clinical diagnostic procedures, guidelines, warnings or alerts about drug interactions, and reminders are all examples of decision assistance.

Jolibert and Jourdan (2006) demonstrated E-health conceivably improves quality of care and may reduce medicinal care costs. Nonetheless, an audit of efficient surveys distributed in 2010 presumed that high-quality evidence on the advantages of E-health interventions is still lacking. The author has carried out a systematic review and meta-investigations on the cost-effectiveness of E-health mediations in patients with the substantial disease to examine whether, and to what conceivable degree, the result of late research backings or contrasts from past conclusions.

According to a Delice (2010) study, the number of efforts, resources, time, people and corporations commitments invest to conform with established healthcare systems might be significantly reduced with the smart use of IT, particularly e-health. Some researchers (Reddon & Jackson, 1984; Schoen *et al.*, 2012) recognised the benefits of e-health systems, including the availability of information in a single, easily accessible location, the streamlined provision of services to patients, and the enhanced relationships between healthcare professionals and patients.

2.8 Challenges / Barriers Related to E-health System

Despite the numerous benefits that health information systems may give to healthcare, there are still several roadblocks in the way of their complete deployment (Elliott *et al.*, 2016; Granja *et al.*, 2018; Mathews *et al.*, 2019; Ravì *et al.*, 2016; Raymond *et al.*, 2015; Tosuntaş *et al.*, 2015). These barriers include things like technical barriers, e-readiness, system failure, concerns about confidentiality, security, and privacy, inefficiency, impact healthcare quality, changes in the work process, healthcare complexity, and practitioners' lack of acceptance.

2.8.1 Technical Blockades

The application of e-health programmes has a number of technology issues, including the absence of centralised hospital infrastructure and standards sharing amongst hospitals and health organisations (Wilson *et al.*, 2021). One of the utmost noteworthy obstacles to e-health is an absence of ICT infrastructure (Zayyad & Toycan, 2018). Internetworking is essential to enable proper information exchange and to establish new avenues for service delivery and communications (Zayyad & Toycan, 2018). An architecture, or guiding set of concepts, models, and standards, is required for the transition to e-health. The digital gap affects many poor organisations, and they are unable to install the necessary ICT set-up for e-health implementation (Zayyad & Toycan, 2018). One of the most significant problems in implementing e-health systems has been recognised as the digital divide (Reiners *et al.*, 2019).

According to Bryman (2017), a robust technical infrastructure is required to deploy the entire e-health system architecture. Healthcare organisations must consequently establish an adequate telecommunication infrastructure to supply e-health services (Reiners *et al.*, 2019). Furthermore, they emphasised that the success of e-health deployment will be determined by how diverse infrastructures' capacities are designed and exploited with an integrated approach (Reiners *et al.*, 2019).

2.8.2 E-Readiness

Telecommunications and computer equipment are not the only components of technical barriers. People must also have e-readiness and ICT literacy to use and profit from e-health applications. E-readiness is a metric that determines how prepared or ready a company is to take advantage of, utilise, and benefit from the digital economy (Liu & Huang, 2015). According to Reiners *et al.* (2019), ICT literacy is the ability to participate in an information technology society by accessing, using, integrating, analysing, and producing information by means of ICT tools, communications tools, and applications. The success of e-health is influenced by a variety of elements, including education, adaptability, and a desire to learn new things.

2.8.3 System Inaccessibility

System failure is a significant impediment, as it prevents access to patient records when the computer system goes down. Users are distrustful about having to rely on computer hardware and software to generate healthcare records as a result of this (Sezgin & Yıldırım, 2014). In addition, many hospital information systems were not designed using the same rigorous software engineering methodologies employed in other safety-critical domains like air traffic control. As per Bryman (2017) when software misjudged the risk of Down Syndrome, for example, it was a system failure.

2.8.4 Privacy, Confidentiality & Security

In both developed and developing nations, privacy is a big concern when it comes to e-health deployment. Concerns regarding information exchange, as well as the leak or mismanagement of personal data, are widespread (Belanger & Hiller, 2016). In 1976, Alan Westin defined privacy as "an individual's right to choose what information about oneself can be shared with others" (Bouraima & Çetin, 2017). Furthermore, it refers "to the assurance of an acceptable degree of security for personally identifiable information" (Lee *et al.,* 2003). When dealing with the privacy issue in the context of e-health, both technological and policy measures may be necessary.

"One of the most important considerations in the establishment of e-health systems is security" (Bouraima & Çetin, 2017). Security is one of the problems with global e-health systems, according to several research, which affects both individuals and organisations (Belanger & Hiller, 2016). Security refers to "the safeguarding of data and systems against unintentional or purposeful disclosure, illegal access, alteration, or destruction" (Lee *et al.,* 2003). As a result, it has to do with managing access to the data itself as well as protecting computer systems and property (Lee *et al.,* 2003).

Computer security, network security, document security, and personal data confidentiality are all common components of security (Liu & Huang, 2015). It also covers upkeep and e-infrastructure security, such as firewalls and access controls for individuals who have access to the data. Furthermore, the use of security technologies in e-health applications, such as encryption, can help meet security goals (Liu & Huang, 2015).

The greater focus on security may result in a lack of interest in patient privacy protection. Patient’s privacy, processing, and collection of personal data for lawful purposes are all protected by healthcare organisations (Sharma, 2017). Privacy and secrecy, according to Belanger and Hiller (2016), are major roadblocks to e-health implementation. Patients are worried about their personal data's privacy and confidentiality. As a result, while developing an e-health system, privacy and confidentiality must be prioritised to enable secure data collecting (Almaiah *et al.*, 2016).

Possession of data responsibility, in the healthcare industry as a rule is an area with no unmistakable rules. A patient's record for instance could be the sole property of the patient, yet can his doctor likewise guarantee possession? This test is worried about the production of approaches and guidelines that draw clear proprietorship limits.

Security, trust and liability issues are challenges focused on the risk of exposing private data, data leakage, and data loss and the absence of learning about the area and jurisdiction of the medical information (Almaiah *et al.,* 2016). From the human services suppliers' viewpoint, e-health introduces a high risk of liability in instances of data loss or leakage creating loss of reputation and patients' trust (Almaiah *et al.,* 2016).

2.8.5 Financial / Cost Barriers

The most important impediment to e-health deployment is a lack of funds, as e-health projects are often quite costly (Cau-Bareille *et al.,* 2012). To accomplish the objectives, it is essential to ensure the availability of the planned and actual financial resources. The idea of paying the substantial sums that a good e-health system will cost is unworkable from a budgetary politics perspective since every organisation's budget is already overloaded with every possible item that budget writers can squeeze into it (Cau-Bareille *et al.*, 2012).

Johnson (2013) said that “demonstrating the profits on such a massive investment was challenging”. Information and communication technology are neither a one-time nor a low-risk capital investment, and it comes with several hazards, including the organization's actual financial cost and the unpredictable cost-benefit trade-off with individual systems. According to Carvin, Hill, and Gohiers (2004), many organisations face the challenge of supporting e-health projects because it is expensive to develop and maintain computer systems, even when a healthcare body/organisation has a strategy for implementing e-health. According to Bryman (2017), “the absence of financial backing for capital investment in new ICT systems is a fundamental barrier to e-health in small clinics”.

2.8.6 Organizational change

The move towards E-health required huge changes to clinical and business procedures and the authoritative limits in the healthcare industry. This challenge is concerned with the progressions that an e-health will present upon participants. Cases of such changes could be as new strategies, techniques and work processes notwithstanding changes in how restorative procedures and documentation are finished (Shaw *et al.*, 2017).

According to Cau-Bareille *et al.* (2012), e-health is more of an organisational challenge than a technical one. The demand that e-health be treated as an organisational transformation issue rather than an IT deployment challenge is one of the main concerns raised by stakeholders concerning the adoption of e-health. Organisational difficulties incorporate issues with procedure and directive, a shortage of trained and competent workers, and a deficiency of cooperation and teamwork (Shaw *et al.,* 2017).

2.8.7 Legislations and Policies

There are still no unmistakable or sufficient enactments and rules for clinical, specialized and business practices of the healthcare industry in the e-setting (Kerikmäe, 2017). This incorporates the absence of guidelines for medicinal informatics, approaches, between operability and transmission strategies in e-health (Kerikmäe, 2017). In such a case, the partners in the e-health do not have a strong base to begin offering and utilizing it. Therefore, more issues may happen because of this shortage and technical, social and moral concerns will emerge.

According to Linstad and Ekeland (2019) currently, There are a few models and characterizations for well-being data frameworks by and large some of which can be received for e-health. One case is the International Classification of Diseases tenth revision (ICD-10) issued by the WHO in the year 2016. It characterizes a therapeutic arrangement list for the coding of diseases, signs or anomalous discoveries, complaints, social conditions and external reasons for injury or disease (Linstad & Ekeland, 2019). The e-health developers can concur on embracing some of these characterized norms and arrangements to empower interoperability among various associations.

“Implementing e-health principles and functions requires a number of new rules, policies, laws, and organisational changes to address electronic activities like digital archiving, digital signatures, the exchange of information, data protection, intellectual property rights, and copyright issues” (Linstad, & Ekeland, 2019). Dealing with e-health necessitates the execution of a bond or a digital arrangement that is endangered and recognised by structured legislation that safeguards and secures these types of actions or procedures. Many countries still lack computerisation legislation (Linstad, & Ekeland, 2019).

2.8.8 Scarcity of skilled workers

Another key impediment to e-health ambitions in the healthcare sector, is the lack of ICT expertise. This is especially true in developing nations, where there has long been a worry about a persistent scarcity of trained workers and inadequate training for human resources (Enaizan *et al.,* 2020). The convenience of necessary skills is vital for the successful deployment of e-health. E-health necessitates human capabilities in terms of technology, healthcare, business, and management (Yusif *et al.,* 2017). Technical abilities is important and it is necessary to have expertise in the use and management of online e-health procedures and functions as well as ICT infrastructure deployment, maintenance, design, and installation.

2.8.9 Cultural Factor

The biggest impediments to e-health deployment are not technological, but rather the cultural consequences of new technology (Enaizan *et al.,* 2020). Culture encompasses a variety of concepts, including a society's ideas, values, and behaviour (Brown *et al.,* 2020). Cultural variables are more likely to impact personal qualities and subjective conditions than the actual conditions surrounding the creation and dissemination of new technologies. As a result, how healthcare providers and policymakers use new technology and online platforms is heavily influenced by cultural and individual behaviour patterns (Yusif *et al.,* 2017).

2.9 Attempts taken to overcome the barriers of e-health

Among all the challenges trust, privacy and security develop as the significant attentiveness toward the e-health implementation (Yusif *et al.,* 2017; Zayyad & Toycan, 2018). Consequently, they have been attempts to offer answers to handle these concerns and enhance the security and privacy of e-health.

To ensure the legal recognition, privacy, and security of electronic interactions and affairs, safeguards and legislative changes are required. Law and public policy must be considered by policymakers when establishing e-health (Bryman, 2017). The initiative must have a broad, non-technological approach. Old laws, outdated regulatory systems, and overlapping and contradictory authority can all make an e-health project more difficult or even impossible to complete (Yusif *et al.*, 2017; Zayyad & Toycan, 2018). Before the internet world can run effectively, legal changes and new policy directives may need to be implemented.

Kreif *et al.* (2016) surveys communication issues required in the plan of successful and accommodating e-health applications to help manage key advancement and usage of health data advances. There is a communication revolution evolving in the conveyance of human services and the advancement of health energized by the development of capable new health information technologies. The improvement, selection and execution of an expansive scope of new e-health applications, (for example, online health data sites, intuitive electronic health records, health decision support programs, custom-made health training programs, human services framework entries and progressed health applications) holds huge guarantee to expand customer and supplier access to pertinent health information, upgrade the nature of care, decrease social insurance error, increment coordinated effort and support the appropriation of sound practices (Yusif *et al.*, 2017; Zayyad & Toycan, 2018). With the development of new and health information technology openings, nonetheless, comes the overwhelming duty to plan interoperable, simple to utilize, drawing in, and available e-health applications that impart the correct data expected to guide medicinal services and health promotion for differing groups of people.

Kreif *et al.* (2016) suggested IT is progressively utilized as a part of medicinal services to enhance and upgrade therapeutic administrations and to decrease costs. In this unique circumstance, the outsourcing of computation and capacity resources to general IT suppliers (distributed computing) has turned out to be exceptionally engaging. E-health offers new conceivable outcomes, for example, simple and pervasive access to therapeutic information and opens doors for new plans of action. However, they additionally bear new threats and raise challenges concerning security and protection viewpoints (Yusif *et al.*, 2017; Zayyad & Toycan, 2018).

There are a few inadequacies of current e-health solution and benchmarks; especially they do not address the client platform security, which is a vital perspective for the general security of e-health frameworks (Yusif *et al.*, 2017; Zayyad & Toycan, 2018). To fill this gap, the author has presented security architecture for setting up protected areas in e-health foundations. Our solution gives customer stage security and appropriately joined with system security ideas (Yusif *et al.*, 2017; Zayyad & Toycan, 2018). Yusif *et al.* (2017), have also discussed further open issues and research challenges on security, protection and ease of use of e-wellbeing cloud frameworks.

Any innovation is less likely to be accepted without top management backing, according to the research (Hossain *et al.*, 2019; Zayyad & Toycan, 2018). As a result, successful adoption of e-health requires backing from the highest levels of healthcare organisations. The commitment of top management to promote a good atmosphere that stimulates involvement in e-health applications is referred to as top management support (Hossain *et al.*, 2019; Yusif *et al.*, 2017; Zayyad & Toycan, 2018). It is serious to the acceptance and execution of e-health (Hossain *et al.*, 2019). Leadership is one of the most important components in the success of any new or creative project or effort, and it is also required for the implementation of e-health.

Healthcare organisations should gather the necessary resources to enhance management and create and sustain a culture of support for new e-health system operating procedures throughout the organisation. Management engagement and clear lines of accountability are essential to overcoming one's natural resistance to organisational transformation (Hossain *et al.*, 2019). Vertically Integrated e-health preparation, the procurement of the resources that are needed, the motivation of staff members, the encouragement of relationships with foreign team members and all parties concerned, and interdisciplinary and organisational collaboration all depend on strong leadership and an integrated vision of IT.

However, leaders who contend they have nothing to gain from e-health employment cannot be relied upon for long-term support. Leaders who perceive a possible advantage from promoting e-health are more inclined to back such initiatives, even if they came across hindrances (Hossain *et al.*, 2019; Yusif *et al.*, 2017). All public and private hospitals' leaders, managers, and administrators need to get training in the planning and administration of ICTs, with a focus regarding accessibility, entrepreneurship, and efficient distribution of health information and amenities (Enaizan *et al.*, 2020).

Coordination and collaboration between public and private institutions, as well as at the local, regional, and national levels, are critical components of the e-health expansion process (Enaizan *et al.,* 2020). Partnership and support, on the other hand, are not easy to achieve. To maintain their control, influence, and hierarchical standing, health organisations frequently oppose open and transparent methods (Cohen *et al.,* 2011). It is critical to strive to develop confidence in the system to ensure that other interested parties and healthcare providers will work together in the e-health initiative (Enaizan *et al.,* 2020).

2.10 E-Health and Healthcare Providers

E-health might lessen the occurrence of mistakes by overcoming challenges with handwriting and physical storage needs (Mathews *et al.,* 2019). According to a descriptive study of nursing staff conducted by Moxey *et al.* (2010), e-health was more of a help than a hindrance to care, 75 percent of respondents said that e-health improved documentation, indicating that technology was more of a benefit than a burden to healthcare. In addition, 54 percent of respondents think that electronic health records are safer than data stored on paper, and 76 percent think that e-health will eventually lead to higher-quality medical care.

According to Walsh *et al.* (2004), when inputting data into a computer, some doctors' cognitive load is higher than when hand typed, the usage of e-health may be limited by the decreased cognitive burden experienced by practitioners working on computers. E-health, however, provides a number of benefits over conventional paper-based records, including generating reminders, computational methods, references as well as risk calculators, decision-making structures, and best-evidence resources (Walsh *et al.,* 2004).

According to Mathews *et al.* (2019), other benefits of e-health for healthcare practitioners include enhanced data management, easy access to data, and more readability of data. Most healthcare workers claim that by using their e-health, they are able to finish their work earlier and have more free time. Electronic medical records are a useful tool that doctors with immediate access to may use to make correct diagnoses in life-threatening situations. Poissant *et al.* (2015), and Mathews *et al.* (2019), emphasised the influence of e-health on doctors' and nurses' time efficiency. These studies looked at a key benefit of e-health systems: time efficacy and accessibility.

In order to identify patients who are chronically ill and in need of medical testing, doctors may use electronic health to do so (Raymond *et al.,* 2015). Additionally, they emphasised the need for better clinical information availability, which would increase the amount of information accessible for patient therapy. The findings of Raymond *et al.* (2015) revealed that, following the use of e-health system, physicians spent around five minutes less with each patient during clinical visits as compared to traditional paper-based records. Doctors could have more time each day to see more patients thanks to the e-health system, which is another important advantage (Granja *et al.,* 2018; Mathews *et al.,* 2019).

According to Godin *et al.* (2008), e-health is, however, made up of multiple different technologies or features that must be employed together if their whole ability should be recognised. They emphasised that doctors can partially embrace an e-health system by utilising only a handful of the system's functions. End-users' willingness to fully leverage e-health systems is being hampered by their rising technological sophistication (Godin *et al.,* 2008). In another statement Godin *et al.* (2008) claim that "broad partial EHR adoption may take place without producing the anticipated improvements in clinical results, safety for patients, and cost control".

Kesse-Tachi *et al.* (2019) indicated that attaining interoperability was difficult, because the different systems are incompatible, and that they do not interact with one another. The majority of healthcare institutions constructed their IT systems independently. It doesn't seem as though e-health registries were created in a systematic or thorough manner (Kesse-Tachi *et al.,* 2019). There are no reports in the literature that a nation has succeeded in establishing a comprehensive database on ailments and remedies that enables a range of stakeholders to use that information.

2.11 E-Health in Africa

The market economic sector of health industry's technological products and services is rising and booming (Jones *et al.,* 2011; Roztocki & Weistroffer, 2015; Shaw *et al.,* 2017). These technologies alone cannot solve all the problems. However, by reducing distances and facilitating rapid exchanges, they can contribute to a valuable improvement in health services (Roztocki & Weistroffer, 2015; Shaw *et al.,* 2017). More than 2 percent of health expenditure in Africa is devoted to investments of this nature with strong annual growth of 9 percent. Most of the projects are in the experimental stage, but they provide a glimpse of developments in the years to come (Metsallik *et al.,* 2018).

The area of the world with the greatest health challenges is Africa (Bouraima & Çetin, 2017). Two main structural issues concern the continent. The first challenge is to alleviate the shortage of health personnel (Bouraima & Çetin, 2017). It is with solutions linked to telemedicine that ICTs can help to partially compensate for these shortcomings. The second challenge aims to improve the quality and density of general health infrastructures, from healthcare organisations to the distribution of medicines, including the fight against counterfeiting and the creation of networks of experts (Bouraima & Çetin, 2017). Here again, ICTs have a role to play, by connecting hospitals, improving the logistics management of drugs, etc. ICTs do not make it possible to regulate all the difficulties of health in Africa, but they make it possible to bring new avenues, new paths for the patient.

Faced with these challenges, and contrary to popular belief, financial resources exist. Indeed, health expenditure is correlated with the wealth of countries (health expenditure represents, in African countries, about 4 percent of Gross Domestic Product GDP), as shown by empirical studies by the World Health Organization (2016) and this, with rare exceptions, whatever the standard of living.

Health expenditure amounted to 51 billion dollars in 2014 for the entire African continent (Bouraima & Çetin, 2017). According to an IFC (International Finance Corporation) study published in 2017, in sub-Saharan Africa, around 50 percent of total health expenditure goes to private providers (commercial companies, etc.) and about 60 percent of health financing comes from private sources (commercial, social enterprises, NGOs, etc.). In addition, there is an informal health sector made up of healers, midwives and drug vendors that should not be overlooked (Bouraima & Çetin, 2017). In Zambia, 40,000 practising traditional healers collect 60 percent of total household health expenditure (i.e., 13 percent of total health expenditure) and in Nigeria, in the rural zone, the first consultation is with a traditional healer in 12 percent of cases (Bouraima & Çetin, 2017).

Regarding the financing of ICTs in health, an analysis of the health market in Africa showed that out of the 51 billion dollars for health, a little more than one billion dollars is devoted to ICT budgets (Bouraima & Çetin, 2017). A threshold analysis shows that this amount breaks down as follows: 47 countries spend less than $ 50 million, 37 countries spend less than $ 10 million, 24 countries spend less than $ 5 million and 9 countries less than $ 1. millions of dollars.

Besides the question of funding, another problem that arises is that of human resources. Sub-Saharan African countries represent 11 percent of the world population but carry 25 percent of the global disease burden compared to 9 percent in Europe (Katurura & Cilliers, 2017). In a problematic reversal, human resources for health at the global level are only 3 percent in Africa against 28 percent on the European continent and the health budget in Africa is less than 1 percent of global expenditure in this area. Of the 57 countries in the world suffering from a critical shortage of health workers as defined by the World Health Organization (2016), 36 are in Africa (Katurura & Cilliers, 2017).

The issues around health remain critical in Africa (Bouraima & Çetin, 2017). More than in any other continent, the gap between morbidity, the level of pandemics on the one hand, and resources on the other, continues to widen. ICTs provide solutions: they make it possible to partially compensate for the lack of technical and human resources, by promoting the exchange of data making it possible to concentrate medical investments and expertise on a few sites. This pooling of resources thanks to the exchange of data ultimately allows a significant gain in productivity: once the networks are installed, the maintenance cost is low and obsolescence less rapid than for the medical equipment itself (Elliott *et al.*, 2016; Touria & Adédiran, 2017).

On the continent, mHealth, EMR and telehealth are the most popular E-health solutions (Katurura & Cilliers, 2017). E-health in radiology and social media is gaining popularity as well (Katurura & Cilliers, 2017). There have also been new intergovernmental agreements established between the Ministries of Health and ICT. Digital medical devices, which are crucial components of digital clinics and the production of digital patients, have been recorded in several nations across the area. The utilisation of medical gadgets to assist remote diagnostic processes and procedures is a common feature of digital clinics, bridging the gap created by a shortage of qualified health workers (Katurura & Cilliers, 2017).

In Zambia, South Africa, and Gambia, for example, computer-assisted screening for chest X-ray has been employed, while digital ultrasound (using mHealth/telemedicine technologies) has been used in Tanzania (Katurura & Cilliers, 2017). In Kenya, Tanzania, and Ghana, rapid diagnostic tests (RDT) are incorporated into a cloud-based mHealth Smart reader system, while in Uganda and Malawi, a Smartphone-powered, cloud-enabled portable electrocardiograph (ECG) is employed. Malawi, which created and approved national e-health) policy in 2003, Cabo Verde in 2007, Ghana in 2010, and Kenya in 2011 were early adopters of e-health on the continent, after which numerous African nations began to use e-health as a method to enhance healthcare delivery (Katurura & Cilliers, 2017).

In hospitals in the capital or large cities, in particular, in South Africa and the Maghreb, networking the hospital makes it possible to improve the management of health records, equipment monitoring, and even the proposal for patient services (Katurura & Cilliers, 2017). To date in Africa, this type of project is either carried out by the richest countries as part of the ex-nihilo construction of new cities called smart cities (in particular in the Maghreb) or private funding for hospitals for medical tourism such as in Tunisia or Mauritius. These solutions are therefore less widespread to date for more traditional hospitals (Katurura & Cilliers, 2017; Van den Berg, & Van der Lingen, 2019).

2.12 E-Health in Mauritius

Mauritius has a population of about 1.3 million. There are five territorial clinics and two district government-owned hospitals (MOH, 2019). The number of beds in government health organizations was 3,581 toward the finish of 2019. In the private area, there were seventeen private health establishments with an aggregate of 690 beds. The total number of beds in people in general and private segments toward the finish of 2019 was in this manner 4271, that is, 285 tenants for each bed. In 2019, a total of 5.2 million cases were seen by doctors in outpatient departments (MOH, 2019). There are one private hospital and 10 private medical clinics around the island (MOH, 2019). Fortis Mauritius Hospital is a Mauritius-based private healthcare company that owns and operates two primary private healthcare facilities in Mauritius, namely, Fortis Clinique Darné and Fortis Wellkin Hospital. The Fortis Hospital opened its doors in April 2009 with the ambition of opting for the use of IT to support clinical processes. Mauritius is pursuing a transformational process to improve its healthcare facilities and promote its image as a medical tourism destination. The Mauritian government is pushing private hospitals to enter into this endeavour (MOH, 2019). The governing bodies at the Fortis Hospital Mauritius opted for the use of IT to support medical practices to join the Mauritian Government endeavour. The organisational adoption of IT changed the nature of practices and strongly influenced the healthcare process at the Fortis Hospitals in Mauritius. For more than ten years, Fortis

Hospital (Mauritius) has placed IT on the agenda of its organisational priorities. The implementation of the e-health system has become, for its health professionals, a major and essential component to ensure the continuity and quality of medical activity at the organisation.

In the Republic of Mauritius, private healthcare has been available for the past 20 years (World Bank, 2017). Fortis Clinique Darné and Fortis Wellkin Hospital are the only private general hospitals operating on the island. There are some independent testing laboratories, particularly in the commercial city of Port-Louis and other larger towns. Private hospitals and diagnostic facilities charge their patients for all medical services. In private healthcare, private insurance reimburses some major procedures. In the Republic of Mauritius, health insurance is not mandatory as the health service in the public hospital is free. The public health system in Mauritius delivers more than 70 percent of the island's healthcare services, according to the MOH (2019). The Mauritian Government looks to improve success for its nationals and to guarantee that it is accessible to everyone, to build up the island encourage keeping in order the end goal to contend with different states in a globalized world and to extend and develop the welfare and instruction frameworks to advance true equivalent open door, giving little importance to gender, ethnicity, social class or religion.

World Bank (2017) have reported the Ministry of Health and Quality of Life planned to adopt ICT in the health sector. Electronic health data is important for better health services, planning and assurance of protection, which is generally not possible with paper-based records. e-health services have been anticipated in the second from the last quarter of 2012. The government of Mauritius is relying on the usage of the e-health system to eliminate the losses that the state brings consistently due to health division. Moreover, added that as per the proposals of the National ICT Strategic Plan 2015, the service has effectively arranged an e-health plan. The World Health Organization (2016) highlighted that the health system is the world's most data-escalated industry and that consistently the business produces huge volumes of information which, appropriately utilized, can enhance clinical practice and results, manage arranging and asset distribution and improve responsiveness. The destinations of the e-health system enhance clinical results through better customer-driven administration conveyance; enhance health awareness levels among patients and upgrade competency levels of social insurance staff at all levels and crosswise over associations. This e-health task will likewise be an eco-accommodating one as there would not be any paper-based restorative records. Everything will be mechanized. The Patients get electronic health cards. Medicinal record prompts to high volume of paper and a great deal of time are squandered in recovering a patient's document.

The Government of Mauritius implemented an e-Health system at the Dr A. G. Jeetoo Hospital in Port Louis in the year 2014. It was a pilot in the territorial healing centre’s Accident and Emergency (A&E) division and the Unsorted Outpatient Department. The aim was to incorporate health information and a point of convergence of reference on all matters identified with health. It incorporates better asset arranging and assignment and Monitoring and Evaluation (M&E) utilizing suitable ICT (MOH, 2019). At the initial stage, there were four computer system modules, restorative records, nursing administration and drug store administrations. According to a report published in the year 2015 by the Ministry of Health of Mauritius, out of nine (9) e-health systems deployed in different public hospitals in Mauritius, only one (1) system is partially being used. Because the benefactor who has an agreement with the Ministry of Health was unable to provide an adequate EHR system, the Republic of Mauritius' EHR system's implementation was delayed from its original planned year of implementation which was 2017 to later on (MOH, 2019). According to the United Nations Development Program signed portfolio document of 2022 on e-health initiatives with the Mauritius Ministry of Health, it is stated that the Mauritian Government's objective for e-health is as follows: To include the creation of a single, integrated source of information and a focal point of reference on all matters related to health.

2.13 E-Health and COVID-19

For the past fifteen years, digital tools have been developed in the health sector (Yusif *et al.,* 2017). This is the case with teleconsultations. The exceptional context of the health crisis of the COVID-19 pandemic has forced us to re-examine the issues raised by these tools from a new perspective, by considering the unprecedented context as a potential factor of transformation of medical practices and the uses of teleconsultation tools (Donders *et al.,* 2020; Pappot *et al.,* 2020).

The health system crisis on the one hand and the pandemic COVID-19, on the other hand, have pushed public health policies to develop the use of new teleconsultation tools. This context has also forced the doctors themselves to adapt their professional practices. The COVID-19 pandemic is putting significant pressure on health systems around the world, which must adapt to increased demand while transforming the way they operate to reduce the risk of the virus spreading (Donders *et al.,* 2020; Pappot *et al.,* 2020). Digital, being the applications, software and associated networks, promises to support organizations, practitioners and citizens through a variety of capabilities to optimize information management (e.g., notification of COVID + cases by email or text message) and support remote care, even self-care (Pappot *et al.,* 2020). Teleconsultations then offered a means for these doctors to manage a crisis and to compensate for the deficiencies of the healthcare system (Pappot *et al.,* 2020). But the devices, as innovative as they are, are not hermetic to the context in which they fit.

The problems related to health inequalities, legislative frameworks, and lack of resources in health care extended beyond traditional care situations to digital practices. The health crisis, far from being a break with these difficulties, prolongs them in a context of pandemic and containment. The health crisis appears to reveal the tensions between the benefits and the risks raised by these systems (Donders *et al.,* 2020; Pappot *et al.,* 2020).

The widespread use of teleconsultation tools is explained by the health crisis and by certain advantages of IT tools perceived as emergency devices. Indeed, according to doctors, teleconsultation is part of a context defined as war medicine which would allow to go to the most urgent, to treat more quickly patients as well as limit encounters. In this case, teleconsultation would save some time (Donders *et al.,* 2020; Pappot *et al.,* 2020).

Teleconsultation tools are built in such a way that, even before meeting the doctor remotely, the patient enters information on his state of health (temperature, pain assessment, treatments, allergies, weight, age). This stage of the consultation is called anamnesis, that is, the interviewing of the patients. In the case of teleconsultation, part of this phase takes place without the presence of the doctor. Once the information has been validated, doctors then have access to this information and can perform a sort of sorting urgent and serious cases.

However, during the health crisis, the standardization of medical practices seems, on the contrary, to have become an asset for doctors. Indeed, faced with a poorly understood virus whose symptoms and effects were discovered almost day to day from March 2020, WHO said they needed standardized protocols. In the early days of the health crisis, the situation appeared to be so unprecedented, that establishing the correct diagnosis was, therefore, a priority objective. The goal was to quickly find out who was sick, who had what and who had the flu or who has been infected by COVID. It was a race against time to limit the spread, identify clusters, assess the pandemic, and even understand this disease. In this, e-health tools appear to be really important technologies, saving time in a situation that is precisely a race against time. E-health has made it possible to respond to an emergency logic, to a crisis, to the resulting speed, efficiency and time savings.

The unprecedented COVID-19 pandemic and containment situation is an opportunity to extend and enrich the reflections on the challenges and limits of teleconsultation devices (Pappot *et al.*, 2020). The health crisis was both a period of rupture with previous research on teleconsultation tools, revealing completely new practices, and, at the same time, it prolonged, and even exacerbated, certain limits identified by the research earlier.

On the one hand, we have seen that teleconsultation tools were widely used during the period of the 1st containment, thus proving a certain effectiveness in the face of the unprecedented situation. Teleconsultation appears to be an effective tool, the terms of use of which correspond to the emergency and the crisis, and which seems appropriate to deal with an unprecedented situation (Mathews *et al.*, 2019). But this tool, as useful as it is, cannot by itself compensate for the lack of human and material resources specific to the health system (Donders *et al.,* 2020; Pappot *et al.,* 2020).

The devices, as innovative as they are, are not hermetic to the context in which they fit. The problems related to health inequalities, legislative frameworks, and lack of resources in health care extended beyond traditional care situations to digital practices. The health crisis, far from being a break with these difficulties, is also prolonging them in a context of pandemic and containment (Donders *et al.,* 2020). In this unprecedented context, the crisis appears to reveal the tensions between the benefits of teleconsultation and the risks raised by these systems.

Clinical management is also strongly mobilizing digital technology in this pandemic period, to set up remote services (telehealth). These tools involve both patients and professionals, mainly for teleconsultation (from patient to professional), telemonitoring (e.g., vital signs) and tele-expertise (from professional to professional). Electronic prescription, which avoids the use of paper and physical contact between caregivers and patients, has also been mobilized. Several telehealth services have been developed to take care of COVID-positive patients, but also to maintain services to the general population by limiting contacts and travel, whether in primary care, accommodation and acute and specialized care (Donders *et al.,* 2020). Some tools have been proposed to support the clinical diagnosis of COVID using algorithms based on different clinical data (e.g., CT scan, chest x-ray), and to target patients at risk for complications. The clinical processes around case reporting and case management have also mobilized digital technology, in a more or less integrated mode with laboratory information systems (request and result, visualization), and case management tools. public health, depending on the jurisdiction (Donders *et al.*, 2020). These tools are sometimes used in combination with contact tracing applications, to complete epidemiological investigation procedures aimed at controlling the spread.

Finally, for managers, the tools identified make it possible to support planning and optimize the use of resources, especially human (e.g., avoiding labour mobility), hospital (e.g., avoiding overflows of specific facilities) or supplies (e.g., avoiding the shortage of protective equipment staff). All the digital tools are combined and used differently depending on the organization of the health system and the context of the different jurisdictions, to inform the general public and patients on what to do, inform managers about the individuals to be tracked and isolated, as well as the strategies to prioritize to reduce the spread and adequately meet the demand for future care (Donders *et al.*, 2020). The health crisis linked to the Covid-19 virus has made digital technology essential in many areas (Donders *et al.*, 2020). Spheres of social life such as teleworking, education, but also access to social rights and services, even the simple fact of maintaining social links, are now dependent on the possession of a computer and an Internet connection (Donders *et al.*, 2020).

CHAPTER 3: RELATED LITERATURE REVIEW: MODEL AND THEORIES FOR TECHNOLOGY ADOPTION

3.1 Introduction

The adoption of ICT among healthcare providers as a component in their day-to-day activities, is an important economic and social issue (Leung & Chen, 2019; Ross *et al.*, 2016). ICTs are part of the daily life activities of medical practitioners and using e-health can aid in raising the standard of service (Kesse-Tachi *et al.*, 2019; Kutia *et al.*, 2019;

Razzak *et al.*, 2021). Given the technological progress that we have recorded in recent years, it is, therefore, necessary to understand the reasons that can lead healthcare providers to adopt and accept an e-health system (Kesse-Tachi *et al.*, 2019; Kutia *et al.*, 2019; Razzak *et al.*, 2021).

The adoption of technology is a subject that is quite mature when it comes to systems for information, it connects several models that come from other fields like psychology and sociology (Venkatesh *et al.*, 2003). To identify the elements that encourage users to embrace a computer system over time, several investigations have been carried out over time. These studies have led to the expansion of many theoretical theory and models to explain the users' intentions of using a system, the attitudes of users towards ICTs, user satisfaction, and the usefulness perceived by users (Handayani *et al.*, 2018; Taherdoost, 2018). To better understand the aspects leading to the use of modern technology among healthcare providers, this chapter presents the theories emerging from previous studies about the initial and long-term adoption of information technology. In this chapter of the literature review, we have made a theoretical presentation of the main models having known great use in various fields which explain the phenomena of adoption, diffusion and use of a new technology.

The adoption of innovation is one of the main areas of research in ICT. Research in this area has evolved by conceptualizing new factors that can better explain the technology adoption phenomenon, resulting in the development of several theories and models. Based on theories of social psychology, such as "Theory of Reasoned Action" (TRA) and the "Theory of Planned Behaviour" (TPB), researchers have created a number of concepts relating to the usage and acceptability of systems powered by information and communication technology (ICT) (Handayani *et al.,* 2018; Leung & Chen, 2019; Razzak *et al.,* 2021; Rogers, 1995; Ross *et al.,* 2016).

The "Theory of Reasoned Action" (TRA) has been introduced by Fishbein and Ajzen in the year 1975 to explain the relationship between attitude and behaviour within human action (Featherman *et al.,* 2021; Fishbein & Ajzen, 1975). It is used to forecast how human being will perform based on their pre-prevailing attitudes and behavioural intentions (Martin *et al.,* 2018). According to Fishbein and Ajzen (1975), a human being's choice to engage in a specific behaviour is founded on the results the individual is expected to achieve, as a result of the behaviour's performance (Davis *et al.,* 1989; Lee *et al.,* 2014; Procter *et al.,* 2019). Featherman *et al.* (2021) stated that "an individual's actions are determined by his or her intentions to carry out those actions, and those intentions are jointly impacted by attitude and personal or subjective norms".

The "Theory of Planned Behaviour" (TPB) was proposed by Ajzen in 1991 as an improvement of the TRA. TPB has introduced a new variable to enrich the TRA model: the "Perception of Behavioural Control" (PBC). PBC is based on the person's access to resources, possibilities, competencies, and capacities to carry out the activity (Chang *et al.,* 2021; Conner & Sparks, 2005; Featherman *et al.,* 2021). The PBC is reflected as a person's ability to execute a behaviour which is influenced by "the effects of Facilitating Conditions and the concept of self-efficacy" (Bandura, 1982). This concept is defined by the individual's belief in the idea that it will be easy or not to adopt a certain behaviour. For the researcher, the individual's behaviour is predicted under the assumption that all behavioural motivations are under control (Pai & Huang, 2011; Rouidi *et al.,* 2022; Wilson *et al.,* 2021). In the TPB, Ajzen (1991) has stated that there are three distinct determinants of intention but interrelated. First is the "Attitude Towards Behaviour", which refers to “the extent to which a person has a positive or negative assessment of the respective behaviour” Ajzen (1991); second is a social factor, subjective norms, which refers to “the perception that a person has formed about the social pressure to have or not have this behaviour” Ajzen (1991); and third is “the extent to which the behaviour is perceived to have control over one's environment” (Ajzen (1991).

The "Technology Adoption Model" (TAM) introduced by Davis in 1986, is an adaptation from the "Theory of Reasoned Action" (TRA) to model a user acceptance theory for Information Technology (IT) Systems (Featherman *et al.,* 2021). The “objective of TAM is to predict the acceptance of IT usage at the individual level” (Davis *et al.,* 1989). TAM is founded on the belief that the way a person acts towards the willingness to embrace any technology is governed by two important factors the "Perceived Usefulness" and "Perceived Ease of Use" (Featherman *et al.,* 2021). Davis *et al.* (1989) defined the factor "Perceived Usefulness" as “the degree to which an individual believes that using a particular system would enhance his work performance”. The factor "Perceived ease of use", on the other hand, is referred to the “degree to which a person believes that using a special system would be free of effort” (Davis, 1989). TAM has been widely tested and accepted as a model rooted in theory with good predictive validity (Garavand *et al.,* 2019; Magsamen-Conrad *et al.,* 2015; Suliman, 2002). The use of the TAM is topical and has generated a lot of interest among health IT researchers (Garavand *et al.,* 2019; Magsamen-Conrad *et al.,* 2015; Shachak *et al.,* 2019; Su *et al.,* 2021). The TAM model, in addition to being validated several times by various researchers, has also undergone multiple theoretical extensions and adaptations, starting with its authors. Two main enhancements are the "TAM 2" model and secondly the "Unified Theory of Acceptance and Use of Technology".

The "Unified Theory of Acceptance and Use of Technology" (UTAUT) was published by Venkatesh and colleagues in 2003 after a systematic review and integration of the eight previous models. The UTAUT model contains four main constructs – “Performance Expectancy”, “Effort Expectancy”, “Social Influence”, and “Facilitating Conditions” – and four moderating variables: “gender”, “age”, “experience”, and “voluntariness of use” (Osifeko *et al.,* 2019; Razzak *et al.,* 2021; Venkatesh *et al.,* 2003; Yoo *et al.,* 2012).

The selected theoretical framework of this research is presented in this chapter, namely the "Unified Theory of Acceptance and Use of Technology" (UTAUT) of Venkatesh *et al.* (2003). Nevertheless, we have started with the presentation of the eight research models which have served as a reference in the creation of UTAUT model, specifically, (1) "Theory of Reasoned Action" (TRA), (2) "Theory of Planned Behaviour" (TPB), (3) "Social Cognitive Theory" (SCT), (4) "Technology Acceptance Model" (TAM), (5) "Combined TAM and TPB" (C-TAM-TPB), (6) "Diffusion of Innovation" Theory (DOI), (7) "Motivational Model" (MM), and (8) The "Model of PC Utilisation". The UTAUT model is presented, followed by its constructs and the moderate variables.

The review of the models and theories have been studied based on articles published in the last ten years and have been searching with the help of search engines and library databases such as Google Scholar, Microsoft Academic Search, Research Gate, IEEE and Science Direct with keywords such as technology adoption, TAM, UTAUT, technology acceptance models, social norms, perceived utility, perceived ease of use, information system acceptance, e-health acceptance. The research was done in English to maximize the results.

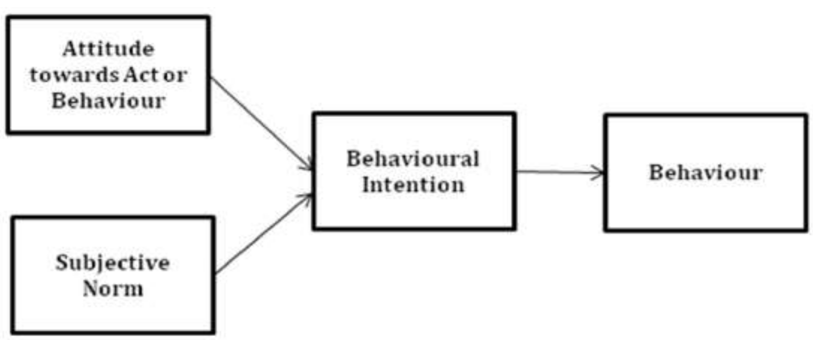
3.2 Theoretical Framework

3.2.1 Theory of Reasoned Action (TRA)

"Theory of Reasoned Action" (TRA) is a model that originated from social psychology (Featherman *et al.,* 2021; Fishbein & Ajzen, 1975). It was established by Martin Fishbein and his collegue Icek Ajzen in the year 1967 to explain the relationship between attitude and behaviour in human action (Davis *et al.,* 1989). It is used to predict how individuals behaved based on their pre-existing attitudes and behavioural intentions (Ajzen & Fishbein, 1980; Featherman *et al.,* 2021; Garavand *et al.,* 2019). TRA assumes that human beings make rational decisions in light of the information available (Davis *et al.,* 1989; Featherman *et al.,* 2021; Fishbein & Ajzen, 1975). According to its authors Fishbein and Ajzen (1975), an individual's actions and behaviours are guided by his or her intentions, and these intentions are impacted by both attitude and the subjective norms as shown in the following figure.

Figure 3.1

Theory of Reasoned Action



Source: Redrawn from *"Theory of Reasoned Action"*, by Fishbein & Ajzen., 1975

According to the TRA, a human being behaviour is described by his desire to do the activity in question, which is impacted by attitudes towards the behaviour as well as subjective norms of the behaviour (Davis *et al.,* 1989; Featherman *et al.,* 2021; Fishbein & Ajzen, 1975; Wilson *et al.,* 2021; Yeo *et al.,* 2017). The authors of TRA, Fishbein and Ajzen (1975), defined "Behavioural intention" of an individual as the degree to which he intends to engage in a certain behaviour; 'attitude' as an affective evaluation and a positive or negative feeling towards a specific behaviour to achieve; 'subjective norms' as the perception that an individual has on the fact that the individuals who matter most to him believe that he should or should not engage in the action in issue; and 'behaviour' as the perception of an individual about the consequences of a specific action (Featherman *et al.,* 2021; Fishbein & Ajzen, 1975; Wilson *et al.*, 2021; Yeo *et al.,* 2017).

According to Schwartz (1992), TRA rejected the idea that the actions of the individual can be underpinned by unconscious motivations which are inherently capricious and unpredictable. According to Schwartz (1992), before acting, an individual considered the implications of his action and depending on this, he decided whether or not to engage in the action.

As per Davis (1989), "a person's perceptions about the behaviour's effects, compounded by how well they think those effects have been handled, will impact their attitude towards that behaviour". Beliefs are defined by the subjective probability of the individual that doing a particular behaviour will produce specific results (Featherman *et al.,* 2021). The TRA model is based on the assumption that external stimuli influenced attitudes by modifying the structure of the individual's beliefs (Martin *et al.,* 2018). On the other hand, the intention to perform a behaviour is also determined by the subjective norms which are themselves determined by the normative beliefs of an individual and by his motivation to comply with norms (Lee *et al.,* 2014; Procter *et al.*, 2019).

Additionally, TRA projected that any other things that affect and influence behaviour only do so inadvertently through the manipulation of people's perceptions of the attitude or their subjective norms (Pare *et al.,* 2014; Procter *et al.,* 2019). In summary, the behaviour of a person would be determined by his behavioural intention to adopt it (Featherman *et al.,* 2021; Fishbein & Ajzen, 1975; Pare *et al.,* 2014; Procter *et al.,* 2019; Ramayah *et al.,* 2010; Rouidi *et al.,* 2022). This intent would depend on the human's perspective and his or her personal subjective norms for the relevant activity, which ends up with an equation of the following type: *"Behavioural Intention = Attitude + Subjective Norms"* (Featherman *et al.,* 2021).

3.2.1.1 **Usage of TRA in Information Technology and E-health**

TRA was used by researchers to investigate human behaviour in the fields of social psychology (Cohen *et al.,* 2011; Nadri *et al.*, 2018) and found support for the calculation of various social actions in literature (Su *et al.,* 2021; Van den Putte, 1991). For instance, Hsu and Lin (2008) used this theory to understand the different factors that encourage people to participate in blogs; Hsu and Lin (2008) incorporated the attitude variable into their model to know the intention of the users to blog. Shih and Fang (2006) have replicated and expanded the TRA to examine the attitudes and subjective norms that would influence the intention of adopting Internet Banking.

Li (2011) used TRA to explain user's intention to use social networking sites, he included in his model the variable of conformity which referred to the subjective norms of the theory. Zhou (2011) also used the same theory based on the same principle as Li (2011), to understand the intention of Chinese scholars to partake in electronic communities. In 2014, Mishra *et al.* have the TRA to evaluate the intention of using Green Data Expertise.

Araújo *et al.* (2000) have used TRA to predict the attitudes and intentions of neurologists and general practitioners towards making use of a teleconsultation system in neurology. The concept of attitude, widely used in models of acceptance of ICT, has been borrowed from psychological theories, which have shown that human actions concerning an object are subject to the attitudes that have been shaped and designed on this object (Ramayah *et al.*, 2010; Rouidi *et al.*, 2022). TRA has been utilized to foresee behavioural intentions by attitudes and subjective norms (Featherman *et al.*, 2021; Fishbein & Ajzen, 1975), the model has been discovered fruitful in various investigations for anticipating practices towards ICT usage (Araújo *et al.*, 2000; Mishra *et al.*, 2014; Ramayah *et al.*, 2010; Rouidi *et al.*, 2022).

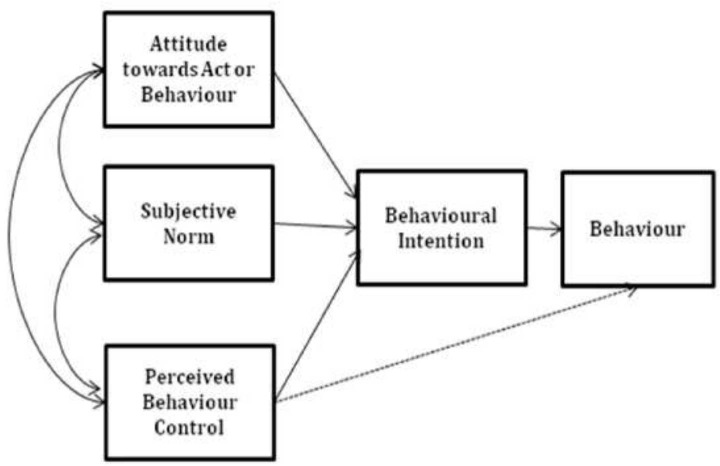
3.2.2 Theory of Planned Behaviour (TPB)

The "Theory of Planned Behaviour" (TPB) was developed by Icek Ajzen in 1991 to overcome the limitations of the “Theory of Reasoned Action” (TRA) which was presented by Fishbein and Ajzen (1975). Originally, TRA was focused on volitional behaviours, which are entirely based on the control and decisions of an individual over behaviour, it has its share of limitations since it does not consider other than personal factors (Abbad, 2021; Ajzen, 1991; Davis *et al.*, 1989; Wilson *et al.*, 2021; Yeo *et al.*, 2017). It is further to this observation that Ajzen (1991) has developed the TPB, a model which considered factors that are not entirely under the control of individuals (Dahl *et al.*, 2018; Pai & Huang, 2011).

A few years after submitted TRA, Ajzen presumed that TRA has gaps (Abbad, 2021; Ajzen, 1991); according to the author himself, "Attitude Towards Behaviour" and "Subjective Norms" are not the only factors that determined the intention to perform a behaviour, for an individual (Abbad, 2021; Ajzen, 1991). He proposed a new framework, based on the initial concepts of TRA, the "Theory of Planned Action" (TPB), which consist of a new construct been added to predict the behavioural intention, the ‘Perceived Behaviour Control’ (PBC) as shown below:

Figure 3.2

Theory of Planned Behaviour



Source: Redrawn from *Theory of Planned Behaviour*, by Ajzen, 1991

As per Ajzen 1991, Perceived Behaviour Control is referred “to people’s perceptions of how simple or challenging it is to carry out an activity rely on their self-efficacy, or how well they believe they will be able to carry out the necessary actions to deal with a problem in the future”. This concept is defined by the belief of the individual in the idea that it will be easy or not to adopt a certain behaviour (Abbad, 2021; Ajzen, 1991; Pai & Huang, 2011; Wilson *et al.,* 2021; Yeo *et al.,* 2017). For the researcher Ajzen, 1991, the behaviour of the individual is predicted on the assumption that all behavioural motivations are under control (Pai & Huang, 2011). Taking this assumption into consideration, and in addition to attitude towards behaviour and subjective norms, the belief in one's ability to regulate one's behaviour influences their aim to engage in it (Abbad, 2021; Ajzen, 1991; Dahl *et al.*, 2018; Pai & Huang, 2011; Wilson *et al.*, 2021; Yeo *et al.*, 2017).

In the commentary of the TPB, Ajzen, (1991) stated that human action, is first of all guided by three types of beliefs: (1) behavioural beliefs, which constitute, an evaluation by the subject of the probable consequences of behaviour; (2) normative beliefs, referring to how the subject represents social norms and the expectations of his peers/society, but also integrating the motivation of the subject to comply with these expectations (or, on the contrary, not to submit to them); and (3) control beliefs related to the incidence and influence of factors that may make it easy, or on the contrary hinder the execution of the behaviour.

According to Ajzen (1991), “if the attitude towards the behaviour and the subjective norms concerning this behaviour are favourable, and if the control perceived elsewhere is important”, i.e., if the individual believes that he will not meet an obstacle in the implementation of the behaviour, then the intention that the person has to perform the behaviour in question will be very strong (Abbad, 2021; Chang *et al.*, 2021; Dahl *et al.*, 2018; Rosen & Kluemper, 2008).

Given a sufficient degree of effective control over behaviour, individuals are expected to fulfil their intentions when the opportunity arises (Fishbein & Ajzen, 2010) and intention is supposed to be the instant predecessor of the behaviour (Ajzen, 2005; Fishbein & Ajzen, 2010). However, because many behaviours pose implementation difficulties, which can limit their deliberate control, it is necessary to consider the direct effects of "Perceived Behavioural Control" on behaviour, alongside the effects of intention represented in the model by the arrow going directly from perceived behavioural control to behaviour (Ajzen, 2005; Fishbein & Ajzen, 2010). Insofar as the perceived control conforms to reality, it can then serve as a proxy for real control, and thus contribute to predicting the behaviour in question (Abbad, 2021; Ajzen, 2005; Chang *et al.,* 2021).

In summary, what emerges from the TPB is that attitude is not in itself a direct determinant of human behaviour (Fishbein & Ajzen, 2010; Flack & Morris, 2017; Shachak *et al.,* 2019; Su *et al.,* 2021). It must first of all be translated into the intention to exert a possible influence on behaviour, but here again, other social dimensions referring for example to norms of accepted behaviour, to the subject's ability to resist or not to social pressure, the identity of individuals and their motivation to respect the rules, even the image they want to give of themselves in the context of the situation as well as the representation that the subject of the feasibility of the action (perceived control) can conflict with attitude, and cause the subject to act differently (Dahl *et al.,* 2018; Fishbein & Ajzen, 2010; Flack & Morris, 2017; Shachak *et al.,* 2019; Su *et al.,* 2021).

In order for attitude to be a good predictor of conduct, “there must be a simultaneous convergence of attitude, subjective norms, and perceived control towards the same behaviour purpose” (Pai & Huang, 2011). More recent works, aimed at validating the "Theory of Planned Behaviour" (TPB) by Ajzen and Fishbein (1980) have demonstrated that the intentions of the individual are generally more strongly correlated with the observed behaviours than are the attitudes, and which allow therefore better behavioural predictions.

TPB stated that the decisions preceding a given behaviour result from a cognitive and emotional process, in which the behaviour is indirectly influenced by factors such as "Attitude Towards Action", "Subjective Norms" and "Perceived Behavioural Control" (Abbad, 2021; Ajzen, 1991). PBC played an important role insofar as the individual is constrained in his behaviour (limited capacity, limited time, environment, etc.), and which ultimately influences his intention to act (Abbad, 2021; Ajzen, 1991). This perception referred to how a person perceived the ease or difficulty of achieving a certain behaviour. PCB varies according to concrete situations and actions (Abbad, 2021; Ajzen, 1991). This concept is very close to the concept of ‘Perceived self-efficacy’ by Bandura (1977) which later on enhanced as Social Cognitive Theory (Bandura, 1997), on how a person can judge, how well he can perform the actions required, to achieve the desired end, in a certain context (Davis *et al.*, 1989).

3.2.2.1 Contribution of TPB in Information Technology and E-health

TPB stated that behaviour in a person is necessarily decided in advance (Abbad, 2021; Ajzen, 1991; Davis *et al.*, 1989; Fishbein & Ajzen, 2010). The main contribution of TPB compared to alternative theories relied on considering behavioural and social control factors, which is important in the study of individuals’ behaviour vis-à-vis Information Systems (Li, 2011).

In 2010, Casalo *et al.* make use of TPB to understand human behaviours relying on the utilisation of online resources. Lin (2006) used TPB to comprehend the elements that may impact the motives of individuals to participate in virtual communities; he has concluded positively that the attitude of members towards participation in communities, subjective norms and perceived behavioural control of members regarding participation in virtual communities, affect the behavioural intention (Abbad, 2021).

Casalo *et al.* (2010) also used TPB to find out the factors that encouraged consumers to participate in an online travel community hosted by an industry firm. They used the same variables as Lin (2006) and hypothesized that they all affected the intention to participate in an online travel-related community. Li (2011) used the same theory to comprehend the elements that may impact the reasons of individuals to habit social networking sites. The author has included the subjective standards variable in his model concerning compliance. He suggested that social influence has an impact on people's aims to utilise social media.

Godin *et al. (*2008) stated that TPB clarified 59 percent of the factors of medicinal experts' aim to adopt new technology systems. Kortteisto *et al. (*2010), have used the TPB to analyse the intentions of healthcare providers to use Decision Support System in their decision-making while providing treatment to patients, which is part of an e-health implementation project (Abbad, 2021). The outcomes showed that all three factors – the “attitude toward the behaviour”, the “subjective norm”, and the “perceived behaviour control” - were significant variables related to the healthcare professionals utilizing the decision support system. A study done by Ifinedo (2018) based on the nurses’ adoption of Health Information System (HIS) stated that perceived behaviour control is the main TPB variable that disclosed examined medical attendants' expectation to utilize the e-health system at work.

3.2.3 Social Cognitive Theory (SCT)

"Social Cognitive Theory" (SCT) is one of the utmost notable theories in psychology (Bandura, 1997; Compeau & Higgins, 1995; Schunk & Usher, 2019). SCT is based on the concept of interaction, which lead an individual to the heart of a dynamic triad between personal, behavioural and contextual factors, in which the individual becomes both constructor and construct of his environment (Baharuden *et al.,* 2019; Bandura, 2006; Chang *et al.*, 2021; Schunk & Usher, 2019). SCT prioritised the idea of self-efficacy, which is the conviction that an individual can carry out a particular conduct (Baharuden *et al.,* 2019; Compeau & Higgins, 1995). The concept has been imposed by Bandura (1977), who demonstrated that since the acquisition of response information is a major aspect of the learning process, a good part of human behaviour is developed through a modelling process. The approximation of the models of responses learned by observation is further refined by corrective adjustments based on feedback-type information from the course of these processes (Compeau & Higgins, 1995; Schunk & Usher, 2019).

Bandura (1982, 1997) explained the concept of self-efficacy, by using the term “efficacy expectations”, which represents a person's conviction that he can achieve the necessary behaviour to produce the desired result. Efficiency expectations have several dimensions: magnitude, generality and strength (Compeau & Higgins, 1995; Schunk & Usher, 2019). Bandura (1997, 2006) mentioned that the stronger the perception of self-efficacy, the more efforts will be made to achieve the objectives, therefore in a context of stimulation and skills, the expectation of efficiency has a significant role in the selection of activities, the intensity of the effort put out, and the persistence with which this effort is pursued (Compeau & Higgins, 1995; Schunk & Usher, 2019).

According to Bandura and Cervone (1986), individuals are characterized by five fundamental abilities: symbolization, imitation, foresight, self-regulation and self-analysis (Baharuden *et al.,* 2019; Compeau & Higgins, 1995). These capacities allow individuals to determine and cognitively structure their behaviours (Bandura, 2006; Chang *et al.,* 2021). In his perceptive Bandura (1997) has paid particular attention to the role of vicarious processes the ability of individuals to learn from the observation of others, and self-regulating in psychological functioning (Bandura, 2006; Chang *et al.,* 2021; Schunk & Usher, 2019). Bandura (2006) thought that the individual's capacity for symbolic representation allows the latter to transform the elements of his experiences into internal models, which is served as a frame of reference to give meaning and continuity to his behaviours (Schunk & Usher, 2019). Self-regulation allowed the individual to control his behaviour, three factors which seem to contribute to individual motivation: self-efficacy, feedback and anticipation of time (Baharuden *et al.,* 2019; Bandura, 1997; Bandura, 2006).

The different effects of self-efficacy are summarized as follows by Bandura and Cervone (1986), people who have low self-efficacy in a particular area avoid difficult tasks that they perceive as threatening, they have low levels of aspiration and little involvement with the goals they have chosen (Baharuden *et al.,* 2019; Locke, 2018). On the contrary, high self-efficacy increases achievement and personal well-being in many ways, people with strong confidence regarding their abilities in a particular area see difficulties as bets to succeed rather than threats to be avoided (Bandura, 2006; Chang *et al.,* 2021; Locke, 2018).

3.2.3.1 Usage of Social Cognitive Theory in IT and E-health

SCT is a triadic proportional determinism in which human behaviour is an aftereffect of three variables: personal, behavioural and contextual factors (Baharuden *et al.,* 2019; Bandura, 2006; Chang *et al.,* 2021; Schunk & Usher, 2019). The personal alludes to personal individual cognitive aspects; the behavioural alludes to a central person's activities; and contextual factors are the environment which incorporates both physical and social environment (Baharuden *et al.,* 2019; Bandura, 2006; Chang *et al.,* 2021). The environment is referred to the different factors that can affect a person's behaviour. The environment can manifest in a social way (family members, friends or colleagues) or in a physical way referring to the size of a room or the outside temperature. The environment provides a frame of reference for the study of behaviour (Schunk & Usher, 2019). As per Bandura (2006), each two of the three factors in SCT can associate with one another and afterwards impact the third one.

Chung *et al.* (2010) used SCT to understand the exchange behaviour between users in their study of online health communities. They included in their model the knowledge-sharing behaviour variable concerning knowledge use and community promotion. The first influences the other two variables. The second mediates between the knowledge-sharing behaviour variable and community promotion (Chang *et al.*, 2021).

For their part, Lee *et al.* (2014) used the same SCT theory to understand the previous experience that influences user behaviour in an online community. They included four variables in their model related to the theory: status research, information research, previous experience of sharing on social media and the intention to share news as a dependent variable. The third variable moderates the association between the dependent variable and the search for knowledge, as well as the association between the dependent variable and the quest for status (Chang *et al.*, 2021).

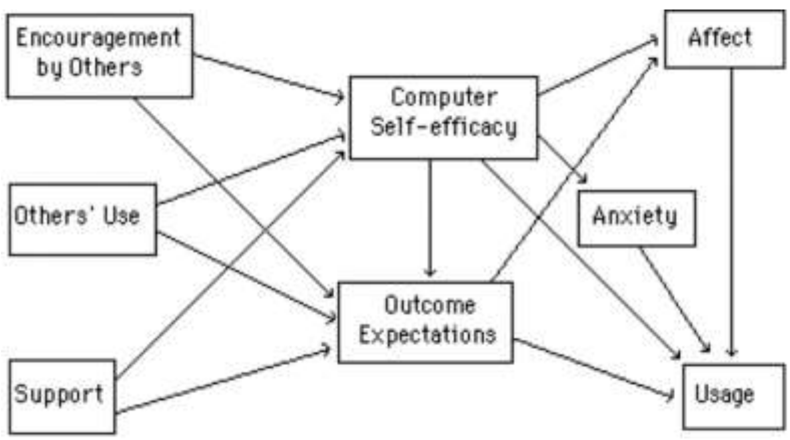
Zhou and Fan (2019) have made use of the SCT to understand the factors which influenced patient E-health literacy, Zhang *et al.* (2017) have used the theory to make a comparative study between knowledge sharing in online communities between healthcare providers and general users.

Compeau *et al.* (1999) employed and enhanced the "Social Cognitive Theory" to analyse the usage behaviour and individual IT performance to the concept of "Computer

Self Efficacy" (CSE) or feeling of personal self-efficacy (Compeau & Higgins, 1995). In CSE, behaviour is affected by both the expected outcome and self-efficacy. The "Self-Efficacy" factor is in turn influenced by recent or past behaviour (Compeau & Higgins, 1995; Garavand *et al.*, 2019; Osifeko *et al.*, 2019; Razzak *et al.*, 2021). The dimensions of the model described by Compeau and Higgins 1999 are as follows:

Figure 3.3

Computer Self-Efficacy Model



Source: Redrawn from *Computer Self-Efficacy Model*, by Compeau *et al.*, 1999

- Encouragement by others: encouragement from people belonging to the individual's reference group. People whom the individual observed and followed in behaviour expectancy.
- Support: organisational support for users of the information system or technology.
- Others' use: the current behaviour of others with technology is a source of influence for the feeling of self-efficacy.
- Computer Self Efficacy (CSE): the beliefs that individual places in his intrinsic capacities and abilities to achieve a specific behaviour (use of technology);

Outcome Expectations: all the benefits expected following the adoption of the behaviour,

- Affect: the feeling of satisfaction associated with the adoption of the behaviour.
- Anxiety: a feeling of anxiety associated with the idea of adopting the behaviour.
- Usage: the behaviour that materializes the interaction between the individual and IT, measured by the time spent and the frequency of occurrence of interactions.

3.2.4 Technology Acceptance Model (TAM)

"Technology Acceptance Model" (TAM) initially laid out and proposed by Davis in 1986, is one of the most prevalent adoption and acceptability paradigms in the field of technology for information system (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011). TAM was introduced by Davis in 1986 as an adaptation of the "Theory of Reasoned Action" (TRA) to shape the acceptance of users for information systems (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011; King & He, 2006; Marquié *et al.,* 2002). Its purpose was sought to identify the elements that influence how widely different technologies and user groups embrace the usage of computers and related technology (Osifeko *et al.,* 2019; Razzak *et al.,* 2021).

TAM was formulated to trace the influence of outer factors on beliefs, attitudes and intentions by identifying a small number of variables related to the psychological and behavioural components that govern acceptability that have been determined by prior research for using computer system and TRA as a theoretical basis to model the theoretical relationships between those variables (Almaiah *et al.,* 2016; Taherdoost, 2018). The target of TAM is to give explanation and forecast the acceptability of the information system by its operators in the pre-adoption phase (Davis, 1989; Osifeko *et al.,* 2019; Razzak *et al.,* 2021).

The TAM model seeks to explain the reasons why an individual will accept or refuse to use a computer application. The model's goal is to give a deeper interpretation of the various variables that influence end users' adoption of technology in general (Davis *et al.,* 1989). In addition, for managerial purposes, TAM aims to offer “elements allowing the effects of external variables to be traced such as system characteristics, training, user involvement in system design and nature of the implementation process” (Razzak *et al.,* 2021).

According to Davis (1989), “TAM anticipated that acceptance of any technology is determined by two relevant beliefs in particular, Perceived usefulness and Perceived ease of use”. These are of paramount importance for acceptable behaviours in the use of technologies. Davis (1989) defined the factor "Perceived Usefulness" as “the degree to which a person believes that using a particular system would enhance his or her job performance” and the factor "Perceived Ease of Use" as “the degree to which a person believes that using a particular system would be free from effort” (Garavand *et al.,* 2019).

According to TAM, the real usage of a technology differs on the desire to use it, and this intention is impacted by how beneficial and simple it is thought to be which derived the two main construct which are “perceived usefulness” and the “perceived ease of use” (Razzak *et al.,* 2021; Rouidi *et al.,* 2022). Perceived usefulness is defined as “the intensity with which an individual believes that using the system will improve his performance at work” (Davis *et al.,* 1989). It is therefore a function of the degree to which a technology or a system is seen as advantageous and profitable to and by its user in his work. "Perceived ease of use", on the other hand, refers to "the degree to which a person believes that using a particular system would be free from effort" (Davis *et al.,* 1989). It describes the level to which a human being believes that utilising a system won't involve them having to exert a lot of cognitive work (Razzak *et al.,* 2021; Rouidi *et al.,* 2022).

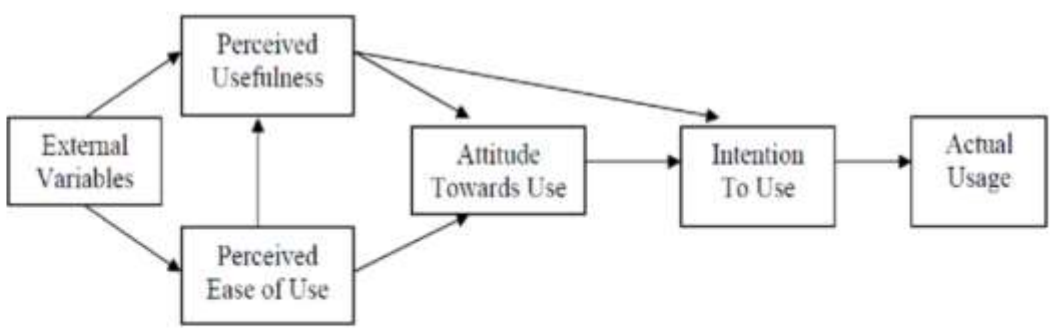
As in the TRA, TAM asserts that the factor "Behavioural Intention" is the one who governs how computer systems are used (Davis *et al.,* 1989; Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011), but stipulates on the other hand that this intention and attitude play a shared role in determining behaviour towards the use of the system and the perception of usefulness (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011). Thus, according to Davis (1989), the general attitude of the individual towards the system is not the only factor that determined usage but can also be based on the impact it will have on its performance. Therefore, even if an employee does not like a system, he is likely to use it if he perceived it would upgrade his functioning at work (Featherman *et al.,* 2021; Hsiao & Yang, 2011). Furthermore, TAM stipulates that there is a direct link between the factor "Perceived usefulness" and the "Perceived of ease of use". Thus, faced with two systems offering the same functionality, the user would choose the one that he finds easier to use and more advantageous (Mortenson & Vidgen, 2016; Shachak *et al.,* 2019; Su *et al.,* 2021).

There are some differences between TAM and TRA. The first being the absence of subjective norms as an antecedent of attitude (Legris *et al.*, 2003; Shachak *et al.,* 2019; Su *et al.,* 2021). Davis (1989), justified this absence by the fact that the effects of subjective norms on intention, represent one of the least understood aspects of TRA (Davis, 1989; Davis *et al.,* 1989) and its effect on intention can manifest itself indirectly, through attitude, by internalization and identification processes (Marquié *et al.*, 2002; Shachak *et al.*, 2019; Su *et al.*, 2021). It is, therefore, the reason for theoretical uncertainty and psychometric status that Davis (1989) renounced the inclusion of subjective norms in his TAM model (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; King & He, 2006; Marquié *et al.*, 2002). Another important difference is that the behavioural intention is not only influenced by the attitude towards the use but also directly by the "Perceived Usefulness" and "Perceived Ease of Use", with relative weights (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; King & He, 2006).

TAM is predicated on the notion that the desire to utilise a technology determines its actual intention of utilisation (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011). Intention is influenced by "Attitude" and "Perceived Usefulness" whereas "Attitude" is influenced by "Perceived Usefulness" and "Perceived Ease of Use" as shown in the figure below (Davis, 1989; Davis & Venkatesh, 1996; Davis *et al.*, 1989).

Figure 3.4

Technology Acceptance Model



Source: Redrawn from *Technology Acceptance Model*, by Davis (1989)

According to Davis (1989), “Perceived Usefulness” directly and positively affects the users’ "Behavioural Intention" to use a system; similarly, "Perceived Ease of Use" has a positive effect on the final users attitude and behavioural intention. Davis and Venkatesh

(1996) state that the more useful the technology is perceived by the potential user, the more likely it is to adopt it. According to Davis (1989) the perception of ease of use would significantly influence an individual's attitude, and this through two main mechanisms: self-efficacy and instrumentality.

According to the "Social Cognitive Theory" the user's sense of self-efficacy will increase in direct proportion to how simple a system is to operate (Bandura, 1997). Likewise, the ease of use of a tool would also give users the feeling of having control over what they are doing (Lepper, 1985). Efficiency is one of the main factors underlying intrinsic motivation (Bandura, 1997; Lepper, 1985) and this is what illustrates here the direct link between the “perception of ease of use” and “attitude”. “Perceived ease of use” can also be instrumental in improving performance (Razzak *et al.*, 2021; Rouidi *et al.*, 2022; Wilson *et al.*, 2021). Indeed, the effort saved thanks to the ease of use, can be redistributed to accomplish more work with the same effort (Davis, 1989).

However, it is important to point out that the work of Davis (1989), displayed that the link between the intention to use an information system and the “perceived usefulness” is stronger than with the “perceived ease of use” (Legris *et al.*, 2003; Marquié *et al.*, 2002; Mortenson & Vidgen, 2016). Thus, according to the TAM model, we can expect that the element that most influenced a user for the adoption of a system is the perception of the usefulness of that system (Marquié *et al.*, 2002; Razzak *et al.*, 2021; Rouidi *et al.*, 2022; Wilson *et al.*, 2021). The simplicity of the TAM model, its generality and the fact of arriving at satisfactory values of the explained variance have led it to very great popularity, numerous studies have tried to apply the TAM model to different environments and different software, with acceptable results (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; Marquié *et al.*, 2002).

3.2.4.1 Contribution of TAM in E-health

The use of TAM is topical and has aroused enormous interest among health IT researchers (Beglaryan *et al.*, 2017). Researchers have utilised TAM, a grounded theory model that has undergone extensive testing and is widely regarded as having strong predictive validity, to gauge the usage and acceptability of ICT for hospital information systems in hospitals or the health sector in general (Ahlan & Ahmad, 2015). Chismar and Wiley (2003) have used TAM to analyse users' intention for using Internet for Health issues. Among the five antecedents (subjective standards, image, relevance of the work, demonstrability of the results and quality of the results) that they used to explain the Perceived Usefulness, only two antecedents were found to be significant, the relevance of the work and quality of the results (Chismar & Wiley, 2003).

Day *et al.* (2007) was interested in the under-use of videophones in clinical settings. This qualitative research was carried out with TAM as a backdrop. The analysis of the material made it possible to highlight the importance of the perceived utility, the lack of resources and the problems of reliability of the equipment (Day *et al.*, 2007; Razzak *et al.*, 2021).

Lin (2006) also used the TAM to identify the different aspects that can induce users' intentions to participate in virtual communities for health. He considered behavioural intent as a dependent variable. The author argued that users' attitudes toward participation in virtual communities positively affect behavioural intent. He also argued that "Perceived Usefulness" and "Perceived Ease of Use" positively affect attitudes toward virtual communities. Finally, it has also been argued that the perception of usability affects the perception of the usefulness of online health communities.

In 2012, Gagnon *et al.* led a survey to examine factors impacting the selection of ICT by health practitioners. They concluded that "Perceived Usefulness" and "Perceived Ease of Use" are the two most persuasive elements in technology acceptance (Gagnon *et al.,* 2012; Razzak *et al.,* 2021; Rouidi *et al.,* 2022; Wilson *et al.,* 2021).

3.2.4.2 Limits and theoretical complements of TAM

Although TAM is so often used and has been validated a lot of times, it is nevertheless the subject of a lot of criticism. Brangier *et al.* (2010), distinguish two main categories of criticism that can be made against TAM (Brangier, *et al.,* 2010; Featherman *et al.,* 2021; Garavand *et al.,* 2019). First are those criticism that fall under the validation methods and secondly, those concerning the foundations and the scope of the model.

3.2.4.3 Criticisms related to validation:

Legris *et al.* (2003), regret that most of the studies using TAM, relate to samples from the student population and that the technologies studied are not related to the application of business processes type, making their generalization to the business world much less relevant (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Legris *et al.,* 2003). Brangier *et al.* (2010) regret that there is no differentiation of technologies by stating that “the characteristics of technologies modify the levels of acceptance and can put into question the principle of acceptance itself” (Brangier *et al.,* 2010).

3.2.4.4 Critics underpinning the foundations:

The main criticism of the foundations of TAM relates to the lack of measurement of feedback from the use of technology on "Perceived Usefulness", on "Perceived Ease of Use" and on "Intention to Use" (Brangier *et al.,* 2010). Measuring essentially the phenomenon of acceptance employing occasional surveys by questionnaires often eludes the behaviour of the phenomenon studied over time (Brangier *et al.*, 2010; Rouidi *et al.*, 2022; Wilson *et al.,* 2021). The acceptance of a technology is frequently evaluated within a short time after its introduction, thus longitudinal studies are absent (Brangier *et al.*, 2010). Acceptance, although often confused with adoption, is seen as the first step in a broader process of adoption of the technology leading to use deemed optimal or its replacement (Brangier *et al.,* 2010; Rouidi *et al.,* 2022; Wilson *et al.,* 2021).

TAM is also criticized for conceiving technology as an isolated object (objectivation), distant from the subject (the user). Acceptance, and ultimately adoption, is essentially determined by the fact that the user can accept or refuse the technology according to internal (attitudes, cognitive elements, representations, perceptions, etc.) or external (expected satisfaction, context) conditions, independent of the characteristics of the "technology object" as a social object (Brangier *et al.*, 2010; Razzak *et al.,* 2021).

3.2.4.5 **The Evolution of Research on TAM**

Since 1989, research on TAM has been essential of three types: research that has contributed to the construction and theoretical development of the model, research that has used TAM for the study of the acceptability and finally, research that has declined TAM for the study of the acceptability and use of various ICTs system (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011).

TAM is regarded as one of the longest-running and most widely utilised approaches for embracing technological advances (Davis & Venkatesh, 1996; Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011; Marquié *et al.,* 2002; Mathieson *et al.*, 2001). TAM has made it possible for researchers to provide, theoretical frameworks and validated models that can be used to explain the intentions and behaviours for the adoption of an innovation (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; Marquié *et al.*, 2002).

It has been repeatedly tested, proven, refined, and extended to a varied range of technologies (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011). These studies have confirmed its robustness, its parsimony and its capacity to 'predict the intention and the use of an IT (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; King & He, 2006; Mathieson, 1991). Information System researchers widely agreed that "Perceived Usefulness" and "Perceived Ease of Use" are relevant antecedents of intention for the usage of a system (King & He, 2006). However, several authors also point out the lack of knowledge on the external variables which influence usefulness and ease of use (Lee *et al.*, 2014). In an article Davis, (1989) the author of TAM, encouraged further exploration of the external variables that may be associated with his model stating the followings: "*Future research [to] consider the role of additional [external] variables within TAM*" (Garavand *et al.*, 2019).

Although TAM is widely used in IS, the fact remains that it has been the subject of some criticism (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011; King & He, 2006). Despite its ability to effectively predict the acceptance of Information Technology, it remains not very useful to provide explanations relevant to the management of the user support process, which could lead to design interventions aimed at promoting and stimulating acceptance (Venkatesh & Davis, 2000). Another limitation of the TAM is that it does not take into account social pressures (subjective norms) which are nevertheless important in contexts of mandated usage of a system (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Hsiao & Yang, 2011).

Venkatesh and Davis (2000) specified that the TAM model has been primarily developed to predict user acceptance of technology based on their perceptions. However, the model does not allow us to understand and explain what this acceptance is based on to guide developments, beyond the simple suggestion that external variables affect perceptions of ease of use and usefulness (Venkatesh & Davis, 2000).

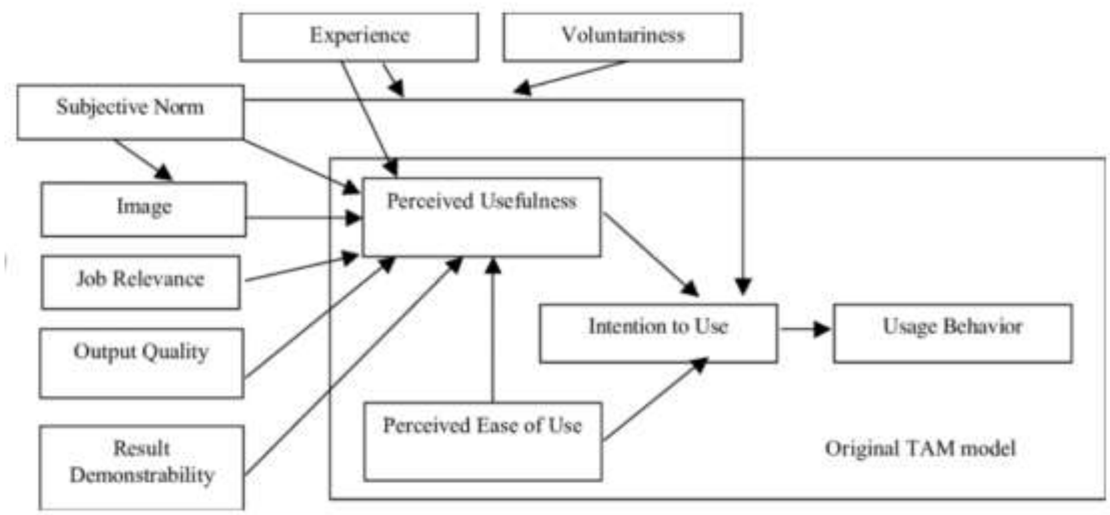
TAM has been constantly extended to overcome these shortcomings starting with its author (Davis *et al.,* 1989). As per Lee (2004) meta-analysis, the first extensions to TAM started around 1994 and continued in a variety of fields of activity including the health field (Lee, 2004). Between 1996 and 2000, at least 55 studies have used the TAM model as a basis for evaluation (Poissant *et al.,* 2015). To cope with certain limitations addressed by researchers, in particular on the motivations of users' perceived usefulness, and so that the model becomes clearer concerning the factors that make the system more useful, Venkatesh and Davis proposed the TAM2 model. They add variables affecting perceived usefulness such as subjective norms, experience, output quality, etc (Venkatesh & Davis, 2000; Venkatesh *et al.,* 2003).

3.2.4.6 Technology Acceptance Model 2 (TAM 2)

The “Technology Acceptance Model” - TAM (Davis, 1989) has shown strong predictive power (Venkatesh & Davis, 2000). On average, “it explains about 40 percent of the variance observed in the intention to use” (Venkatesh & Davis, 2000). Venkatesh and Davis, (2000) started from the initial TAM model and incorporated new constructs, to develop the TAM 2 model. They added 2 other constructs: the processes of "Social Influence" and "Cognitive Instrumental" (Yoon, 2018). The first construct denoted to the subjective norms (we are reminded of TRA), voluntariness and image, while the second is related to the relevance of the job, the quality of the output and the demonstrability of the results, in addition to the traditional perception of ease of use (Davis & Venkatesh, 1996). From the original TAM model, Venkatesh and Davis (2000) has removed the 'Attitude' construct and made a direct relationship between EOU and Behavioural Intention (Yoon, 2018). Below is a diagram illustrating the links between the different components of the TAM 2 model.

Figure 3.5

Technology Acceptance Model 2



Source: Redrawn from *TAM 2,* by Venkatesh & Davis, 2000

The authors of TAM 2 introduced "Subjective Norms" as a mandatory context and have added "Voluntariness" as a moderating variable about the connection between subjective norms and a desire to utilise. Experience is also introduced as a moderating variable, both for the link between the "Subjective Norms" and the "Intention to Use" and between the same subjective norms and the perceived usefulness. In both cases, Venkatesh and Davis (2000) stipulated that, the expected direct positive effect of "Subjective Norms" both on "Perceived Usefulness" and on "Intention to Use" will decrease under the conditions of an increase in experience.

The authors highlighted how subjective norms and intention to utilise/use in TRA and TPB are related based on conformity concerns, whereas in TAM 2 these relations are envisaged in the form of internalization and identification (Venkatesh & Davis, 2000). Internalization referred to the process by which a person perceived that a third party, whom he regards as a referent, thinks that he should use a system and would integrate its beliefs (Razzak *et al.*, 2021; Sharma, 2017). The identification referred to the power of the referent (Sharma, 2017).

Another construct introduced in the TAM 2 is the "Image", defined by (Davis, 1989) as the level “to which the use of an innovation is perceived as a chance to improve the status of a person in the social environment in which he finds himself, and the model considers that subjective norms will positively influence the image, regardless of experience and voluntariness”. In addition to the factor "Perceived Ease of Use" already developed in the TAM model, Venkatesh and Davis (2000) consider three additional constructs:

- Job Relevance, defined as “a person's estimation of how much the system in issue pertains to their position and the duties involved in it” (Shachak *et al.*, 2019).
- Output Quality, the quality of the results provided by the system, a perception of the quality with which the system performs its tasks (Venkatesh & Zhang, 2010).
- Result Demonstrability, which is defined by Moore and Benbasat (1991) as the tangible quality of the results of the use of a technology.

All these developments upsurge the explanatory supremacy of the model, tested in 4 different environments, including 2 in a mandatory context and 2 in a voluntary context and following a longitudinal logic, in 3 stages; pre-implementation, post-implementation after one month, and post-implementation after 3 months (Shachak *et al.,* 2019; Su *et al.,* 2021; Venkatesh & Davis, 2000; Yoon, 2018). The results have shown a percentage increase from 40 percent to 60 percent of the described variation in the intention to use, thus demonstrating a significant improvement in the model. The TAM 2 made it possible to highlight the variables that impact the perceived usefulness of an information system (Shachak *et al.,* 2019; Su *et al.,* 2021; Venkatesh & Zhang, 2010). However, this model did not explore the history of perceived ease of use, which further extended the TAM model (Venkatesh & Zhang, 2010).

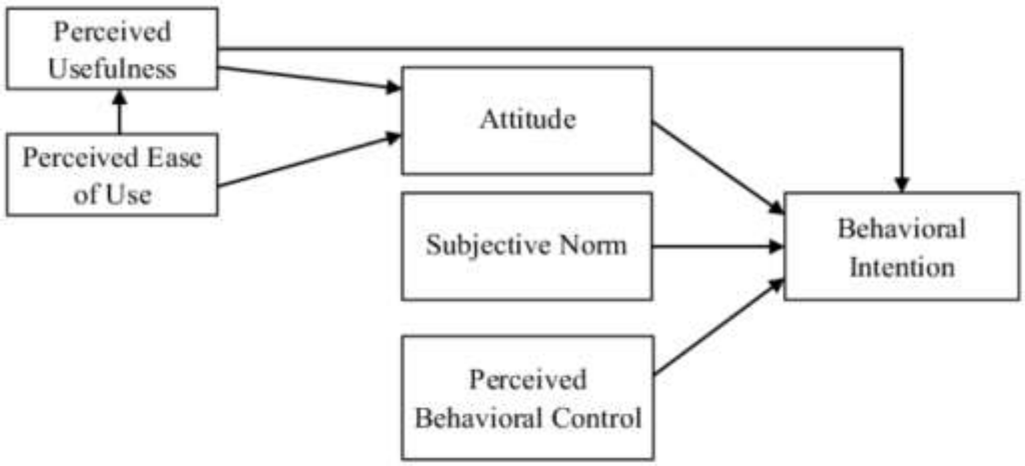
TAM 2 was recently utilized in a study by Nadri *et al.* (2018) to analyse the factors affecting the acceptance of Hospital Information Systems in three paraclinical departments. It was concluded that TAM 2 constructs have a substantial influence on the user's attitude towards the usage of the e-health system (Nadri *et al.,* 2018).

3.2.5 Combined TAM and TPB (C-TAM-TPB)

Taylor and Todd, 1995 have introduced a combined model of TAM (Davis, 1989) and TPB (Ajzen, 1991) namely the C-TAM-TPB model (Taylor & Todd PA, 1995). This model first states that subjective standards are affected by the influence of peers and the influence of superiors. The "Perceived Behavioural Control" variable depends on the feeling of self-efficacy, the enabling conditions and the organisational support. Finally, attitude results from the usefulness, compatibility and usability of the technology (Nadri *et al.,* 2018; Osifeko *et al.,* 2019). In this model, subjective norms, perceived behavioural control and attitude determine behavioural intention as shown below.

Figure 3.6:

C-TAM-TPB Model



Source: Redrawn from *C-TAM-TPB Model,* by Taylor and Todd PA (1995).

According to Mathieson (1991), compared the "Technology Acceptance Model" of Davis (1989) with the "Theory of Planned Behaviour" of Ajzen, 1991) based on three criteria (Mathieson *et al.*, 2001; Nadri *et al.*, 2018; Osifeko *et al.*, 2019).

1) The value of the information provided by the models: TAM provides high-level information on "Perceived usefulness" and "Perceived ease of use", which allows an easy application of the results in different contexts (Mathieson, 1991; Mathieson *et al.,* 2001). However, having only two essential antecedents to the intention of use, TAM loses its predictive power since the model makes use of the measures of the same concepts whatever the population and the context of the study (Mathieson, 1991; Mathieson *et al.,* 2001; Nadri *et al.,* 2018; Osifeko *et al.,* 2019). About the other side, the TPB provides additional specific details about the environment of the anticipated system usage, it takes into account the social context in which the use of innovation takes place (Mathieson, 1991; Mathieson *et al.*, 2001; Nadri *et al.,* 2018; Osifeko *et al.,* 2019). Its application is more difficult to obtain relevant

results (Mathieson, 1991; Mathieson *et al.*, 2001), researchers often carried out pilot studies where the subjects specify the characteristics of their member groups and the beliefs of control to which they refer (Mathieson, 1991; Mathieson *et al.*, 2001). The information provided by TPB is probably more useful during the development and implementation phase of the computer system since this theory can overcome the contextual problems of the adoption of the new technology (Mathieson, 1991; Mathieson *et al.*, 2001; Nadri *et al.*, 2018; Osifeko *et al.*, 2019).

2) Social variables: In TAM, the social variables are not explicitly taken into account (Mathieson, 1991). According to Davis (1989), the effect of social variables could be considered implicitly in the model. The perceived usefulness of the innovation could imply an improvement in the image returned by the reference group. In contrast, TPB provides precise and fully-fledged measures of the effect of subjective norms on intended use (Abbad, 2021; Ajzen, 1991; Mathieson, 1991; Nadri *et al.*, 2018; Osifeko *et al.*, 2019).

3) Perceived behavioural control (PBC): the difference between the treatment of the ‘control’ variable is significant between the two models (Mathieson, 1991). The PBC variable is implicitly included under the perceived usefulness in the technology acceptance model (Davis, 1989). It refers to an assessment of skills and the availability of resources necessary to enable the use of technology. Ajzen (1991) distinguishes between the internal control factors that are characteristic of the individual (competence and self-efficacy) and the external control factors specific to the situation of use of cooperation and organisational support (Mathieson, 1991; Mathieson *et al.*, 2001; Nadri *et al.*, 2018; Osifeko *et al.*, 2019).

Although the two models are used to describe the perspective on the adoption conduct of a computer system, the TAM is more efficient by explaining 72 percent of the observed variance, against 38 percent explained by applying the TBP (Mathieson, 1991; Mathieson *et al.*, 2001). According to Mathieson (1991), this difference may be due to the difference between the standard deviations of the observed values; (TAM = 1.74 and TBP = 1.13). However, the difference is not large enough to conclude that one model is better than the other since the two models predict usage intent almost equally (Mathieson, 1991; Mathieson *et al.*, 2001; Nadri *et al.*, 2018; Osifeko *et al.*, 2019).

The C-TAM-TPB model was utilised by Chau and Hu (2001) to explain why a sample of Hong Kong-based physicists used telemedicine technology. The influence of "Utility", "Usability", "Attitude", "Subjective Norms", and "Perceived Behavioural Control" on the desire to use a computerised system in the healthcare industry has been examined by researchers. Their results showed that the link between the variable "Subjective Norms" and the intention to use was not significant. Still, when deciding to accept or reject technology in telemedicine, physicists are based more on their perception of the usefulness ($\beta = 0.40$ with $p < 0.001$) of this technology as well as on their perceptions of behavioural control ($\beta = 0.30$ with $p < 0.01$). The authors suggested the pragmatic nature of the adoption of innovation since it is based more on the usefulness and control of the system than on its usability and the subjective standards of the reference group (Chau & Hu, 2001). However, it would also be necessary to examine other variables that could affect the intention to use in this context such as computer self-efficacy or also the socio-demographic characteristics of the subjects as well as their personal experiences (Chau & Hu, 2001).

Likewise, Lee (2004) also make use of the C-TAM-TPB to predict and explain the adoption behaviour of an online banking service site. In addition to the variables from the model, the author has integrated components of the variable ‘risks perceived online’ which consist of the risk of loss of time, security risk, financial risk, and performance risk (linked to poor site manipulation). The results demonstrated a strong descriptive power of the combined model ($R^2 = 80\%$); the study also showed a negative impact of perceived risks on the intent to use the website as well as the effect of perceived usefulness ($\beta = 0.21$ with $p < 0.001$) and behavioural control ($\beta = 0.11$ with $p < 0.001$) on the intention of use (Lee, 2004). On the other hand, ease of use and subjective norms do not affect the adoption of this bank site (Lee, 2004). This suggests that the level of familiarity with online banking is important in our society today, which makes the tool seem simple as the bank pays more attention to the development of increasing ease-of-use applications (Lee, 2004).

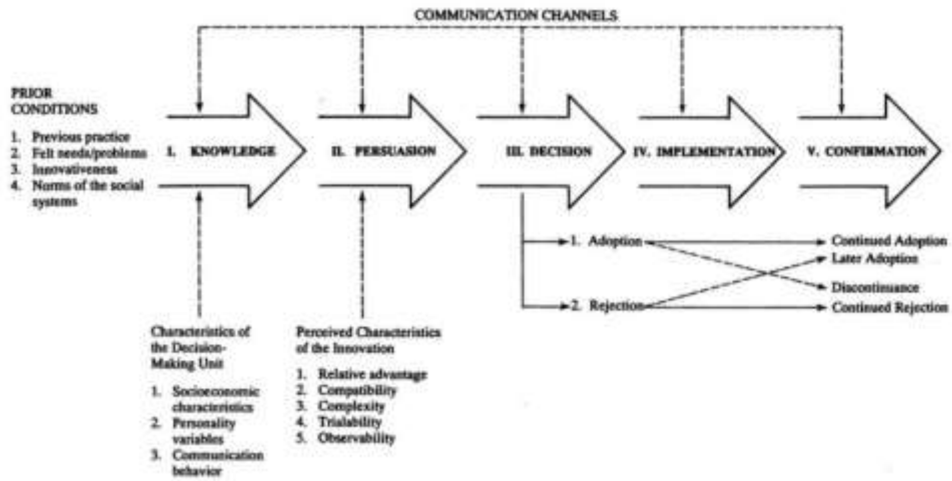
3.2.6 Diffusion of Innovation Theory (DOI)

The "Diffusion of innovation" (DOI) theory proposed in 1962 by Everett Rogers has been applied “both at an individual level and an organisational level” (Lallemand *et al.,* 2015). Although DOI is not only related to computer technology, it also offers a conceptual framework to the concept of acceptability because it aims to explain how a technological innovation evolved from the stage of the invention to that of extensive use (Elmghaamez *et al.*, 2022; Miranda *et al.*, 2016). “Innovation”, “communication channels”, “time”, and “social system” are the four key components of the DOI (Rogers, 1995). Elmghaamez *et al.* (2022) defined diffusion as “the method through which a new idea spreads through specific channels, over time, and among members of a particular social system” and innovation as an idea, practise, or thing that an individual or other unit of adoption perceives as novel (Rogers, 1995; Shih & Fang, 2006). Rogers (1995) has usually used the term ‘technology’ and ‘innovation’ as synonyms (Elmghaamez *et al.,* 2022; Miranda *et al.,* 2016; Shih & Fang, 2006). It has also been noted that “a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome” (Foon & Fah, 2011).

Rogers (1995) described the innovation-decision process as “an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation”. As shown in Figure 3.7, the Innovation-Decision process consists of five stages preceding the adoption criteria: (1) Knowledge stage, where users are introduced to innovation and gain an initial understanding of the innovation; (2) Persuasion stage, where decision-makers create the attitude towards innovation; (3) Users' acceptance or rejection of the innovation was decided at the Decision Stage; (4) Implementation stage, where users use the innovation; (5) Confirmation stage, where the adoption or refusal decision is reconfirmed or reversed (Elmghaamez *et al.,* 2022; Farias & Almeida, 2014).

Figure 3.7:

The Model of Five Stages in the Innovation-Decision Process



Source: Redrawn from *Diffusion of Innovation Model*, by Rogers, 1995

DOI defined the "Diffusion of Innovation" as a process from which an idea, a practice or a technological object is conveyed through a communicative channel to a target population (social system) to achieve a stake implementation of this innovation (Elmghaamez *et al.*, 2022; Farias & Almeida, 2014; Rogers, 1995; Shih & Fang, 2006). The realization of the implementation revolved around a sequential link to which the individual adhered, namely knowledge of innovation, persuasion and decision (Elmghaamez *et al.*, 2022; Farias & Almeida, 2014). The decision is the driving force for carrying out the implementation at an individual and organisational level (Elmghaamez *et al.*, 2022; Farias & Almeida, 2014). In this innovation process, Rogers (1995) identified five properties of innovation that can explain or help promote the dissemination of an innovation: (1) "Relative Advantage", (2) "Compatibility", (3) "Complexity" (4) "Trialability" and (5) "Observability".

- The relative advantage "is the extent to which a new technology is regarded as superior to existing ones" (Rogers, 1995). This innovation does not need to have many more advantages than the others, but what is important is that the individual perceived it as being more advantageous (Elmghaamez *et al.*, 2022; Miranda *et al.*, 2016; Rogers, 1995).
- Compatibility is "the extent to which a new idea is regarded as being compatible with current principles, experiences, societal customs, and user expectations" (Rogers, 1995). An idea that would be incompatible with current values and standards would take longer to adopt than a compatible innovation. Likewise, in some cases, the adoption of a compatible innovation required prior adoption of a new value system, which can take considerable time (Elmghaamez *et al.*, 2022; Miranda *et al.*, 2016).
- Complexity is "the degree to which an invention is seen as being challenging to use and understand" (Rogers, 1995). New ideas that are easy to understand and are adopted much faster than others that require developing new skills before you can understand them (Rogers, 1995).
- Trialability – defined by Rogers, (1995) as "the degree to which an innovation may be experimented with on a limited basis". It consists of the possibility of testing innovation and modifying it before committing to use it. The opportunity to test an innovation will allow potential users to have greater confidence in the product because they will have had the opportunity to learn how to use it (Elmghaamez *et al.*, 2022; Miranda *et al.*, 2016).

- Observability – defined by Rogers, (1995) “as the extent to which an innovation's consequences are apparent to others”. The results and benefits of an innovation are clear. The clearer the results of adopting the innovation, the easier it will be for individuals to adopt it (Elmghaamez *et al.,* 2022; Miranda *et al.,* 2016).

Each of these characteristics alone is not sufficient to predict the adoption of an innovation, but studies have shown that a combination of these characteristics (advantages, compatibility with beliefs and standards, a low level of complexity, a chance to test innovation and a high degree of observability) result in a higher chance of adoption of the innovation (Rogers, 1995).

Moore and Benbasat (1991) drew its foundations from Rogers (1995) theory and Davis (1989) TAM model. It integrated, on one hand, the five dimensions stated, by Rogers (relative advantage, compatibility, complexity, testability and observability) and, on the other hand, it considered that through social systems and behavioural processes, people adopt new technologies (Zhang *et al.,* 2015). According to Moore and Benbasat (1991), Rogers' relative advantage, is closely linked to the first belief of TAM (perceived usefulness), as the relative advantage designates the perception of the superiority of the new technology compared to the technology in use (Elmghaamez *et al.,* 2022; Farias & Almeida, 2014; Zhang *et al.,* 2015). In addition, the second dimension of the Rogers model, namely the idea of complexity, is linked with the second belief of TAM, namely the "Perceived Ease of Use" (Elmghaamez *et al.,* 2022; Farias & Almeida, 2014; Koenig-Lewis *et al.,* 2010; Zhang *et al.,* 2015).

3.2.6.1 **Usage of DOI in Information Technology**

Helitzer *et al.* (2003) have applied the DOI to survey and anticipate the selection of a telehealth program in Mexico. The research was to comprehend the dynamic associations between the attributes of telehealth and the social framework. The authors concluded that DOI is helpful for assessing telehealth programs (Helitzer *et al.,* 2003). In 2008, Greenhalgh *et al.* used the DOI to explore the introduction of a centrally stored, shared electronic patient record in England (Castillo *et al.,* 2010). In a research study, Chew *et al.* (2004), have used DOI to study the use of Internet healthcare services by family physicians (Chew *et al.*, 2004); Lee (2004) conducted a qualitative study using DOI to investigate the adoption of a computerized nursing care plan by nurses in Taiwan (Lee, 2004). These studies demonstrated that Rogers' innovation theory is useful for the conceptualization of technology adoption in the perspective of e-heath (Farias & Almeida, 2014; Zhang *et al.,* 2015).

3.2.7 Motivational Model

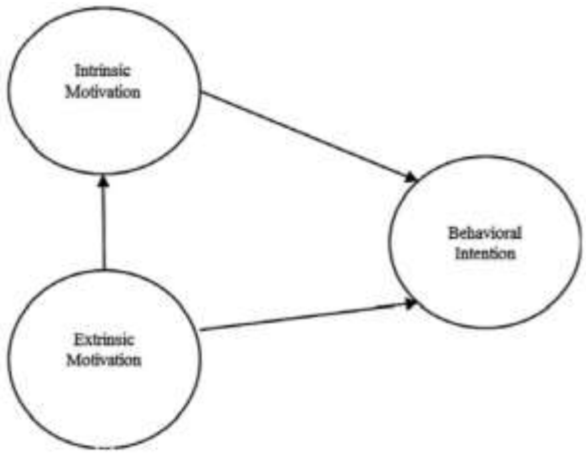
White (1959) defined the concept of proficiency as the ability of an organism to act together effectively with its environment. He postulated that the search for an effective interaction with the environment is permanent in humans, it is this search that never seemed to be exhausted, which is called "Motivation" (Ryan, 2012; White, 1959; Yahaya *et al.,* 2022). Scientific work on human motivation has been booming in the past years (Ryan, 2012; Yahaya *et al.,* 2022). Such research has highlighted the fundamental role of motivation in explaining human behaviour (Ryan, 2012; Shah & Gardner, 2008) in contexts such as education or working situations (Kanfer, 2012). Built on the theory of Deci *et al.* (1985); Vallerand and colleagues have developed a far-reaching theory of motivation by considering many phenomena and applying it to different behavioural contexts in 1987. The Motivational Model (Vallerand *et al.,* 1987) represents a major theoretical paradigm in the field of motivation (Davis *et al.,* 1992; Ryan, 2012; Ryan &

Deci, 2000). Indeed, over the past years, numerous studies have shown that this theoretical paradigm was particularly useful and interesting for analysing the motivation of individuals in many contexts such as work and education (Ryan, 2012; Yahaya *et al.,* 2022). Davis (1989) has enhanced the "Motivational Model" by Vallerand *et al.* (1987), to study the adoption and usage of ICT system (Li, 2010).

Many motivation theories have postulated that motivation is a unitary concept (Bandura, 1982), either by considering that motivation has only one dimension, or by proposing different forms of motivation which should be added together to form a total motivation score (Bandura, 1982). Davis (1989) considered that the understanding of individual attitudes and behaviours would be improved if researchers relied on several forms of motivation rather than using a single motivation score reflecting only the intensity of motivation strong motivation vs weak motivation (Davis *et al.*, 1992; Li, 2010; Yoo *et al.,* 2012). The Motivational Model developed by Davis (1989), explained the acceptance and use of a technology based on the constructs of 'Extrinsic Motivations' and 'Intrinsic Motivations' (Davis *et al.,* 1992; Li, 2010; Ryan, 2012; Yahaya *et al.,* 2022; Yoo *et al.,* 2012).

Figure 3.8

Motivational Model



Source: Redrawn from *Motivational Model*, by Yoo *et al.*, 2012

Extrinsic motivation is defined by Davis *et al.* (1992) as effectiveness in carrying out a task since it is seen to be a factor contributing to favourable outcomes. Extrinsic motivation allows an individual to act not for pleasure, but for the rewards due to a certain behaviour (Davis *et al.,* 1992; Yahaya *et al.,* 2022). Extrinsic motivation is a factor where the goal is not the object of the activity and is not directly related to the task performed (Deci *et al.,* 1985). It is illustrated by saying that an employee who works only for pay has extrinsic motivation (Deci *et al.,* 1985). Extrinsic motivation is thus demarcated, by the search for external rewards and the avoidance of punishment (Davis *et al.,* 1992; Deci *et al.,* 1985; Li, 2010; Yoo *et al.,* 2012). It occurs when the individual tries to obtain something in return for practising the activity. Deci and Ryan (2012) have identified four forms of extrinsic motivation.

- The extrinsic motivation by external regulation where the individual performed an activity for the reward attached to him or to avoid the punishment that his non-execution can entail or simply by obligation.

- The extrinsic motivation by introjection where the individual carries out an activity because he imposed pressure on himself.
- The extrinsic motivation by identification where the individual carried out an activity by choice by valuing it and judging it as important.
- Extrinsic motivation by integration where the individual carried out an activity by choice and the decisions taken are consistent with his personality, his beliefs, and his values.

Lawler *et al.* (1975) determined that extrinsic rewards or motivations such as promotion opportunities, financial rewards, extrinsic comfort like job security, and social comforts like support from co-workers and supervision are all factors of extrinsic motivation which play a determining role in the commitment to work (Deci *et al.*, 1985; Li, 2010; Yoo *et al.*, 2012).

In the perspective of ICT adoption and use, Davis *et al.* (1992) have elaborated extrinsic motivation as the “perception that users want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, higher pay, or promotions”. The "Perceived Usefulness" of technology, the "Perceived Ease of Use" of a system and "Subjective Norms" are examples of extrinsic motivation (Anthony Jnr, 2022; Li, 2010; Yahaya *et al.*, 2022; Yoo *et al.*, 2012).

Intrinsic motivation is referred to as “the circumstance that individual wishes to carry out an activity only for pleasure and for satisfaction in the execution of a behaviour” (Davis *et al.*, 1992). Intrinsic motivation, according to Nuttin (2015), is the motivation that relates to the act in question. Intrinsic motivation has its source in the individual himself and implies the existence of an organic link between the means and the end (Nuttin, 2015). Thus said, interest and pleasure encourage an intrinsically motivated person to engage in an activity without expecting any form of external reward (Nuttin, 2015). Lawler, *et al.* (1975), defined intrinsic motivation as the reason, other than that of a financial nature, which motivated workers and cited the feeling of self-esteem and personal achievement as an example (Lawler *et al.*, 1975; Nuttin, 2015).

Intrinsic motivation is considered by Deci *et al.* (1985) to be the highest level of self-determined motivation an individual can achieve (Deci *et al.,* 1985; Yahaya *et al.,* 2022; Yoo *et al.,* 2012). It is also the source of energy which serves as a starting point for the active nature of the human organism. In more concrete terms, intrinsic motivation implies that the individual practices an activity because he derived pleasure from it and a certain satisfaction (Deci & Ryan, 2012; Deci *et al.,* 1985). According to Deci and Ryan (2012), behaviours that are intrinsically motivated are those for which a person will engage in an activity to feel competent, and self-determined and has consequences on the internal reward. Deci and Ryan (2012), distinguished three forms of intrinsic motivation:

- Intrinsic motivation of knowledge which is expressed when the individual undertakes an activity for pleasure and for the satisfaction experienced in doing it.
- Intrinsic motivation for accomplishment is expressed when the individual performs the activity for the feelings of pleasure and satisfaction felt while he is outdoing himself in his work or during the creation of something.
- Intrinsic motivation for sensations that is expressed when the individual performs the activity to experience stimulating sensations.

In the context of ICT adoption and use, Davis *et al.* (1992) mentioned that intrinsic motivation is related “to perceptions of pleasure and satisfaction from performing the behaviour where users want to perform an activity for no apparent reinforcement other than the process of performing the activity per se”. Intrinsic motivation directly influences the quality of usage because it promotes cognitive processes such as the intensity of attention, the ability to concentrate, the effectiveness of memory and the courage to venture into the unknown and to take risks (Davis *et al.,* 1992; Li, 2010; Yahaya *et al.,* 2022; Yoo *et al.,* 2012).

The investigation of Davis *et al.* (1992) brought up that there is a positive connection noted between "Perceived Usefulness" and "Enjoyability Perception", where pleasure and satisfaction unequivocally impact the behaviour when it is seen as increasingly useful. In summary, the greater enjoyability of the technology improves the valuableness of the system (Yahaya *et al.,* 2022; Yoo *et al.,* 2012).

3.2.7.1 Usage of Motivational Model for IT Adoption

In 2012, Yoo *et al.,* have used the Motivational Model to comprehend the role of "Intrinsic" and "Extrinsic" motivators while encouraging online learning in a working environment. The study was carried out in South Korea, they concluded that intrinsic motivation influenced users’ goal to utilize e-learning in the working environment more than extrinsic (Yahaya *et al.,* 2022; Yoo *et al.,* 2012).

Tielman *et al.* (2017), have used the self-determination theory and Motivational Model to analyse the determination of users for a virtual agent operating in a post-traumatic stress disorder in an e-health system. They considered intrinsic and extrinsic motivation factors as dependent variables. The author argued that members' motivations toward participation in virtual communities positively affect behavioural intent.

Mather *et al.* (2014), have done an investigation in Australia using the motivational model, intended to recognize the dissimilarities in the conduct of undergrad healthcare assistants in the usage of the m-health system for accessing patient data.

Zhang *et al.* (2017), examined the components that persuade the goals of sharing information in healthcare organisations by joining in social capital and motivational model. The impacts of intrinsic and extrinsic motivations were additionally inspected and thought about. They concluded that those two constructs of the Motivational Model can enlarge the comprehension of the basic drivers of expectation to share information concerning e-health.

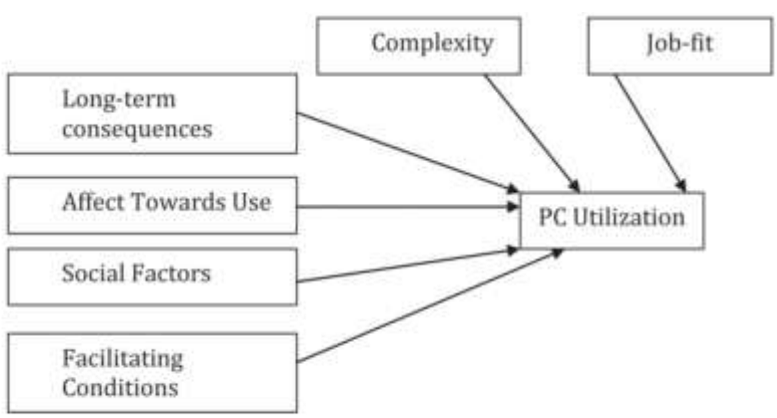
3.2.8 Model of Personal Computer Utilisation (MPCU)

Research on the relationship between behavioural variables and the use of a PC was almost non-existent before the development of the "Model of Personal Computer Utilisation" MPCU (Thompson *et al.,* 1991). MPCU originated from the Theory of Interpersonal Behaviour (TIB) by Triandis (1977). According to Thompson *et al.* (1991), the "Theory of Interpersonal Behaviour" by Triandis (1977), has brought a downside of the "Theory of Reasoned Action" (TRA) by Ajzen, 1975. It limits the scope of intention as a behaviour preacher and evokes automated behaviours that can take place without being the result of a conscious will (Anthony Jnr, 2022; Thompson *et al.,* 1991; Triandis, 1977). TIB introduced the notion of “force of habit”, i.e., the frequency with which behaviour has already manifested itself previously, as a predictor of the adoption of a behaviour (Anthony Jnr, 2022; Thompson *et al.,* 1991). If a person has never adopted a behaviour, it is the intention that will determine whether or not the behaviour is adopted (Anthony Jnr, 2022; Thompson *et al.,* 1991; Triandis, 1977). On the contrary, if the behaviour is a habit, it is the habit of the gesture that will replace the intention (Triandis, 1977). Another factor of TIB for the adoption or not of behaviour, is the presence of favourable or unfavourable conditions to the adoption of the desired behaviour, conditions which multiply the weight of the intention and the habit in adopting behaviour (Thompson *et al.,* 1991; Triandis, 1977). According to the theory of interpersonal behaviour (Triandis, 1977), Behaviour results from three factors: the intention to adopt the behaviour, the habit and the presence of conditions facilitating or preventing the adoption of the behaviour. For its part, the intention is defined by four main factors: social factors, perceived consequences (cognitive dimension of attitude), affect (affective dimension of attitude) and personal conviction on moral standards (Anthony Jnr, 2022; Triandis, 1977).

Thompson *et al.* (1991) have used the TIB by Triandis (1977), to develop the "Model of Personal Computer Utilisation" (MPCU). The MPCU have succeeded in explaining the use of a PC using the six variables: "Job Fit", "Complexity", "Long-term Consequences", "Affect Towards Use", "Social Factors" and "Facilitating Conditions" (Anthony Jnr, 2022; Li, 2010; Thompson *et al.,* 1991; Wang *et al.,* 2009).

Figure 3.9

Model of PC Utilisation



Source: Redrawn from *PC Utilisation Model,* by Thompson *et al.*, 1991.

- Thompson *et al.* (1991) defined ‘Job Fit’ as “the extent to which an individual believes that using a technology can enhance the performance of his or her job” such as better performance or reduction of time in performing tasks (Thompson *et al.,* 1991). The constructive association between perceived job fit and PC utilisation has empirical support. In Tornatzky *et al.* (1982) analysis of innovation adoption, they stated that an innovation is more likely to be adopted when it is compatible with individual job responsibilities. Davis *et al.* (1989), "Perceived Usefulness" construct in the "Technology Acceptance Model" (TAM) is found to be strongly related with technology utilisation (Anthony Jnr, 2022; Wang *et al.,* 2009).
- Complexity is defined as “the extent to which a technological advancement is seen as being somewhat challenging to comprehend and apply” (Anthony Jnr, 2022). This construct is related to the "Perceived Ease of Use" construct from the TAM (Anthony Jnr, 2022; Li, 2010; Wang *et al.*, 2009).
- ‘Long-Term consequence’ is defined as “the outcomes that have a pay-off in the future” (Thompson *et al.,* 1991), such is improving the ability to change professions or the availability of more fulfilling employment. For some individuals, the motivation to adopt and use technology may relate more to building or planning for the future rather than addressing current needs (Thompson *et al.*, 1991).
- ‘Affect towards use’ is defined as “the emotions that a person associates with a certain deed, such as happiness, euphoria, or pleasure as well as despair, disgust, dislike, or hate” (Thompson *et al.,* 1991).

- ‘Social factors’ is defined as the “the incorporation of the subjective culture of the reference group by the individual, as well as unique interpersonal agreements reached in certain social contexts by the individual” (Thompson *et al.,* 1991).
- ‘Facilitating conditions’ is defined as “provision of support for users of PCs may be one type of facilitating condition that can influence system utilisation” (Thompson *et al.,* 1991).

In a study done by Atif *et al. (*2012), the MPCU jointly with Social Cognitive Theory by Bandura, 1986 and TAM by Davis, 1986 were used to evaluate the utilisation and acceptance of an e-learning system. In 2019, Van den Berg and colleagues used the MPCU to study the factors affecting mobile enterprise applications and concluded that the different constructs of the MPCU are important factors that shape the adoption of a mobile system. Van Daalen *et al.* (2014) have used the MPCU to analyse the relationship between Computer Games and System Dynamics.

3.2.9 Unified Theory of Acceptance and Use of Technology (UTAUT)

The "Unified Theory of Acceptance and Use of Technology" (UTAUT) model was proposed by Venkatesh and colleagues in 2003 after examining and synthesizing several technology acceptances models to improve the thoughtful of the factors determining the embracing of Information and Communication Technology (ICT) (Fan *et al.,* 2018; Featherman *et al.,* 2021; Venkatesh *et al.,* 2003). Eight models of personal ICT acceptance were combined to create the model known as UTAUT (Yahaya *et al.,* 2022), to improve the understanding of the mechanisms of technology adoption (Wilson *et al.,* 2021; Yahaya *et al.,* 2022). UTAUT is in the family of models of intention and is focused on the individual value of acceptance of technology (Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2012; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). This theory corresponds to an attempt to unify the literature related to the acceptance of Information Technologies (Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2012; Wilson *et al.,* 2021; Yahaya *et al.,* 2022).

The UTAUT Model of Venkatesh *et al.* (2003) presents itself as a synthesized and complete theory, which takes up theories of the acceptance of pre-existing technologies, whose variables validity and predictive power were found to be the most significant (Fan *et al.,* 2018; Featherman *et al.,* 2021; Venkatesh *et al.,* 2003). By bringing together, consolidating and refining the previously established theories, UTAUT is considered by its authors as the model which best accounts for the adoption and use of technologies (Razzak *et al.,* 2021; Williams *et al.,* 2015).

After analysing several research studies, Venkatesh *et al.* (2003) felt that the "Technology Acceptance Model" (TAM) did not predict enough variance in the use of information technology (Gu *et al.,* 2016; Razzak *et al.,* 2021; Williams *et al.,* 2015). The authors of the UTAUT model have based themselves on a comparative review of the literature on eight models of user acceptance of technology and their extensions to propose a unified model which is formulated and validated as the "Unified Theory of Acceptance and Use of Technologies" – UTAUT (Gu *et al.,* 2016; Razzak *et al.,* 2021; Venkatesh *et al.,* 2003; Williams *et al.,* 2015). The eight studied models are:

- The "Theory of Reasoned Action" (TRA) by Fishbein and Ajzen (1975).
- The "Theory of Planned Behaviour" (TPB) by Ajzen (1991).
- The "Social Cognitive Theory" (SCT) by Bandura (1997).
- The "Technology Acceptance Model" (TAM) by Davis (1989).

- The "Combined TAM and TPB" (C-TAM-TPB) by Taylor and Todd PA (1995).
- The "Diffusion of Innovation" theory (DOI) by Rogers (1995).
- The "Motivational Model" (MM) by Davis *et al.* (1992).
- The "Model of PC Utilisation" by Thompson *et al.* (1991).

Williams *et al.* (2015) stated that "the research field surrounding the adoption of technology by users is the most mature field of work in Information Technology". The enthusiasm for this theme has led to the proliferation of theoretical models used to understand the use of technologies in many scientific disciplines such as psychology and sociology (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014; Razzak *et al.,* 2021; Williams *et al.,* 2015). Venkatesh *et al.* (2003) aimed to synthesize all these models to achieve a combined approach which bring in picture the "Unified theory of acceptance and use of technology" (UTAUT). Venkatesh *et al.* (2003) reviewed the eight above-mentioned models to discuss their similarities and differences (Nadri *et al.,* 2018; Osifeko *et al.,* 2019; Razzak *et al.*, 2021; Wang *et al.,* 2015) to overcome the limitations of previous individual studies, and carried out a longitudinal study, supported by the collection of data through subjects presented with similar applications of information technology (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014). A study to test 32 constructs from eight theoretical models simultaneously was carried out to identify the constructs that have more influence on the use of information technology (Bawack & Kamdjoug, 2018; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). Based on the conceptual analysis coupled with an empirical approach, the UTAUT model synthesized 32 constructs summarizing the acceptance of technology as shown in the table below:

Table 3.1

The 32 Constructs from the 8 Models and Theories Used in UTAUT

Models / Theories	**Constructs**
Theory of Reasoned Action (TRA)	Attitude towards Behaviour
	Subjective Norms
Theory of Planned Behaviour (TPB)	Attitude towards Behaviour
	Subjective Norms
	Perceived Behavioural Control
Social Cognitive Theory (SCT)	Outcome Expectation
	Self-efficacy
	Affect
	Anxiety
Technology Acceptance Model (TAM)	Perceived Usefulness
	Perceived Ease of Use
	Subjective Norms
Combined TAM and TPB (C-TAM-TPB)	Perceived Usefulness
	Perceived Ease of Use
	Subjective Norms
	Attitude towards Behaviour
	Perceived Behavioural Control
Diffusion of Innovation Theory (DOI)	Relative Advantage
	Compatibility

	Complexity
	Trialability
	Observability
	Behavioural processes
	Social Systems
Motivational Model (MM)	Intrinsic Motivations
	Extrinsic Motivations
The Model of PC Utilisation	Long-Term Consequences
	Job fit
	Complexity
	Affect towards use
	Social Factors
	Facilitating Conditions

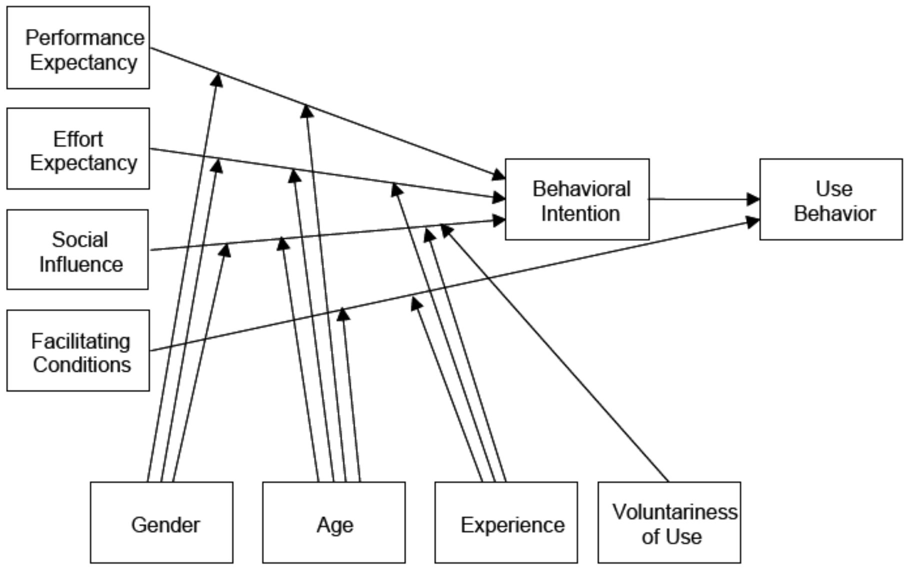
Note: Adapted from *Constructs of 8 theoretical models,* by Venkatesh *et al.,* 2003

Note: This table did not fit on the bottom of the previous page.

The authors of the UTAUT model considered that the determinants of the intention to use technology can be grouped into four direct constructs: (1) “Performance Expectancy”, (2) “Effort Expectancy”, (3) “Social Influence” and (4) “Facilitating Conditions”, as well as four moderating variables (1) “gender”, (2) “age”, (3) “experience and (4) “voluntariness of use” (Bawack & Kamdjoug, 2018; Nadri *et al.,* 2018; Osifeko *et al.,* 2019; Razzak *et al.,* 2021)

Figure 3.10:

Unified Theory of Acceptance and Use of Technology



Source: Redrawn from *UTAUT Model,* by Venkatesh *et al.*, 2003

The UTAUT constructs focus on (1) users' perception of the usefulness of a system to increase their productivity, (2) their perception of how easily they can learn to use the system, (3) the role played by influential people in the work environment towards the end-user, and (4) the measures taken to facilitate the adoption of the system (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). The four constructs of UTAUT, in comparison with the TAM by Davis *et al. (*1986), are considered to be equivalent, respectively, to the "Perceived Usefulness", the "Perceived Ease of Use", the "Subjective Norm" and the "Perception of Behavioural Control" (Holden & Karsh, 2010; Maillet *et al.*, 2015). "Gender", "Age", "Experience", and "Voluntariness to Use" are used to moderate the impact of the four key concepts on behavioural intention (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Wilson *et al.*, 2021; Yahaya *et al.*, 2022).

As per Venkatesh *et al.* (2003) "the eight studied models, explained between 17 percent to 53 percent of the variance of intention to use information technology, whereas UTAUT explained a variance of 70 percent for intention to use and 50 percent for the usage of the system". It is for this reason that Venkatesh and colleagues present the UTAUT model as the best model for explaining the user's intent to utilise an information system (Oechslein *et al.*, 2014; Venkatesh *et al.,* 2012; Wilson *et al.,* 2021; Yahaya *et al.,* 2022).

For the justification of the UTAUT, the authors of the UTAUT model, compared eight alternative models out of a population of 215 professionals (Jawadi, 2014). The results of this analysis made it possible to assess the contribution of the various determinants and moderating variables in determining intention and usage (Jawadi, 2014). According to the authors of the UTAUT, the influence of voluntariness of use has a significant influence on technology adoption (Razzak *et al.,* 2021; Wang *et al.,* 2015). When this context is mandatory, the determinants from social impact have a stronger effect. Likewise, the effect of the different determinants of intent varies over time (Razzak *et al.*, 2021; Wang *et al.,* 2015). The addition of the experience variable is significant on the measurement of certain determinants and different on others (Jawadi, 2014). The explained variation of the contributing factor of intention and use increases considerably with the addition of the moderating variables "Age" and "Gender" (Bawack & Kamdjoug, 2018; Jawadi, 2014; Wang *et al.,* 2015).

"Performance Expectancy" is outlined by Venkatesh *et al.* (2003) as "the degree to which the user expects that using the system will help him or her to attain gains in job performance". These are the benefits that the user expects in the performance of his work following his use of technology. "Effort Expectancy" is described as "the degree of ease associated with the use of the system" (Venkatesh *et al.,* 2003). It is an endeavour to deliver services related to system usage. "Social Influence" is termed as "the degree to which an individual perceives it important what others believe that he should use the new system" (Venkatesh *et al.,* 2003). This construct concerns the importance of the opinions of the social group in the foundation of the intention to use a new system. The UTAUT model offers two direct influences on the use of technology, namely the intention of use and a new construct proposed by Venkatesh *et al.* (2003), called the "Facilitating Conditions". It is the fourth basic determinant of the use of information technology. Venkatesh *et al.* (2003), define "Facilitating Conditions" 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).

In previous research, Venkatesh and Davis (2000) have shown that "Self-Efficacy" and "Anxiety" are philosophically and practically different from "Effort Expectancy" and "Perceived Ease of Use". Thus, the factors "Self-Efficacy" and "Anxiety" were seen as indirect determinants of intention, completely moderated by "Perceived Ease of Use" (Venkatesh & Davis, 2000). When validating the UTAUT model, Venkatesh and colleagues considered these two determinants which were significant in "Social Cognitive Theory" by Bandura (1997), and the results showed that the effect of self-efficacy and anxiety on intention to use the system is not significant (Bawack & Kamdjoug, 2018).

Following two empirical tests Venkatesh *et al.* (2003) postulate that "Age", "Gender", "Experience" and "Voluntariness to Use" the system moderate the impact of the main constructs on the objective and use of information technology. First, "Performance Expectancy" directly influences behaviour and is more important for men and younger employees. Then, the ‘effort expectancy’ inversely affects the intention and is more significant in women, older employees and those with limited experience. On the other hand, the ‘facilitating conditions’ conversely affect the current use of technology, its effect is stronger among older workers and those with more experience. Finally, the effect of the factor "Social Influence" is stronger among women, older workers, those with limited experience and those using the system under mandatory conditions (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014; Williams *et al.,* 2015; Yahaya *et al.,* 2022).

As per Venkatesh *et al.* (2003) the eight studied models, explained “between 17 percent to 53 percent of the variance of intention to use information technology, whereas UTAUT explained a variance of 70 percent for intention to use and 50 percent for the usage of the system”. It is for this reason that the authors of this great framework cite the UTAUT model as the most effective one for describing how users want to utilise information systems (Oechslein *et al.,* 2014; Venkatesh *et al.,* 2012; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). By explaining almost 70 percent of the variance in behavioural intention and 50 percent of the variance in use (Venkatesh *et al.,* 2003; Wilson *et al.,* 2021), UTAUT is positioned as the model with the best coefficient of determination of the behavioural intention to adopt and to use an ICT System (Holden & Karsh, 2010; Jawadi, 2014; Maillet *et al.,* 2015).

It is important to note that the UTAUT model is essentially based on the TAM by Davis (1989) model. It brings together the two key concepts of this model, namely "Perceived Usefulness" and "Perceived Ease of Use". The UTAUT model is more complete and has proven a strong predictive capacity since it incorporates significant constructs and has a powerful predictive power (Oechslein *et al.,* 2014; Razzak *et al.,* 2021; Williams *et* *al.,* 2015). It provides a rich theoretical basis for examining the factors contributing to the acceptance of ICT. In addition, this model is easy to apply, it has proven to be of considerable empirical validity (Mohammadyari & Singh, 2015; Rouidi *et al.,* 2022).

Few are the limits of UTAUT, but they are significant. According to Bagozzi, (2007), UTAUT focuses exclusively on individual perceptions of the external circumstances that lead to the intention to behave and current behaviour. This eliminates the consideration of objective environmental factors that can influence usage (Bagozzi, 2007). UTAUT is also criticized on the grounds of being overly complex, not being parsimonious in its approach and its inability to explain individual behaviour (Van Raaij & Schepers, 2008). However, UTAUT theory is proven to be a powerful forecasting model based on constructs from several behavioural theories developed to forecast the use of information technology (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). UTAUT has made a considerable contribution to research. It synthesizes decades of the theory of behavioural psychology into a model that consists only of constructs that have more influence, moderators that interfere with the intended use and current use of information technology (Oechslein *et al.,* 2014; Oechslein *et al.,* 2014; Venkatesh *et al.,* 2012; Williams *et al.,* 2015).

Since its proposal, UTAUT has been widely used in different fields. According to a review made on UTAUT by Williams *et al.* (2015), they stated that researchers have widely used UTAUT in the adoption of information technology for explaining user intention (Razzak *et al.,* 2021; Williams *et al.,* 2015). The authors collected around 5000 citations of Venkatesh *et al.* (2003) article in various fields such as the Internet, academics, health, finance, and others (Razzak *et al.,* 2021; Williams *et al.,* 2015). Since its publication in 2003, numerous scholars have tested and validated the UTAUT model in different industrial and cultural contexts such as the use of information systems in mass distribution (Jawadi, 2014); usage of e-recruitment (Laumer *et al.*, 2010); acceptance of health information system (Kijsanayotin *et al.*, 2009); for knowledge bases system (Bourdon & Hollet-Haudebert, 2009); utilisation of tablet PCs in university (Anderson *et al.*, 2006); and role of personality traits in online investments (Wang & Yang, 2005).

Despite its strong explanatory power, UTAUT is not without criticism. Bagozzi (2007) notes that the complexity of UTAUT and the number of variables modelled make its practical use difficult. Van Raaij and Schepers (2008) agree in the same way that, unlike TAM, UTAUT does not provide a more precise basis for studying use intention, since it focuses more on moderating variables than on the determinants of intention. Van Raaij and Schepers (2008) contended that “UTAUT provides the basis for a structure sparing to guide future research in the area of technology acceptance”. Venkatesh *et al.* (2003) furthermore underlined some of the model limits, which notably concern the moderating variables (Van Raaij & Schepers, 2008). They explained that age and gender moderate all key relationships (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Wilson *et al.*, 2021). They also pointed out that the interaction between the "Gender" and the "Age" of users is a strong moderator (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Wilson *et al.*, 2021). Thus, Venkatesh *et al.* (2003) pointed out that existing studies have contributed to the independent understanding of influences of gender and age. However, their research does shed light on the interaction of these two key demographic variables, thereby increasing understanding of the phenomenon (Van Raaij & Schepers, 2008; Wilson *et al.*, 2021). The results of Venkatesh *et al.* (2003) suggest, moreover, that as the youngest employees of an organisation mature, gender variations in the opinion of technology tend to dissipate (Van Raaij & Schepers, 2008). According to the authors UTAUT, this is a sign of hope which suggests that the differences mentioned in the use of technology may only be temporary when considering the generation of younger educated workers. in the digital age (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Venkatesh *et al.*, 2012; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). The summary of the UTAUT model allows us to retain the followings:

- There are three (3) direct determinants of behavioural intention:
    - Performance Expectancy
    - Effort Expectancy
    - Social influence
- There are two direct determinants of use (intention to use/use behaviour):
    - Facilitating conditions
    - The intention to adopt a behaviour (behavioural intention)
- There are four moderating variables: gender, age, experience and voluntariness of use (voluntary or compulsory).
- Three concepts identified as not being direct determinants of the intention (Rouidi *et al.*, 2022; Venkatesh *et al.*, 2003):
    - Self-efficacy
    - Anxiety
    - Attitude towards technology

3.2.9.1 The utilisation of UTAUT in Information Technology and E-health

The UTAUT is considered to have a considerable contribution to research for system adoption. It synthesizes several years of research on the adoption of new technologies by grouping several variables having significant effects on the intention of use. The contribution of UTAUT compared to other models of intention is the subject of several empirical validations (Holden & Karsh, 2010; Jawadi, 2014; Maillet *et al.*, 2015; Rouidi *et al.*, 2022).

The model is found to be used in several areas of system adoption (Jawadi, 2014). The model has been used in the professional environment to evaluate the key factors of adoption of information systems in a company (Jawadi, 2014), to understand the extension due to the adoption of mobile banking services (Oliveira *et al.*, 2014), for the low-cost payment of online tickets by carriers (Casalo *et al.*, 2010) and to predict the practices of adopting a multi-generational tablet (Raymond *et al.*, 2015; Rouidi *et al.*, 2022).

UTAUT has been employed to review the impact of e-learning on student performance at the academic level (Mohammadyari & Singh, 2015; Rouidi *et al.*, 2022), on the utilisation of e-learning in the required advanced education environment (Dečman, 2015) and the assessment of the aspects that afflict the adoption of e-learning (Salloum & Shaalan, 2018).

Being multidisciplinary, the UTAUT model has also been used in the health field to determine the societal effect on the use of clinical support decision systems (Jeng & Tzeng, 2012), to predict the adoption of RFID technology in the healthcare supply chain from a user perspective (Chong, *et al.*, 2015), to investigate the e-health accession of practitioners in Africa (Ami-Narh & Williams, 2012), to investigate the adoption of artificial intelligence by healthcare providers (Fan *et al.*, 2018; Featherman *et al.*, 2021), to explore the acceptance of intelligent healthcare systems (Hsieh *et al.*, 2017), to monitor the usage of the Picture Archiving and Communication System (PACS) by radiologists and hospital physicians (Duyck *et al.,* 2008), to research the elements affecting the uptake of mHealth (Hoque & Sorwar, 2017) and to the readiness of the health practitioners to use e-health as daily routine (Hennemann *et al.*, 2017).

Different extensions have been proposed for the UTAUT model to adapt it to the different specific areas for which it was used. Zhou *et al.* (2010) tried to determine the gender differences based on a study of 343 people in Taiwan; in the acceptance of mobile internet banking (Zhou *et al.,* 2010). They replaced the facilitating conditions with three other constructions: the perceived recreational aspect, the perceived value and the efficiency of the devices. 65 percent of the variance in intention to utilise mobile internet banking was explained by the model (Zhou *et al.*, 2010).

For their part, Lin and Anol (2008) proposed an extension of UTAUT, adding the influence of online social support on the use of information network technologies (Lin & Anol, 2008). Three hundred and seventeen (317) participants were asked about their online social support using instant messaging. Except for the association between online social support and enabling conditions, which was not significant, they discovered that all of the correlations in the model were significant (Lin & Anol, 2008).

In a study presented by Maillet *et al.* (2015), an extension for the health field has been proposed, in an attempt to explain the acceptance and use of a computerized patient management system by nurses. The suggested model explained 33.6 percent of the variation in usage, 54.9 percent of the satisfaction of the nursing staff, 50.2 percent of the expected performance, and 52.9 percent of the expected effort, according to the findings of the analysis. Furthermore, the influence of the expected effort on use was not significant (Maillet *et al.*, 2015).

3.3 Empirical Literature Review

3.3.1 UTAUT Model Constructs

According to UTAUT, the real application of a technology is a function of the behavioural goal to use, whereby the determinants have an impact on: "Performance Expectancy", "Effort Expectancy", "Social Influence" and "Facilitating Conditions" (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). In addition, UTAUT incorporates moderating variables which change how the deciding factors have an impact on the intention to utilise, these are: "Gender", "Age", "Experience" of use and "Voluntariness of Use" whether it is compulsory or voluntary (Venkatesh *et al.*, 2012; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). According to Venkatesh *et al.* (2003), "Self-Efficacy", "Anxiety" and "Attitude Towards Using Technology" are three independent variables that were used in the study but were not retained in the UTAUT model as they were not direct determinants of the dependent variable 'Behavioural Intention'.

3.3.2 Performance Expectancy

"Performance Expectancy" relates to the belief that an individual achieves a profit improvement in his work using an information system (Torrance, 2012). It is described as the extent to which one thinks utilising cutting-edge technology would increase work performance (Bawack & Kamdjoug, 2018; Oechslein *et al.*, 2014; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). As per Venkatesh *et al.* (2003), this construct takes root from five different concepts:

- The perceived usefulness from the "Technology Acceptance Model" (Davis, 1989) and the Combined model of the "Theory of Planned Behaviours" with the "Technology Acceptance Model" (Taylor & Todd PA, 1995)
- The extrinsic motivation from the "Motivational Model" (Davis, *et al.,* 1992)
- The relative advantage of improving work in the "Diffusion Theory of Innovation" (Rogers, 1995).
- The job fit from the "Model of PC Utilisation" by Thompson *et al.* (1991).
- The outcome expectation from "Social Cognitive Theory" (SCT) by Bandura (1997) and Compeau and Higgins (1995)

UTAUT suggests that "Performance Expectancy" is a variable controlled by "Gender" and "Age". This variable has been demonstrated by several works as being a very significant factor in the explanation of the intention to adoption of a technology (Bawack & Kamdjoug, 2018; Wilson *et al.,* 2021). The study by Venkatesh *et al.* (2003) has revealed that the "Performance Expectancy" is the most powerful predictive construct of the model, whether in a discretionary or mandatory context (Bawack & Kamdjoug, 2018; Raymond *et al.,* 2015). However for the other moderating variables such as "Gender" and "Age", Venkatesh *et al.* (2003) postulate that these two variables will have a major moderating consequence in a technological perspective (Bawack & Kamdjoug, 2018; Elmghaamez *et al.,* 2022; Wilson *et al.,* 2021).

3.3.2.1 Role of performance expectancy in the acceptability of information systems and e-health

"Performance Expectancy" is “the degree to which an individual believes that using a system will help him or her to attain gains in job performance” (Venkatesh *et al.,* 2003).

It is similar to the "Perceived Usefulness" of TAM (Davis, 1989), the relative advantage of DOI (Rogers, 1995), the intrinsic motivation of MM (Davis *et al.*, 1992), the "Job Fit" of MPCU (Thompson *et al.,* 1991) and finally awaiting the results of TSC (Compeau *et al.,* 1999). The performance expectancy in information technology “is useful in achieving goals in terms of job performance” (Venkatesh *et al.,* 2003).

Meece *et al.* (1990), have demonstrated that the perceived utility of a task is the phenomenon by which the importance of engaging in a task is given about goals located in more or less the near future, rather than about the immediate pleasure felt by carrying out this task. Mitchell and Biglan (1971) emphasized that the perceived usefulness of the task refers to the perception of a necessary, even essential, link between a behaviour and its consequences on the user's future (Elmghaamez *et al.*, 2022; Mitchell & Biglan, 1971; Raymond *et al.,* 2015).

Performance expectancy is basically about the benefits the user will enjoy with new technology, compared with the old system as related to his job performance (Osifeko *et al.,* 2019; Pare *et al.,* 2014; Razzak *et al.,* 2021). Elmghaamez *et al.* (2022) showed that “performance expectancy is the strongest determinant of behaviour intention”. In the e-health sector, Anja *et al.* (2014) noted various ways in which medical practitioners can benefit from using clinical informatics to increase job performance which includes the provision of adequate information such as clinical reminders, medical interaction and allergy alerts. Clinical informatics is assumed to be an essential mechanism in resolving major healthcare issues because it can promote efficiency and effectiveness of healthcare (Anja *et al.,* 2014). Pynoo *et al.* (2012) reveal that the medical doctors in Belgium are likely to accept clinical informatics if they discovered that clinical informatics would enhance their job performance. Anja *et al.* (2014) identifies the free flow of information in hospitals as a major reason why medical doctors in Germany accepted to use e-health system. According to Doolin (2016), the success of technological innovation is linked to the individual decision to perceived it useful or not.

3.3.3 Effort Expectancy

"Effort Expectancy" (EE) relates to the belief that an individual can use an information system with the least effort (Razzak *et al.,* 2021; Venkatesh & Zhang, 2010). This construct is defined as “the level of convenience and usability that people feel when using a specific information system” (Venkatesh *et al.,* 2003). Similar to "Performance Expectancy", three components from different models were integrated into this notion by the UTAUT authors, they are "Perceived Ease of Use", "Complexity" and "Ease of Use" (Razzak *et al.,* 2021; Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2016). The first one, "Perceived Ease of Use", is a concept from the "Technology Acceptance Model" (Davis, 1989), it alludes to the notion that someone will believe that utilising a new tools will be simple. According to Wilson *et al.* (2021), the complexity of the MPCU is the second thought included into "Effort Expectancy" construct. In this approach, complexity is defined as the degree to which users consider a system to be difficult to use. A fundamental element of the DOI is the "Ease of Use" construct, this construct is also included in the definition of the "Effort Expectancy". According to Venkatesh *et al.* (2003) and Wilson *et al.* (2021), easiness of use differs from complexity only in one way; while ease of use refers to an invention, the notion of complexity refers to a general system (Wilson *et al.,* 2021).

According to Wilson *et al.* (2021) the study of effort expectations is more significant in the pre-implementation stage of the information system. This variable is moderated by gender; expectations of effort are higher in women than in men (Bawack & Kamdjoug, 2018; Wilson *et al.*, 2021), by age; the older the age, the more likely the person will find it difficult to adopt a new information system and from the individual's prior experience.

Venkatesh *et al.* (2003), recall that even if these concepts have evolved and are distinct, many authors evoke a substantial similarity around their construction and the scales measuring them (Davis, 1989; Moore & Benbasat, 1991). The study of Venkatesh *et al.* (2003) reveals that the effort required is significant, whether in a discretionary or compulsory context, but more particularly immediately during the introduction of the technology (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021).

3.3.3.1 Role of effort expectancy in the acceptability of new technologies and e-health

"Effort Expectancy" can be described as the level of easiness and effort-free utilisation of innovation (Razzak *et al.*, 2021; Wilson *et al.*, 2021). Effort expectancy has a direct similarity with "Perceived Ease of Use" from the TAM by Davis (1989). "Perceived Ease of Use" is the second cognitive construct of TAM and is considered an intrinsic motivation (Davis, 1989). "Ease of use" construct has been defined as “the extent to which a person believes that using a particular system effortlessly” (Davis, 1989). Vijayasarathy (2004) demonstrated that ease of use influences attitude. The perception of usefulness should be influenced by usability because effects being equivalent, the more a technology is easy to be utilise, the more it can be useful (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). Mathieson (1991) concluded in his study that; a considerable portion of the variation in usefulness may be explained by simplicity of use. The TAM recommends that simplicity of use has a double effect, direct or indirect, on behavioural intention (Delice, 2010; Razzak *et al.*, 2021). This is enhanced by Venkatesh and Davis (2000) emphasised how alleged simplicity of utilisation has a direct impact on a person's conduct intention and how observed worthwhileness has a direct and indirect impact. Indeed, the direct impact of ease of use on intention is considered a potential catalyst which increases the probability of acceptance of uses (Venkatesh & Davis, 2000). Ease of use certainly affects and predicts behavioural intent. However, influence manifests itself indirectly through individual factors (Davis, 1989; Pal *et al.,* 2018).

Individual factors are those factors which are relevant to the subject, and which are likely to hinder or encourage the adoption of new technologies (Venkatesh *et al.,* 2012; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). These factors bring together demographic characteristics; psychological characteristics such as feelings of self-efficacy, control, feeling of confidence in one's skills and technology; characteristics which concern the experience of the individual such as testing the technology, interest in ICT, habit and nature of the training adopted; and the effects experienced by the subject during potential use (Bawack & Kamdjoug, 2018; Razzak *et al.,* 2021; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). According to Bobillier-Chaumon and Dubois (2009), the intra-individual factors include the perceived constraints which relate to the cognitive (self-efficacy, control, etc.) and psychological cost in terms of effects mobilized by the individual in a situation of potential use. of innovation.

The study by Ouadahi and Guérin (2007), carried out in two different companies in Canada (a ministerial department of the government and a social benefits company) focused on the importance of individual characteristics and personal perceptions in the adhesion of employees to an information system (IS). This research mainly distinguished the role of openness to change in the adoption of an IS: the more positive an employee is (open to change) by displaying a pioneering spirit in the practise of new technologies, the more he presents interest in ICT and the more easily it adapts to the new information system. Openness to change is one of the five personality traits present in the taxonomy of the “Big Five” by Costa Jr and McCrae (1992). Among the personal variables identified by the study by Ouadahi and Guérin (2007) is the feeling of personal effectiveness, which is defined by Bandura (1977) as the conviction of being able to successfully carry out a given action, positively affects the perceived usability of the information system.

Hamner and Qazi (2009) suggest that the level of familiarity and the habit of using computer tools favour the adoption of personal computers. Indeed, the notion of habit identified by the model of Triandis (1977), refers to “the degree of standardization and routine in the use of innovation” (Trice & Treacy, 1986). According to the study by Limayem, *et al.* (2001), habit is formed when the experience of use is repeated and automatic and has a substantial impact on the existent use of electronic messages.

In the healthcare industry, Nuq and Aubert (2013) noted that effort expectancy could be an important factor for medical doctors to use clinical informatics in developing countries due to little or poor ICT familiarity. Latifi and Alizadeh (2016) noted a lack of experience with clinical informatics as a challenge to the use of the tools.

Effort expectancy plays a very active role in voluntary and mandatory usage contexts, but not more important in the second time of use because the users must have gained necessary skills to manipulate the system and familiar with the system (Sepeame & Ajala, 2013). Aggelidis and Chatzoglou (2009) and has revealed that "Effort Expectancy" is a meaningful element of users' purpose to use technology among medical doctors in Greek hospitals (Aggelidis & Chatzoglou, 2009). To buttress this, Cilliers and Flowerday (2013) conducted a study on telemedicine use among health workers; the majority of the respondents admitted the system is user-friendly. Seventy-one per cent (71%) claimed that they can use the technology with ease and 69 percent admitted that the system is very easy to learn. That most of the respondents admitted that the technology is very easy to use due to the computer knowledge earlier gained and the training that the staff had undergone (Razzak *et al.,* 2021; Williams *et al.,* 2015).

3.3.4 Social Influence

"Social Influence" was described as "the extent to which an individual allows the opinions of others to influence their decisions to use the system" (Venkatesh *et al.,* 2003), and it is the manner in which someone values other people's endorsement and believe that they should or should not employ the new method (Bawack & Kamdjoug, 2018; Razzak *et al.,* 2021Wilson *et al.,* 2021). According to the authors of the UTAUT model, this construct takes root from five fundamental concepts from the studied models:

- "Subjective Norms" from the "Theory of Planned Behaviour" TPB (Ajzen, 1991), the "Technology Acceptance Model" (TAM) by Davis *et al.* (1989) and the combined C-TAM-TPB model by Taylor and Todd PA (1995)
- "Image" from the theory of "Diffusion of Innovation" (Rogers, 1995)
- "Social factors" from the "Model of PC Utilisation" (Thompson *et al.,* 1991).

The role of "Social Influence" according to Venkatesh *et al.* (2003) The choice to adopt information systems is extremely complicated and open to a variety of potential factors. "Social Influence has an impact on individual behaviour through three essential mechanisms: compliance, internalization and identification" (Bawack & Kamdjoug, 2018). These mechanisms vary, from social influence brought about by a desire to please change and a deep conviction in thought. In the setting of their study, Venkatesh *et al.* (2003) stated that none of these concepts are significant in a discretionary context but become significant in a mandatory context (Bawack & Kamdjoug, 2018). They explain that this can be attributed to the concern for compliance in the mandatory context in response to social pressure (Bawack & Kamdjoug, 2018; Venkatesh *et al.*, 2003; Wilson *et al.*, 2021). According to Razzak *et al.* (2021) "the impact of social influence on the intention to use is moderated by age, gender, user experience and the voluntariness of use". The social influence is more pronounced in older women, in the early stages of exposure to the new tool and when the use is compulsory (Bawack & Kamdjoug, 2018; Venkatesh *et al.*, 2003; Wilson *et al.*, 2021).

3.3.4.1 Role of social influence in the acceptability of information systems and e-health

Social influence in information system acceptance is how crucial does a person think it is for other people to believe him while deciding whether to utilise the freshly implemented system (Venkatesh *et al.*, 2012; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). The effect of "Social Influence" on the intention of usage of a system is adapted by Rogers (1995) in the "Diffusion of Innovation" theory; he also integrated the notion of self-image within the category of variables related to technology usage (Rogers, 1995; Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Wilson *et al.*, 2021). This notion of self-image is linked with the social influence variable, in the sense that it affects the intention of usage and relates to social desirability and the desire to improve the social image of the person (Rogers, 1995). Social influence found its roots in many theories such as the "Theory of

Reason Action" by Fishbein and Ajzen (1975), the "Theory of Planned Behaviour" by Ajzen (1991), the "Technology Acceptance Model" of Davis (1989), in the revised version of TAM2 (Venkatesh & Davis, 2000), and the "Unified Theory of Acceptance and Use of Technology" (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Wilson *et al.*, 2021). Although according to these theories, the influence of the social component had different labels, such as "Subjective Norms", "Social Factors" or "Social Influence", they contain the idea, whether explicit or not, that people's conduct is impacted by how other people feel about using a certain technology (Raymond *et al.*, 2015).

The concept of self-image used in the theory of "Diffusion of Innovation" (Rogers, 1995) correlates to the point to which an individualistic think that utilising an invention is likely to enhance his reputation within a social group. Subjective norms according to the "Theory of Planned Behaviour", Fishbein and Ajzen (1975) and the combined model of Taylor & Todd, 1995 refers to the person's perceptions that their reference group thinks they should or should not adopt the behaviour in question (Gorman *et al.*, 2010; Razzak *et al.*, 2021). Social influence is represented under the label of social factors in the "Model of Personal Computer Utilisation" MPCU (Thompson *et al.*, 1991), it relates to how a person internalises the subjective culture of the reference group as well as the specific understandings they have developed with others in certain social contexts (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Thompson *et al.*, 1991; Wilson *et al.*, 2021).

As per Kim and Kankanhalli (2009), the social norm is defined as an implicit or explicit rule which prescribes the appropriate behaviour to adopt in society in well-defined situations (Kim & Kankanhalli, 2009). These standards are therefore an important source of influence by the fact that they prescribe people how they should behave so as not to be categorized as “non-standard” (Kim & Kankanhalli, 2009). The fear of being categorized as such generates a powerful form of influence that is found, for example, in conformism (Kim *et al.,* 2007).

"Social influence" (SI) represents “the level to which the user, or the decision-maker in the implementation of the system, is sensitive to his social environment: the influence of the media, the opinion of specialists in the field or even colleagues” (Chen *et al.,* 2014). Studies on adoption tend to emphasize the role of social effects by noting that adoption behaviour is affected by exposure to the knowledge, attitude or behaviour of another actor (Van den Bulte & Lilien, 2001). Based on the growing number of adopters of technological tools, Bagozzi (2007) conceptualized social contagion as an imitation effect. Indeed, the influence of the social environment refers to the case where individuals change their behaviour under the influence of others (Chen *et al.*, 2014).

In the context of technology adoption and according to Venkatesh *et al.* (2003) it is “the degree to which a person feels that other people think that he or she should use the new system”. It is either the influence of colleagues or that of peers (Hassani *et al.,* 2019; Teo & Van Schaik, 2012). As noted by Hu and Van den Bulte (2014), those with high status tend to receive more attention than those with lower status. As a result, their behaviour becomes more salient and the products or services they adopt and use are more likely to be noticed (Spooner *et al.,* 2017). That way, since the hierarchical superiors have a high status in the company then they can impose the use of the system and consequently positively influence the reasoning of the individual for the adoption of the information system, however, Mark and Poltrock (2004) found that adoption is not only a result of line management but that it can sometimes be influenced by colleagues. It is for this reason that, Venkatesh *et al.* (2003) emphasized that social influence can shape the attitude of the user or the decision-maker according to several dimensions by acting as well on the perceived benefits in terms of status as on perceived utility, "Perceived Ease of Use", "Attitude Towards Innovations" or perceived security (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Wilson *et al.*, 2021).

Corresponding to Venkatesh and Davis (2000), social factors affect usage intention through three mechanisms:

1. Out of convenience - in this case, technology is used for a utilitarian purpose and to avoid conflicts in the group.
2. By identification - to join a reference group which brings prestige and visibility.
3. By internalization - in this case, the subject fully adheres to the group's value system and makes it his own. The latter mechanism most deeply influences the individual and results in a lasting adoption of technology.

The cultural approach to the use of information systems evokes the concept of acculturation defined by Rudmin (2009) as a process of cultural learning. Applied to the field of information technology use, this concept refers to the cultural learning process resulting from exposure to information systems (Straub, 2009). Maslow's theory of needs stated that the individual is motivated by an internal force which is a need. According to Igbaria and Chakrabarti (1990) a society where the use of innovations is valued, the use of information technologies is more appreciated since it obeys the standards which reign in the group of belonging. Mark and Poltrock (2004) suggest that the cultural and social variable mediates the adoption behaviour of information technology because individuals make their decisions according to common representations of the judgment of convention.

These researchers indicated that organisational culture could hinder or encourage the embracing of technology.

The empirical experiment by Jung and Loria (2010) demonstrated the direct impact of social factors and subjective norms on the purpose to use electronic health and the intended use of this technology in a Swedish context. A study by Hoque and Bao (2015) investigating the cultural factors affecting e-health usage in Bangladesh found that social factors have a direct impact and affect the Meaning to Use of e-health, while uncertainty avoidance, collectivism, and pragmatism had no huge effect on Intention to Use of e-health. Kim and Kankanhalli (2009) express that the negative disposition of senior therapeutic specialists toward the utilisation of clinical informatics may influence the demeanour of youthful medicinal specialists towards the utilisation of the system. This suggests if senior specialists are not utilizing clinical informatics systems, it might adversely impact others' choice to utilize them (Kim *et al.,* 2007).

3.3.5 Facilitating Conditions

The UTAUT model proposed two direct influences on the use of technology, namely the "Behavioural Intention to Use" and a new construct proposed by Venkatesh *et al.* (2003), called "Facilitating Conditions" (Razzak *et al.,* 2021; Williams *et al.,* 2015). This construct is 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). The construct is referenced from three constructs (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021) from the studied models namely:

- "Perceived Behavioural Control" from the "Theory of Planned Behaviour" (TPB) by Ajzen (1991) and the combined C-TAM-TPB model by Taylor and Todd PA (1995)
- "Facilitating Conditions" from the "Model of PC Utilisation" (Thompson *et al.*, 1991).
- "Compatibility" from the "Diffusion of Innovation" (DOI) theory by Rogers (1995)

Venkatesh *et al.* (2003) indicated that the "Facilitating Conditions" will not have a major impact on the intention to use when the expected performance variable measuring the impact is present (Razzak *et al.*, 2021; Williams *et al.*, 2015). Explaining this by the fact that the concept of enabling conditions was already largely captured by that of expected performance (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Williams *et al.*, 2015).

Organisational support or the involvement of leaders, Dishaw and Strong (1999) qualified them as “agents of change” which is presented by Venkatesh *et al.* (2003) as a determinant factor in the process of adopting technology within an organisation (Razzak *et al.*, 2021; Williams *et al.*, 2015). Singh and Shoura (2006) also confirmed that organisational support is an essential factor in explaining the success of technology in an enterprise. Venkatesh *et al.* (2003) also explains that the "Facilitating Conditions" are considered to directly influence use without being filtered by intention to use (mediating variable). Venkatesh *et al.* (2003) postulated that "Age" and "Experience of Use" are important moderating variables such that the effect will be stronger for older workers, particularly with increasing experience (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Williams *et al.*, 2015).

3.3.5.1 Role of facilitating conditions in the acceptability of information systems and e-health

The origin of "Facilitating Conditions" on the acceptability of new technologies comes from management sciences studies, in particular, the study of Churchman and Schainblatt (1965) who suggested links between the style of management and the success of the implementation of an information system in the industrial sector (Spooner *et al.*, 2017). Organisational factors are therefore likely to affect the acceptability of information systems (Spooner *et al.*, 2017). The work of Lucas Jr and Prescotts (1978) also fits into this perspective, they made it possible to classify the predictive factors of the success of an information system implementation into two main categories: organisational and individual factors. Based on nine empirical studies carried out in different sectors on the implementation of a particular software at the time, Lucas Jr and Prescotts (1978) were able to predict a successful implementation from the attitudes and perceptions of future users, from decision-making style, the quality of the computer system and situational and personal factors.

"Facilitating Conditions" refers to which extent people believe that to support the system, there is a technological and organisational infrastructure (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021; Wilson *et al.*, 2021). Chang *et al.* (2008) found that "Facilitating Conditions" have an advantageous impact on how innovation is used. According to Venkatesh *et al.* (2003), they discovered that when the construct "Effort Expectancy" is used in the same model, facilitating conditions alone do not extensively calculate intention to practice utilisation of the system. However, when it is moderated by age and experience, it has a pointed impact on intention to use the system for older workers with more experience (Bawack & Kamdjoug, 2018; Chang *et al.*, 2008; Razzak *et al.*, 2021; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). The study by Lucas Jr and Prescotts (1978) highlighted the role of managerial support, the quality of staff training, and the style of leadership have a significant effect on the success of an implementation of computer software.

Delone and Mclean (2004) have suggested a model which stipulated that the success of an information system presents a dynamic phenomenon which depends on six factors between which there is a causal and temporal interdependence. The six dimensions are 1) the quality of information, 2) the quality of the information system, 3) the quality of the technical service, 4) the use of the information system, 5) overall satisfaction and 6) the benefits produced by the system. The first three components of the model train the rest of the components of the model: user satisfaction and product benefits (Delone & Mclean, 2004).

The study by Lin and Lu (2000) highlights the significant role of compatibility on the attitude of use of health electronic services: ($\beta = 0.495$; $p < 0.05$). Compatibility corresponds to “the degree of coherence of the innovation with existing values, past experiences and the needs of potential adopters” (Triandis, 1977). From another angle, Lin and Lu (2000) examine the role of the quality of a website on the intention to use this product. According to the authors, the level of an information system's quality includes the response time of the site, the quality of the information provided and accessibility to the system. The integration of these variables into the "Technology Acceptance Model" has shown that the reaction time of an internet site affects both utility ($\alpha = .25$ with $p < .01$) and perceived usability ($\alpha = .43$ with $p < .001$). On the other hand, the quality of the information on the site only affects the utility ($\alpha = .27$ with $p < .001$) according to Lin and Lu (2000).

Olasina (2015) observed that facilitating conditions has a strong influence on effort expectancy, he argued that facilitating conditions influence the usage of ICT. It can be deduced from the foregoing that that "Facilitating Conditions" construct is related to the construct "perceived behavioural control" from TPB "Facilitating Conditions" from MPCU and "Compatibility" from DOI (Al-Qeisi *et al.*, 2015).

Holden and Karsh (2010) noted that facilitating conditions in healthcare acceptance technology is very important. They argued that availability of resources which include technical knowledge and adequate knowledge of computer are some of the facilitating conditions that promote the use of clinical informatics. Owolabi and Evans (2018) note that "Facilitating Conditions" is very important to medical doctors for the acceptance of the e-health system as it significantly explains technology use. Hills (2011) highlight the various resources that promote facilitating conditions in hospitals as including technical services, knowledge of the system and compatibility with other systems already in place.

3.3.6 Moderate Variables in the UTAUT Model

According to Baron and Kenny (1986), a moderating variable is a "qualitative or quantitative variable which influences the direction and/or strength of the relationship between an independent and dependent or criterion variable". A moderating variable is an interacting term which is said to emerge when the unexpectedly weak association between the independent and dependent variables or inconsistent relationship or no relationship at all, thus the moderating variable is introduced to reduce or strengthen the relationship (Baron & Kenny, 1986; Suliman, 2002). The study of Venkatesh *et al.* (2003 emphasises the importance of moderating variables including "Gender", "Age", the "Experience of

Use" and the "Voluntariness or Compulsory of Use", about the desire to use technology (Razzak *et al.*, 2021; Venkatesh *et al.*, 2003).

3.3.6.1 **Age**

Digitization affects all areas of life and imposes no age limit to adapt to this evolution and develop new skills (Quillion-Dupré *et al.*, 2016). Unfortunately, the use of new technologies is still a real challenge today for some senior adults (Seifert & Schelling, 2015). On one hand, it is difficult for some adults especially those over the age of 50 to use new online tools due to the lack of mastery of ICT, on the other hand, it is because some systems do not meet ergonomic criteria (Wang *et al.*, 2009). According to Seifert and Schelling (2015), the variable “age” is associated with resistance to technological change. In a survey by Olasina (2015), 43 percent of employers surveyed believed that older workers find it difficult to adapt to ICT and 40 percent believe that these workers are unable to adopt new technologies. The authors explained this resistance to change, by the feeling of tiredness in the daily routine among employees in the middle or at the end of their career (Olise *et al.*, 2014).

A study by (Quillion-Dupré *et al.*, 2016), was carried out to investigate how age affected the participation in ICT training. The age effect is compared to the effect of intermediate variables such as gender, intellectual level and professional experience of the candidate. However, when these variables are controlled, the statistics show that from the age of 29, a person's motivation to invest in a training project decreases. Also, the probability of obtaining a diploma decreases after 34 years of life. This could be explained by judgments ruling out that individuals carry on themselves following the assessment of their skills. According to the same study, more than 60 percent of the sample questioned having an age higher than 50 years, considering that they found difficulties in their professional integration.

The study of Guillemard and Salzberg (1994) suggests that older workers give more importance to their manpower which plays against their adaptation to new information and communications technology. In the same perspective, Marquié *et al.* (2002), showed that 2/3 of the people in the mid-career questioned associate with advancing age, greater difficulty in getting into IT. They have given some explanations for this difficulty which increases with age such as the fear of losing one's job, the apprehension of damaging the equipment, the lack of time to familiarize oneself with technological change and the difficulty to find yourself with the online user manuals.

In the study by Wang *et al.* (2009), they stated that older workers show less interest in new information systems, even less when they consider the time they have before retirement. Arning and Ziefle (2007) also found that the older the individual, the more their intention to use an information system decreases. Several other studies join this finding, notably that of Chung *et al.* (2010) by examining the effect of age on the acceptability of technological innovations, particularly on the ease of use of navigation tasks.

However, several authors have another opinion stating that senior employees are ready to adopt digital technologies (Czaja & Lee, 2002; Dickinson & Gregor, 2006; Min *et al.,* 2008) as long as they show their usefulness and they are not a source of frustration (Min *et al.,* 2008). It also emerged from the study by Seifert and Schelling (2015), interventions on subjective factors could have beneficial effects on “the use of the information system, for example by highlighting the usefulness of information system”.

In the e-health field, Campbell *et al.* (2017), has investigated the premiums, inclinations, and worries of more grown-ups employees in utilizing the e-health system, they concluded that the more the employees reach near the age of retirement the more the intention to use information system decreases. Torrent-Sellens *et al.* (2018) study on the evaluation of European health practitioners on the usage of e-health, showed that users below the age of 45 years had a greater favourable tendency to e-health usage.

3.3.6.2 **Gender**

Information Technology has no gender, but the numerous research undertaken by historians or sociologists of science and technology have demonstrated that its social construction was eminently masculine (Vollmeyer & Imhof, 2007). Information Technology, like science, has been developed with the emergence of capitalism, in an era strongly marked by the model of patriarchy (Dong & Zhang, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019). The situation of women has certainly improved considerably since then: they have benefited from the opening of education systems and have gradually gained access to several jobs initially reserved for men (Dong & Zhang, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019; Zhou *et al.*, 2014). The predominance of boys in scientific and technical disciplines is however noticeable in secondary education and continues in higher education (Zhou *et al.*, 2014). The supremacy of girls in terms of access rates in developed countries has not eliminated the hegemony of boys, mastering most of the promising technical fields (Dong & Zhang, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019; Sáinz & López-Sáez, 2010).

Sexual orientation has been and kept as one of the most widely recognized bases of division utilized by decision-makers (Kim *et al.*, 2007). Much research contemplates that focuses on sexual orientation contrasts and their effect on innovation acknowledgement exhibit that gender assumes a noteworthy job in deciding the utilisation of innovation (Dong & Zhang, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019; Zhou *et al.*, 2014). A study by Venkatesh and Davis (2000) on employees belonging to five different organisations, supports the difference between the process of adoption of information systems according to gender. Researchers have shown that men and women can react differently to new technology (Razzak *et al.*, 2021; Venkatesh & Davis, 2000). Men's decision to use the new system is strongly impacted by how valuable they think it is (Venkatesh & Davis, 2000). On the other hand, women's decision to adopt the system depends mainly on the "Perceived Ease of Use" and the attitude of the reference group towards the new technology (Venkatesh & Davis, 2000).

The impact of gender is also noted at the level of information processing. Men and women use different strategies to process information (Dong & Zhang, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019). More selective men do not carry out a complete and exhaustive treatment of the information available, whereas women pay more attention to the subtle details (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Karjaluoto *et al.*, 2010). In addition, women give more importance and attention to the ease of use when choosing a system (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Karjaluoto *et al.*, 2010). This emanates from a particular attention to the aesthetic aspect of the innovation which is not without effect on the adoption of a technology (Featherman *et al.*, 2021; Garavand *et al.*, 2019; Karjaluoto *et al.*, 2010). In other words, the aesthetic side of the system influences perceptions of ease of use for women (Arcand *et al.*, 2011; Featherman *et al.*, 2021; Garavand *et al.*, 2019; Karjaluoto *et al.*, 2010). Also, according to Arcand *et al.* (2011), the quality of information contributes more to usability perceptions among women than among men. These peculiarities at the level of the information processing process and the judgment criteria, affect the perceived usability of an information system but not the intention of use (Arcand *et al.,* 2011; Featherman *et al.,* 2021; Garavand *et al.,* 2019; Karjaluoto *et al.,* 2010).

A finding by Zhang *et al*. (2014) on how gender affects a person's decision to use m-health adoption stated that although smart devices are perceived to be more useful and have a greater social presence by women than by men, this does not change their usage intentions on the effective adoption of 1 them-health application. In a study by Khan and Aleem (2014) on factors affecting e-health adoption, the authors inform that for men the decision to adopt innovation depends on its perceived usefulness. Whereas for women, this decision stems from two essential factors; "Perceived Ease of Use" and "Social Influence". On a practical level, these results suggest that the training of men in the information system must focus on the usefulness of the software. On the other hand, for women, the training sessions must focus more on how to use the software to simplify it by emphasizing the social implications favouring the use of the system (Khan & Aleem, 2014).

3.3.6.3 User experience

The construct "User Experience" was explained by Norman (1999) corresponds to “a person's responses and perceptions that result from the use or anticipation of the use of a product, service or system”. Coming from a clever mix between ergonomics and human sciences, the user experience aims to provide the most suitable approach vis-à-vis a target audience based on any offered products, services or companies (Lallemand *et al.,* 2015). As technology related to information is used more and more, user experience has taken on an even larger scale because it has proven to be particularly adapted to the online world (Hassenzahl *et al.,* 2010).

The concept of user experience as per Hassenzahl *et al.* (2010), came from the desire to go beyond approaches based on usability, work and task paradigms (Hassenzahl *et al.*, 2010). They defined user experience as the perceptions and reactions of a person resulting from the actual and/or anticipated use of a product, system or service. Three notes providing details on the elements influencing user experience have been added by Hassenzahl *et al.* (2010):

- User experience includes all the emotions, beliefs, preferences, perceptions, physical and psychological reactions, behaviours and achievements of the user, which occur before, during and after use.
- User experience is a consequence of the brand image, presentation, functionality, performance, interactive behaviour and assistance capabilities of the interactive system; the internal and physical state of the user resulting from past experiences, his attitudes, his skills and his personality as well as the context of use.
- Usability, when interpreted from the perspective of users' personal goals, may include the type of perceptual and emotional aspects generally associated with the user experience. Usability criteria can be used to assess aspects of the user experience.

The user experience is intimately linked to the maturity of new technology (Barcenilla & Bastien, 2009). According to Rogers (1995), a product is only really accepted for routine use when it is judged sufficiently mature. This variable is noted by TAM2 (Venkatesh & Davis, 2000); the user experience moderates the effect of subjective standards on perceived utility and intended use. In the UTAUT model, the user experience has a moderating role on expectation in the effort, "Social Influence" and "Facilitating

Conditions". Depending on the feedback from the user experience, acceptance or rejection of the new product takes place. This notion accounts for the framework of human interaction with technology by integrating its different components (Barcenilla & Bastien, 2009), which is defined as “the consequence of the internal state of the user, the characteristics of the system and the context in which the interactions take place”.

3.3.7 Other variables used in the study of the UTAUT Model

3.3.7.1 Behavioural Intention

"Behavioural Intention" (BI) is referred to, as “the degree of a person's intention to engage in certain conduct” (Razzak *et al.*, 2021). The more firmly one wishes to engage in a conduct, the more probable it is that they will do so, according to the motivational variables that impact a certain action.

3.3.7.2 Use Behaviour

The way a user uses a system as part of his work and responsibilities is determined by how they utilise it. Razzak *et al.* (2021) claim that use behaviour assesses how frequently people utilise technology. The definition of use behaviour is the actual frequency of a certain technological usage Venkatesh *et al.* (2003).

3.3.7.3 Self-Efficacy

"Self-Efficacy" is defined as “an individual's belief about his or her capability to perform a behaviour that exercises influence over events” (Bandura, 1997). "Self-Efficacy" (SE) stands for to a person's sense of assurance in their capacity to perform any task (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021). Since "Self-Efficacy" may be either general or task-specific, people may at any moment have a range of thoughts about themselves. The presumptions one has about their degrees of self-efficacy can have an impact on how they feel, think, and motivate themselves. As a result, people with various levels of self-efficacy may act in ways that are very different from one another (Razzak *et al.,* 2021). People with a high sense of self-efficacy have a deep faith in their abilities and see challenges as trials to be overcome rather than risks to be avoided (Razzak *et al.,* 2021).

3.3.7.4 Anxiety

Anxiety refers to the participant's self-reported hesitation when using the Information System (Venkatesh *et al.,* 2003; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). Due to this perception that challenges are harmful, users may consequently entirely shun them. It may be difficult for some people to get past failures since they frequently concentrate on their previous transgressions (Razzak *et al.,* 2021).

3.3.7.5 Attitude towards using technology

Smith *et al.* (2015) define attitude “as an evaluative judgment, either favourable or unfavourable, towards performing an activity”. Four previous constructs were combined to create the variable ‘attitude towards using technology’: the "Attitude Towards Behaviour" based on TRA, TPB, and C-TAM-TPB; "Intrinsic Motivation" from the motivation model; affect towards usage from the MPCU; and affect from the social cognitive theory (Razzak *et al.,* 2021; Venkatesh *et al.,* 2003; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). The idea represents how a user ordinarily feels about a particular conduct (in this case, employing technology). It is obvious that its design is in tune with a person's taste for, enjoyment of, and delight in utilising technology (Razzak *et al.,* 2021).

3.4 Conceptual Framework of the Study

Several studies and adoption theories of ICT were examined in the previous section. It is clear from the research that TAM, TRA, and TPB have been used extensively to gauge technological acceptability in a variety of study types. These models, however, have been questioned for their remarkably poor explaining ability of the user behavioural intention to adopt a system, which generally ranges between 30 to 40 percent.

As this research is to answer the essential questions of E-health system adoption, UTAUT is the chosen theory as recommended by Venkatesh *et al.* (2003), future research should focus more on approaches integrative, combining the unified model with other constructs identified as relevant in previous research. Since its proposal, UTAUT has been widely used in different IT research fields. Based on a review of UTAUT by Williams *et al.* (2015), they stated that researchers have widely used UTAUT in the adoption of information technology about explaining the intention of users. Over the period 2004 to 2011, Williams *et al.* (2015) found that 174 studies were using the UTAUT model cited in 13 journals and conferences. Fifty-two percent (52%) of the studies concerned the use of general-purpose systems (Internet, non-specific information systems, etc.), 28 percent concerned specialized trading systems, 14 percent for communication systems and 6 percent for small systems of everyday use (databases, desktop application, etc.). Of the total number of studies reviewed, nine (9) were in the healthcare field. Four articles have been published on electronic medical record systems (Chisolm *et al.*, 2010; Hamner & Qazi, 2009; Kijsanayotin *et al.*, 2009; Terrade *et al.*, 2009), two on medical teleconferencing and telemedicine (Kvedar *et al.*, 2014; Lee *et al.*, 2014), and one for medical support systems (Jeng & Tzeng, 2012) and one on hospital information systems (Aggelidis & Chatzoglou, 2009).

Indeed, the UTAUT model is a synthesis of all the main models explaining the acceptance of a technology that has proven its validity and significant predictive power (Holden & Karsh, 2010). In addition, the model chosen by UTAUT can explain up to seventy percent of the variance in the intention to use a technology and about fifty percent of the actual use of the latter; this represents an extremely high predictive capacity (Aggelidis & Chatzoglou, 2009; Garavand *et al.*, 2019; Holden & Karsh, 2010; Suliman, 2002; Venkatesh *et al.*, 2003; Venkatesh *et al.*, 2012; Wilson *et al.*, 2021; Yahaya *et al.*, 2022). The UTAUT model has been applied successfully to numerous innovation adoption studies and is deduced as a convenient tool for researchers to assess IT performance (Garavand *et al.*, 2019; Magsamen-Conrad *et al.*, 2015; Suliman, 2002).

The UTAUT model was chosen for this study because of its thorough and integrated approach, which incorporates a wide variety of explanatory elements from the leading theoretical frameworks developed to explain the adoption and utilisation of technology. For instance, Venkatesh *et al.* (2003) thoroughly reviewed the literature on this topic and developed a unified model that takes into account the advantages of the prior theories. Therefore, it makes fair to assume that a theory will be superior to past theories that tried to explain technology adoption and usage if it combines the most substantial contributions from other models. The UTAUT model of Venkatesh *et al.* (2003) is the selected model to reply to our research questions and formulate our hypotheses.

3.4.1 Hypotheses Generation

This study's objectives are to identify, comprehend, and investigate the variables that affect healthcare practitioners' behavioural intents to utilise an e-health system. Alternatively put, it tries to pinpoint the crucial elements influencing the adoption of e-health and how this knowledge may be applied to speed up the process of dissemination and adoption. The UTAUT model developed by Venkatesh *et al.* (2003) is employed to achieve this goal. To help attain the required objectives, the following hypotheses have been developed.

3.4.1.1 Performance Expectancy

An Information System can only be accepted by professionals within an organisation if they perceive it useful to their work, and if they are convinced that this new technology will help them evolve and be more efficient (Razzak *et al.,* 2021; Rouidi *et al.,* 2022; Wilson *et al.,* 2021). The construct "Performance Expectancy" is how strongly a person feels that using a certain system would enable him to improve his performance at work (Venkatesh *et al.,* 2003; Wilson *et al.,* 2021; Yahaya *et al.,* 2022). According to Razzak *et al.* (2021); Rouidi *et al.* (2022); & Venkatesh *et al.* (2003), the "Performance Expectancy" construct is a direct determinant of "Behavioural Intention" to adopt an information system, that is "Performance Expectancy" has a positive relationship upon the dependent variable "Behavioural Intention". Thus, the following hypothesis has been developed.

H1: There is a positive relationship between performance expectancy and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.2 Effort Expectancy

According to Razzak *et al.* (2021), "Effort Expectancy" refers to the idea that a person may adopt an information system with the least amount of effort. This construct is to ease of use of the system. According to Razzak *et al.* (2021); Rouidi *et al.* (2022); & Venkatesh *et al.* (2003), the "Effort Expectancy" construct is a direct contributing factor and has a positive relationship with "Behavioural Intention" to adopt an information system. Thus, the following hypothesis has been developed.

H2: There is a positive relationship between effort expectancy and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.3 **Social Influence**

"Social influence" refers "the degree to which a person thinks that the system is advantageous to those that they look up to or whose opinions matter to them" (Wilson *et al.,* 2021). Social influence has previously been modelled using TRA and TAM-2 as a subjective norm. The inference is that a person's behaviour is impacted by those they identify with because they think that these people often make the right decisions, even though these factors have distinct names. According to Razzak *et al.* (2021); Rouidi *et al.* (2022); Venkatesh *et al.* (2003) & Wilson *et al.,* 2021, that there is a strong correlation between the factor "Social Influence" concept and the dependent variable "Behavioural Intention" to use an information system and has a positive connection with it. Thus, the following hypothesis has been developed.

H3: There is a positive relationship between social influence and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.4 **Facilitating Conditions**

This construct is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the adoption of the system" (Venkatesh *et al.,* 2003). Venkatesh *et al.* (2003) stated that in the presence of the "Performance Expectancy" and "Effort Expectancy", the "Facilitating Conditions" construct will have a non-significant influence on "Behavioural Intention" to adopt (Nadri *et al.,* 2018; Osifeko *et al.,* 2019; Razzak *et al.,* 2021; Williams *et al.,* 2015). Thus, the hypothesis developed for this construct is as follows:

H4. There is no relationship between facilitating conditions and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.5 Self-Efficacy

Razzak *et al. (*2021) state that self-efficacy relates to people's evaluations of their effectiveness or capacity to do a particular activity successfully; it is unrelated to an individual's talents but rather to how he or she views their capacity to make use of these skills. According to Venkatesh *et al.* (2003), "Self-Efficacy", is not retained in the UTAUT model as a direct determinant of "Behavioural Intention" to adopt an Information System. Thus, the hypothesis developed for this construct is as follows:

H5. There is no relationship between self-efficacy and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.6 Anxiety

Anxiety refers to the participant's self-reported hesitation when using the Information System (Abbad, 2021; Chang *et al.*, 2021; Featherman *et al.*, 2021; Garavand *et al.*, 2019). According to Razzak *et al.* (2021); Rouidi *et al.* (2022); Venkatesh *et al.* (2003) & Wilson *et al.*, 2021, "Anxiety" is not a direct determining factor of "Behavioural Intention" to adopt an information system and does not have a positive relationship with "Behavioural Intention". Thus, the following hypothesis has been developed.

H6. There is no relationship between anxiety and healthcare provider's behavioural intention to adopt the E-health system.

3.4.1.7 Attitude Towards Using Technology

According to Razzak *et al.* (2021), the concept of Attitude Towards Using Technology concepts depicts how a user generally feels about a certain behaviour (in this example, using technology). It is clear that this design appeals to a person's preference for, enjoyment of, and delight in using technology. According to Razzak *et al.* (2021); Rouidi *et al.* (2022); Venkatesh *et al.* (2003) & Wilson *et al.*, 2021, "Attitude Towards Using Technology" is not a direct determining factor of "Behavioural Intention" and does not have a positive relationship with the dependent variable. Thus, the following hypothesis has been developed.

H7: There is no relationship between attitude towards using technology and healthcare provider's behavioural intention to adopt the E-health system.

3.5 Identified Literature Gap

Based on the literature reviews, several noteworthy topics and research gaps are to be considered. Firstly, it is clear that many previous studies have used TAM, TRA, and TPB to assess technology acceptability in e-health in various places throughout the globe. However, these models have come under criticism for having a low explanatory power for behavioural intention, which only varies from 30 to 40 percent (Marquié *et al.*, 2002; Oechslein *et al.,* 2014; Razzak *et al.,* 2021; Williams *et al.,* 2015). On the other hand, UTAUT is positioned as the model with the best coefficient of determination of the behavioural intention (Holden & Karsh, 2010; Jawadi, 2014; Maillet *et al.*, 2015), explaining nearly seventy per cent of the variance in "Behavioural Intention" (Bawack & Kamdjoug, 2018; Razzak *et al.,* 2021). According to (Anja *et al.,* 2014; Doolin, 2016; Fan *et al.,* 2018; Featherman *et al.,* 2021; Schneider *et al.,* 2010), there's a need to investigate technology adoption in e-health using the UTAUT model of Venkatesh *et al.* (2003).

Second, the literature assessment revealed that the majority of scientific researchers who employed Venkatesh *et al.* (2003) UTAUT model to investigate adoption variables in ICT did their research in developed nations. Studies on e-health uptake in developing nations, particularly in Africa, are scarce. According to Owolabi and Evans (2018), South Africa leads the way with 46 articles using UTAUT from 2005 to 2015, followed by Nigeria with 06, Sudan with 03, and Ghana with 02. Compared to what we have in developed countries, only four studies in South Africa utilised UTAUT for e-health studies, whereas no studies in other African nations used UTAUT for healthcare research. As a result, there is a tremendous desire for the UTAUT concept to be applied to developing countries (Holden & Karsh, 2010; Moghavvemi *et al.*, 2013; Wang & Yang, 2005).

According to studies healthcare informatics resources are underutilised by medical professionals in many healthcare settings. UTAUT has shown to be an extremely useful theoretical tool for analysing ICT acceptance and rejection. Despite this, researchers in the field of social informatics rarely use this theory. According to Tielman *et al.* (2017), there are many contradictions in research outcomes, which might be attributable to the improper application of the UTAUT theory (Lallemand *et al.*, 2015). Many clinical informatics researchers, however, have not been able to fully utilise UTAUT in their research. This suggests that there is a knowledge gap in the use of UTAUT in clinical informatics research.

As a result, our study aims to comprehend and identify the determining factors that either discourage or encourage healthcare providers in Mauritius to adopt and use e-health systems. It should be mentioned the fact that there is a gap in the literature regarding the identification of "what" determining factors influence and affect the acceptance and adoption of e-health systems in Mauritius from the perspective of healthcare providers.

3.6 Summary

The adoption process is defined as the mental process through which a person (or any other decision-making unit) goes through and which starts from the knowledge of innovation to the confirmation of the decision to adopt, “including training regarding the innovation, the decision to adopt or reject it, and its implementation” (Chong *et al.*, 2015)

The acceptability phase rests from a theoretical point of view on prediction and modelling via functional and socio-cognitive indicators of the behaviours, attitudes or intentions of users (Gu *et al.,* 2016). From a methodological point of view, acceptability aims to assess a priori by relying on variables such as "Perceived Usefulness", "Perceived Ease of Use", "Social Influences", "Self-Image", etc (Gu *et al.*, 2016). Thus, many theories have been developed to understand and predict the behaviour of individuals vis-à-vis technology acceptance.

Theories such as the "Theory of Reasoned Action" - TRA (Ajzen & Fishbein, 1980), the "Theory of Planned Behaviour" TPB (Ajzen, 1991), the "Social Cognitive Theory" SCT (Bandura, 1997), the theory of "Diffusion of Innovations" DOI (Rogers, 1995) a "Motivational Model" (MM) by Davis *et al.* (1992) have been essentially projected with the aim of explaining human behaviour in general without concentrating on any specific area of the domain (Bawack & Kamdjoug, 2018). Davis *et al.* (1989), however, the "Technology Acceptance Model" - TAM (Davis *et al.*, 1989) has set out to describe the technology adoption behaviour through a model which is used as a benchmark for the majority of research on the favourable reception of technologies.

The specificity of TAM in information technology, the precision of the determinants it offers, as well as its parsimony, make it the most used model in the fields of acceptability and adoption of information technologies (Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011; Marquié *et al.,* 2002). A large number of studies (Bawack & Kamdjoug, 2018; Featherman *et al.,* 2021; Garavand *et al.,* 2019; Hsiao & Yang, 2011; Marquié *et al.,* 2002) have validated the use of TAM to explain the adoption of different information technologies in various contexts. Several extensions have been brought to the TAM model, among them we can find the TAM 2 by Venkatesh and Davis (2000), the "Combined TAM and TPB" (C-TAM-TPB) by Taylor and Todd PA (1995) and the "Unified Theory of Acceptance and Use of Technology" (UTAUT) by Venkatesh *et al.* (2003).

The "Unified Theory of Acceptance and Use of Technology" (UTAUT) created by Venkatesh *et al.* (2003) presented as a synthesized and complete theory (Rogers, 1995; Williams *et al.,* 2015). By bringing together, consolidating and refining the eight (8) established theories namely TRA, TPB, DOI, SCT, TAM, C-TAM-TPB, MM, and MPCU. UTAUT is believed by its authors as the model which best accounts for the embracing and use of information technologies (Oechslein *et al.,* 2014; Rogers, 1995; Williams *et al.,* 2015). UTAUT postulates that the actual use of technology is a function of the purpose to use, which itself is affected by the determinants, which are: "Performance Expectancy", "Effort Expectancy", "Social Influence" and "Facilitating Conditions" (Oechslein *et al.,* 2014; Razzak *et al.,* 2021; Williams *et al.,* 2015). In addition, UTAUT incorporates new categories of so-called moderating variables which vary the effect of the determining variables on the intent to use, these are "Gender", "Age", "Experience" and "Voluntariness of Use", whether the usage is compulsory or voluntary (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014; Venkatesh *et al.,* 2003; Williams *et al.,* 2015). Because of its parsimony, the specificity of its constructs and especially its particularization for information and communication technologies the UTAUT model is chosen as the research framework of this work. We have studied different theories based on technology adoption, focusing our interest, especially on the UTAUT model. The UTAUT framework is developed based on a fusion of (8) reputable theories, whose variables and predictive power were found to be the most significant for technology adoption

By bringing together, consolidating and refining the previously established theories, UTAUT is considered by its author, to be the best theory explaining up to seventy percent (70%) of the behavioural intention to adopt technology; and can explain about fifty percent (50%) of the actual usage of the technology. The UTAUT model has been utilised successfully to several IT adoption surveys and according to (Fan *et al.*, 2018; Featherman *et al.*, 2021) because of its comprehensiveness and completeness, UTAUT is seen as a convenient tool for researchers to measure IT adoption.

CHAPTER 4: RESEARCH METHOD

4.1 Introduction

With the increase in automation, Electronic Health (e-health) is considered to be the system that improves effectiveness, efficiency, quality and safety of healthcare (Castillo *et al.,* 2010; Elmghaamez *et al.,* 2022; Gagnon *et al.,* 2016; Garavand *et al.,* 2019; Wilson *et al.*, 2021). According to Hillestad *et al.* (2005), e-health has the potential to advance the quality of healthcare service; reduce medical errors; reduce healthcare costs; increase administrative efficiency; reduce paper consumption in clinics; and facilitate access to primary healthcare resources.

E-health refers to all areas of health involving information and communication technologies (Elmghaamez *et al.,* 2022; Gagnon *et al.,* 2016; Wilson *et al.,* 2021). Telemedicine, mobile health, electronic medical records, and computer-assisted surgery are becoming more and more common in today's society (Severinsen *et al.,* 2019). Digital innovations, according to Schoen *et al.* (2012), "contribute to the goals of sustainable development, including access to universal health coverage".

With e-health, financial and technical barriers are falling, and with them, access to healthcare is becoming easier, especially for progressing countries (Garavand *et al.*, 2019; Jones *et al.,* 2011). According to the Program Evaluation Report of the African Development Bank published in 2013, "e-health enforced the strengths of participation, accountability and good governance in the health sector". The World Health Organisation (WHO), in its WHA58.28, a resolution conceded in 2005, defines e-health as: "the cost-effective and secure adopt 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".

Even though e-health has the ability to enhance and facilitate the calibre of care delivered by medical professionals (Elmghaamez *et al.*, 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019), the adoption and usage of the system among healthcare providers are still low (Schoen *et al.*, 2012). As stated by Castillo *et al.* (2010) and Karamagi *et al.* (2022) several computerization projects, particularly related to the implementation of e-health systems were the subject of resistance from users when they were deployed.

According to the Registered Nurse Association of Ontario (2017), it is estimated that more than 70 percent of e-health implementation projects in the province of Ontario in Canada have failed, with huge financial losses, which has contributed to the loss of confidence in information and communication technology (ICT) to support clinical processes, especially within healthcare providers. According to a report published in the year 2015 by the Ministry of Health of Mauritius, out of nine (9) e-health systems deployed in different public hospitals in Mauritius, only one (1) system is partially being used.

Thus, analysis of all upcoming elements influencing the use of the e-health system is crucial, beginning from macro-level systemic factors to individual micro-level barriers (Pare *et al.*, 2014). In the e-health arena, several studies have been focused on analysing the determinants pre-adoption factors (Pare *et al.*, 2014). However, analysis of the concept of acceptability disclosed that adoption is a dynamic process that begins in pre-adoption and continues into post-adoption throughout the life cycle of the system (Abdekhoda *et al.*, 2016; Kootstra, 2004).

Therefore, the success variables that affect the process of acceptance and adoption behaviour must be understood and identified. Considering that adoption is a dynamic and constantly changing process, it becomes crucial for the survival of e-health in a clinical routine that post-adoption phenomena are analysed and understood to ensure organisational sustainability (Abdekhoda *et al.*, 2016; Kootstra, 2004; Severinsen *et al.*, 2019).

The target of this study is to relate and explore the influencing elements that have an impact on how healthcare professionals implement e-health systems into their everyday practises as part of primary care. As stated by Gagnon *et al.* (2016), e-health is perceived to be the key solution that can help the healthcare sector to improve and provide efficient quality of care, a deep and scrutiny analysis of the critical influences affecting physicians' adoption of an e-health system could lead to better design of outreach strategies that could optimize the impact of implementation projects, particularly about the reduction of the failure rate and better control of project costs.

This study has a quantitative research approach as it analyses the different variables such as "Performance Expectancy", "Effort Expectancy" and "User Experience", which affect the e-health adoption among the healthcare providers. It is essentially based on measurable data that is obtained through questionnaires survey from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius as a case study. The questionnaire has been adopted from the "Unified Theory on Acceptance and Use of Technology" (UTAUT) model created by Venkatesh *et al.* (2003).

4.2 Research Paradigms

This section examines several research paradigms as well as the research paradigm that is most suited for the instrument of investigation used in this study. A set of presumptions known as a research paradigm directs the investigation of the social environment and the use of appropriate inquiry procedures (Mahendran *et al.,* 2022; Miles & Huberman, 2003). The creation of a competent technique necessitates the acceptance of a research paradigm. A paradigm, according to Patton (2014), “is a tool for deconstructing the complexities of the real world”. A paradigm is made up of different philosophical concepts such as ontology, epistemology, axiology and methodology.

Ontology is defined as the nature of reality, according to Pai and Huang (2011). Things in the world and reality are referred to as ontology (Ali *et al.*, 2020; Carignan *et al.*, 2016). Epistemology, according to Casalo *et al.* (2010), is the connection between science and reality, or how reality could be evaluated. The processes of inquiry used to generate knowledge are known as epistemology (Angkurawaranon *et al.,* 2020; Min *et al.,* 2008). Is it possible to use and research the same principles in both social and scientific sciences? This is the fundamental question in epistemology. Axiology primarily relates to the study's objectives. The emphasis of axiology is on the research's values. This is significant because values influence how research is conducted and what is valued in the research's findings (Angkurawaranon *et al.,* 2020). Methodology is a set of overarching guidelines and methods for arranging and organising theoretical and practical work, as well as the philosophy behind the methodology (Angkurawaranon *et al.,* 2020).

The two most common techniques for collecting information in the social sciences are positivism and interpretivism (Yoo *et al.,* 2012). Other paradigms mentioned in the literature include post-positivism and critical theory (Burkholder *et al.*, 2020; Carignan *et al.*, 2016; Yoo *et al.*, 2012). The two prevalent paradigms that have affected social scientific research, however, are positivist and interpretative viewpoints.

According to Casalo *et al.* (2010), "positivism is the earliest theory in the social sciences and is related to the intellectual works of A. Comte and E. Durkheim and they believed that knowledge is based on sensory experience and may be obtained via observation and experimentation". Pai and Huang (2011) claimed that human behaviour may be studied via observation and reason. Positivist philosophy defines reality as anything that can be felt by the senses. The rules that govern reality are exact, well-organized, and independent of human knowledge.

Mather *et al.* (2014) demonstrated that positivist researchers believe reality is objective and can be investigated using measurement methods that are not reliant on the scientist or their equipment. According to researchers like Bagozzi (2007), The ability to divide and fragment "Reality" makes it possible to make exact measurements and observations of the physical world. According to Raymond *et al.* (2015), the positivist approach "is a propensity to adopt a realist perspective and believe that there is a single, objective reality that exists independent of what individuals perceive". Regardless of human opinions, the social world is a real, genuine, and unalterable place of conflict.

Interpretivism, on the other hand, reflects the viewpoints of scholars who have been doubtful of applying natural scientific approaches to the research into the social realm (Bryman, 2017; Garz, 2020). According to the author, humans in the social sciences are not the same as those in the natural sciences and cannot be thought of as similar objects. A distinct viewpoint is necessary for the study of society. Vico and Dilthey are two authors whose work is connected to the interpretive theory, according to Mather *et al.* (2014). The reality, according to the interpretative view, exists only in the mind and is only perceived inwardly.

Interpretive researchers, according to Raymond *et al.* (2015), think that social factors like language and awareness may be used to evaluate reality. The interpretive method aims to depict a wide range of perceived realities that may not be understood ahead of time (Garz, 2020; Raymond *et al.*, 2015). In an interpretive approach, questions and data collecting are devised together. When compared to positivist researchers, interpretive researchers construct more personal and adaptable research architectures.

According to Farias and Almeida (2014), “the two fundamental tenets used for evaluating health care information systems are objectivist and subjectivist assumptions”. According to Farias and Almeida (2014), the objective assumption is linked to quantitative research through the development of data-gathering devices. Qualitative research is connected with the subjective assumption. In qualitative research, rather than formulating hypotheses ahead of time, researchers may generate them as the study progresses (Farias & Almeida, 2014). According to Mather *et al.* (2014), the constructivist and positivist perspectives are ideal for doing information systems research.

According to Ivankova *et al.* (2006), constructivist scholars analyse reality through the lens of the individual's experience. Qualitative approaches, such as interviews, are used by researchers with subjective assumptions to reveal individual impressions of a circumstance (Richman & Zucker, 2019; Tielman *et al.*, 2017). Psychology has long been associated with quantitative research techniques (Larsson, 1993). The positivist or neo-positivist philosophies underpin quantitative technique. To create a difference between reason and emotion, researchers might use the positivist method to remain detached from respondents and emotionally impartial (Mahendran *et al.*, 2022; Quinlan *et al.*, 2019; Scheim & Bauer, 2019).

Positivist research follows a set format, allowing for precise responses to each topic. To embrace new information, Quinlan *et al.* (2019) advocated utilising a quantitative method, because the researcher can independently and objectively evaluate reality. Mathematical precision is a prerequisite for quantitative approaches as a tool for science (Mahendran *et al.*, 2022; Quinlan *et al.*, 2019; Scheim & Bauer, 2019). The most important aspect of quantitative research is objectivity. Sharma (2017) claimed that objectivity allows researchers to avoid personal bias and portray reality as it is. The researcher maintains objectivity by remaining detached from and unbiased toward the research subjects, respondents, and data collection procedures.

4.3 Research Approach and Design

The purpose of this section is to look at the right paradigm for this study and how to choose the best method. An evaluation of research methods was carried out to determine the benefits and drawbacks of various research paradigms. Deductive and inductive techniques were examined. The primary distinction between inductive and deductive techniques is that the inductive technique tries to build a theory, whilst the deductive technique aims to test an existing theory (Ali *et al.*, 2020; Angkurawaranon *et al.*, 2020; Burkholder *et al.*, 2020; Garz, 2020). The inductive technique is typically used when there is almost no or very little literature on a subject and there is no theory to test. The inductive method entails three steps. 1. Observation, 2. Pattern recognition, and 3. Theory development. On the other hand, deductive techniques generally start with a theory (Ali *et* *al.,* 2020; Angkurawaranon *et al.,* 2020). The various phases of a deductive research approach are as follows: 1. Formulate a problem statement based on an existing theory. 2. Create an empirically testable hypothesis based on the existing theory. 3. Compile data to test the theory. 4. Examine the data and decide whether to accept or reject the hypothesis (Ali *et al.,* 2020; Angkurawaranon *et al.*, 2020; Burkholder *et al.,* 2020; Garz, 2020).

Inductive reasoning is a method of qualitative research in which the researcher obtains data and then utilises it to produce ideas and theories (Burkholder *et al.,* 2020; Scheim & Bauer, 2019). Whereas most quantitative techniques use a deductive strategy. The positivist paradigm is "used when a researcher uses a logical method to create a theory, then develops a plan to test the hypotheses that result from that theory" (Bandura, 1997). An inductive method begins with data collection and then develops a theory based on data analysis (Bandura, 1997; Burkholder *et al.,* 2020; Scheim & Bauer, 2019). It is more interpretative in character and arises from the facts.

Quantitative, qualitative, or mixed methods are research approaches that can be used. Deductive approaches are strongly connected with quantitative methods, whereas inductive methods are more directly related to qualitative research (Scheim & Bauer, 2019). In the social sciences, there are two types of methodology: quantitative and qualitative (Foon & Fah, 2011). The two techniques combined known as mixed methodology, can, however, be used in tandem.

4.3.1 Quantitative Research Approach

For many years, researchers have used the quantitative approach, which is a generally observed study methodology (Burkholder *et al.,* 2020; Ivankova *et al.,* 2006; Scheim & Bauer, 2019). The positivist or neo-positivist philosophies under pin quantitative techniques (Mahendran *et al.*, 2022; Quinlan *et al.*, 2019; Scheim & Bauer, 2019). Researchers who utilise quantitative approaches, according to Stake (1995), "typically appeal to the virtues of mathematics as a clear, unambiguous language that might increase our ability of deductive reasoning".

Quantitative research is defined as a systematic attempt to define, measure, produce and analyse data on the relations between the factors of a phenomenon (Patton, 2014; Zyphur & Pierides, 2019). Quantitative methods are research approach, using mathematical and statistical analysis tools, to describe, explain and predict phenomena through historical data in the form of measurable variables (Angkurawaranon *et al.*, 2020; Bryman, 2017). Quantitative research is a structured way to collect and analyse data from different sources and is based on a positivist or post-positivist epistemology (Berkovich, 2018; Howlett, 2013; Zyphur & Pierides, 2019). Quantitative research involves the use of computer tools, statistics and mathematics to obtain results (Zyphur & Pierides, 2019). It is conclusive in its end since it tries to quantify the problem and understand how widespread it is, by looking for results that can be projected on a larger population (Bryman, 2017). On the other hand, the quantitative method differs from qualitative methods which is generally more exploratory, a type of research that depends on the collection of verbal, behavioural or observational data that can be interpreted subjectively (Berkovich, 2018; Bryman, 2017).

Researchers that adopt quantitative rather than qualitative method generally seek to measure the magnitude and look for objectively interpreted statistical results (Basias & Pollalis, 2018; Garz, 2020). While the results of qualitative research may vary depending on the capabilities of the observer, the results of quantitative research are interpreted almost identically by all experts (Basias & Pollalis, 2018; Garz, 2020). The two types of research vary considerably not only in their results but in all other aspects (Rahman, 2017), qualitative data provides a subjective view of the problems, while quantitative data defines a structured of relationship for causation between the issue and the variables (Basias & Pollalis, 2018; Rahman, 2017).

Quantitative methods most often adopt a hypothetic-deductive approach as opposed to the inductive approach which is more used in the qualitative research approach (Ali *et al.,* 2020; Basias & Pollalis, 2018). In a hypothetic-deductive approach, a preliminary hypothesis is formulated, most often after a review of the literature on a specific research question, to verify or refute the hypothesis, where data is first collected and then analyse (Basias & Pollalis, 2018). In a post-positivist approach, the scientific validity of such studies is based on the fact that the hypothesis is refutable and that the experience is reproducible (Basias & Pollalis, 2018; Bryman, 2017).

Quantitative research, as its name suggests, aims to quantify the results of the research (Bryman, 2017). It is commonly used in the healthcare arena for experiments in the form of randomized controlled trials, aimed at understanding the effects of new technology compared to other treatments or the absence of treatment (Scheim & Bauer, 2019). In psychology, Westerman (2006) considered that quantitative research is necessarily also hermeneutics and that the notion of measurement in its transposition from the natural sciences to the human sciences must be rethought. In medicine, quantitative methods have acquired the status of scientific truth (Ali *et al.,* 2020; Bradshaw *et al.,* 2017), if a phenomenon can be reduced to measurable variables, then it can claim scientific validity (Bradshaw *et al.,* 2017). As per Scheim and Bauer (2019), it is undeniable today that medical progress cannot do without quantitative studies, but it is equally undeniable that this progress will be limited without the development of qualitative studies (Bradshaw *et al.,* 2017).

However, quantitative experiments can be difficult and require a lot of time to carry them out (Richman & Zucker, 2019). They must be carefully planned to ensure that there is complete randomization and the designation of the control groups is correct. Quantitative studies usually require extensive statistical analysis, which can be difficult, because most scientists are not statisticians (Ali *et al.,* 2020; Allwood, 2012). The field of statistical study is a scientific discipline as a whole and can be difficult for non-mathematicians (John & Johnson, 2000). In addition, the requirements for statistical success in confirming the results are very strict, with very little experience in detail proving a hypothesis, there is usually some ambiguity, which requires further testing and refinement of the structure and design of the experience (John & Johnson, 2000). This means that a new investment of time and resources must be committed to refining the results (John & Johnson, 2000).

Quantitative research, with its structure is a great way to finalize the results and prove or refute a hypothesis (Richman & Zucker, 2019). This structure has not changed in centuries; it is so standard in many fields and scientific disciplines. After a statistical analysis of the results, a complete response is reached, and the results can be legitimately discussed and published. Quantitative experiments also filter out external factors if they are well designed so that the results obtained can be viewed as real and unbiased (Richman & Zucker, 2019).

Objectivity is considered the most important factor by many quantitative researchers. Objectivity is seen as a virtue in quantitative research, according to Sharma

(2017). Sharma (2017) further emphasised the need for objectivity in reducing personal prejudice and bias, as well as ensuring that social reality is portrayed as it is, rather than how the investigator interprets or imagines it.

To assume an objective position, the researcher must maintain their distance from the study's subject, respondents, and data collecting and analysis procedures. The selection of a sample that "accurately represents the characteristics of the target population is one of the most important criteria in quantitative research" (Ali *et al.,* 2020). It is necessary to utilise a representative sample of the population while doing quantitative research on a population of interest. Generalisation and conclusions that may be applied to the entire population are made possible by achieving representativeness in quantitative research. Deductive reasoning, in which a researcher depends upon a theory, is used in quantitative research. By collecting and interpreting data, this is done to produce hypotheses that are subsequently tested (Richman & Zucker, 2019).

Questionnaires or surveys are frequently used in quantitative research to determine how individuals see themselves (Suliman, 2002). Questionnaires should be created and enhanced as the primary research technique in quantitative studies to produce accurate and reliable data that will enable precise analysis to answer research questions and assess hypotheses. According to Van den Bulte and Lilien (2001), the most prevalent form of data collecting in quantitative research including the use of ICTs is a survey. Quantitative research (for example, surveys) is advocated by Fan *et al.* (2018) and Patton (2014) to examine participants' opinions and behaviour. Sharmas (2017) underlined that if the sample is representative of the community, the conclusions of quantitative research may be broadened to the full population. A quantitative approach can be used to describe how strongly the variables under investigation are related.

4.3.2 Qualitative Research Approach

The qualitative method became popular in the last three or four decades (Ivankova *et al.*, 2006; Richman & Zucker, 2019). According to Cahill (1996), qualitative research may be employed as a pre-quantitative study research project or as a post-quantitative study follow-up research project to assess the study's validity. Using the qualitative research approach of inductive reasoning, the researcher gathers data and then uses it to come up with theories and concepts. Sezgin and Yıldırım (2014) described qualitative research as a collection of material and interpretive techniques that make the world visible, such as conversations, observations from the field, recordings, images, and memos. The authors emphasised that qualitative researchers look at items in their natural environments. The most popular research approach is interviewing, which allows researchers to interact closely with participants (Larsson, 1993). Theoretical frameworks for qualitative research vary. Sharma (2017) identified three approaches to social study, namely phenomenology, hermeneutics, and symbolic interactionism. These methodologies were not examined further because they were not used in this Thesis's research.

There isn't a single accepted approach for doing qualitative research, according to Lees (2004). When conducting their research, researchers consider a number of variables, including the objectives of the study as well as their own viewpoints on the social environment and what can be learned about it (ontology), the essence of understanding and how it may be acquired (epistemology), and so forth. Researchers should assess the research's intended audience, the participant characteristics, and the researcher's position and surroundings, according to Lees (2004). The aim of the researcher, according to Pai and Huang (2011), is “to develop new knowledge (epistemology) and adequately describe the nature of reality (ontology)”. According to Pai & Huang (2011) and Scheim & Bauer (2019), the researcher makes links between reality and the new knowledge that emerges from it.

In qualitative research, the sample size may be small, and many researchers do not place the same emphasis on representativeness as they do in quantitative research, where results may be applied to the entire community (Raymond *et al.*, 2015; Scheim & Bauer, 2019). In qualitative research, theoretical sampling, which involves the recruitment of necessary, typical, and theoretically pertinent units, accomplishes transferability (Raymond *et al.*, 2015; Scheim & Bauer, 2019).

Interview is the most popular approach in qualitative research, although data can also be acquired through group discussions, observation, diverse texts, photos, and other materials (Pare *et al.*, 2014). Interviews, according to Suliman (2002), may be utilised to gather data that provides true insights into people's experiences. Suliman (2002), on the other hand, acknowledged that interviewees may not always deliver valuable insights and instead reply to interviewers with personal narrative structures.

It is possible to combine quantitative and qualitative approaches, which is known as a mixed method approach (Ivankova *et al.*, 2006). It's a term used in the post-positivist movement. Mixed method techniques are still evolving in terms of form and substance. Bryman (2017) advocated combining quantitative and qualitative research since it can result in a slew of unexpected conclusions. Pare *et al.* (2014) noted that with mixed techniques, both methodologies compensate for one other's flaws, boosting the study's overall strength.

4.3.3 Difference between Qualitative and Quantitative

While the quantitative strategy gathers data using a pre-set methodological framework and questionnaires with precise specifications, the qualitative strategy, which uses amorphous or semi-controlled interviews, reveals the assembly of the data through information analysis (Ali *et al.*, 2020; Angkurawaranon *et al.*, 2020; Burkholder *et al.*, 2020; Garz, 2020). The quantitative method favours bigger samples to generalise the results to a larger population. Smaller samples are chosen in the qualitative method to make the research more in-depth. The main objective of the qualitative method is not to generalise the results. Patton (2014) addressed how doing one-on-one interviews for qualitative research may take more time than preparing and distributing a questionnaire to a broad sample in quantitative investigations. But in quantitative research, creating a questionnaire, choosing a bigger sample, and obtaining data are time- and labour-consuming procedures (Ali *et al.*, 2020; Angkurawaranon *et al.*, 2020; Burkholder *et al.*, 2020; Garz, 2020).

Qualitative researchers seek rich, real, deep, and valid data, whereas quantitative researchers seek hard, reproducible, and dependable data (Shih & Fang, 2006). The results of quantitative investigations are usually provided in a numerical format, whereas the most typical means of presenting the results of qualitative studies is in a textual format (Patton, 2014). In quantitative research, hypothesis testing is the most common strategy, whereas qualitative studies use an inductive approach to generate hypotheses. Qualitative research generates concepts that assist to comprehend social processes, whereas quantitative research delivers measurable responses to study questions (Brown *et al.*, 2020). Brown *et al.* (2020) advocated that employing a qualitative technique for in-profound investigation, such as determining how teens can obtain instructional messaging on quitting smoking.

Neither method is superior to the other; they both have advantages and disadvantages, and they may be combined (Mahendran *et al.*, 2022; Patton, 2014; Quinlan *et al.*, 2019). Before focusing on how to do the study, the author suggests that the researcher focus on what he or she is looking for (questions) (methods). According to Begley (1996), the quantitative technique is employed in circumstances when the issue is well-understood, but the qualitative approach is used in exploratory investigations to undertake a more in-depth examination. In health services research, Brown *et al.* (2020) advocated for the use of qualitative research to get access to regions that are not conducive to quantitative study. According to Pai and Huang (2011), Instead than predicting human conduct, the interpretive approach focuses on understanding and interpreting it.

According to Pai and Huang (2011), “using the subjectivist assumption, end users who utilise ICT systems may have different viewpoints on what is good. As a result, the interpretative assumption explores several types of diversity rather than expressing the user's belief”. In quantitative and qualitative research, multiple ways of data collection are used. In qualitative research, data is collected by direct interaction with individuals, either individually or in groups (Mahendran *et al.*, 2022; Quinlan *et al.*, 2019; Scheim & Bauer, 2019). As a result, this form of data collection takes a long time. The information is gathered from reduced samples. However, qualitative research gives deeper data, which allows the researcher to better understand the phenomena. Focus groups, interviews, observation, and action research can all be used to collect data in qualitative research

(Mahendran *et al.,* 2022; Quinlan *et al.,* 2019; Scheim & Bauer, 2019). However, data collection in quantitative research can take many different forms, including reviews, experiments, medical trials, surveying and documenting events, and presenting information from information systems. wider samples used to collect data for quantitative techniques enable results to be applied to a wider population (Patton, 2014).

4.3.4 Justification of the Research Method and Approach

The UTAUT model has been used to define the hypotheses. This research is part of a positivist paradigm, assuming the existence of a fixed reality that can be explained by analysing the factors associated with the phenomena to be studied. As stated by Orlikowski and Robey (1991) “Researchers who adopt a positivist perspective assume the existence of a priori fixed relationships within a phenomenon whose nature can be relatively un-problematically apprehended, characterized, and measured”. The positivist method focuses on testing predictions from an established theory and interpreting individual conduct to support the predictions (Angkurawaranon *et al.,* 2020; Burkholder *et al.,* 2020). In order to convey much of the reality, this research had to take into account Ivankova *et al.* (2006) theories on the positivist method with the use of numerous techniques and multiple participant viewpoints. According to a survey of methodological tactics, the reality is objective and may be investigated using quantifiable methods that are not reliant on the scientist (Mahendran *et al.,* 2022; Miles & Huberman, 2003).

A positivist approach will enable the investigator to stay impartial towards the study's participants. The positivist approach will need the researcher to maintain emotional neutrality. The recognised scientific methodology for this inquiry may be used, as suggested by Cahill (1996). The positivist research instrument's fixed form permits only accurate replies to each question, and it may be used to examine the attitudes of healthcare professionals about new ICT. As a result, in this thesis, a positivist paradigm was determined to be the most acceptable instrument for evaluating healthcare practitioners' intents.

To address the research questions and evaluate the study hypotheses that were presented in Chapters 1 and 3 respectively, a quantitative research approach will be used for this research as it is usually the tool of researchers who examine phenomena from a positivist perspective (Howlett, 2013; Mahendran *et al.*, 2022; Miles & Huberman, 2003), as we assume the existence of a fixed reality that can be explained by analysing the factors associated with the phenomena. Only exact, accurate measurements can be employed to answer the inquiry questions in this study (Bagozzi, 2007; Norman, 1999). Qualitative research generates concepts that assist us comprehend social processes, whereas quantitative research delivers measurable responses to study questions (Brown *et al.*, 2020; Richman & Zucker, 2019).

One of the quantitative research benefits implies the rapid speed that data can be collected (Schoen *et al.*, 2012). In addition, using random samples that are statistically valid survey can quickly be generalized to the entire population (Basias & Pollalis, 2018; Bryman, 2017). Quantitative research can also be anonymous, which is useful when dealing with sensitive topics (Berkovich, 2018). Another major pro of quantitative research is that it allows you to generalize your results beyond the group of participants (Howlett, 2013; Mahendran *et al.*, 2022; Miles & Huberman, 2003; Zyphur & Pierides, 2019).

The recommendations of Moore and Benbasats (1991) that the quantitative technique may be used to test hypotheses and assess attributes were also considered. The recommendation from Moxey *et al.* (2010) that a quantitative technique be utilised to denote "the strength of the statistical correlation between variables was employed in the development of the research instrument". Shih and Fang (2006) suggested that the quantitative approach allowed for the capture of specific, repeatable, and reliable data. We looked at the suggestions made by Chew *et al.* (2004) and Patton (2014) that quantitative methodologies are preferable for extrapolating findings from a sample to the complete target population. In order to give precise correlations between the factors examined in the technology acceptance models in this study, Laumer *et al.* (2010) guidelines on the suitable complexity of the study were taken into account.

4.3.5 Case Study as the Quantitative Research Design

The case study is a research methodology used to study phenomena in real situations, whether they are new and/or complex, or to extend knowledge on phenomena already investigated (Mahendran *et al.,* 2022; Runfola *et al.,* 2017). Case study is a methodological approach which systematically aims to collect sufficient information on a person, an event or a social system (group of individuals or organisation) to allow the researcher to understand how it functions or behaves in a real situation (Berg, 2000; Runfola *et al.,* 2017). Rigorous case studies allow researchers to explore or describe a phenomenon in context using a variety of data sources (Gibbert & Ruigrok, 2010; Mahendran *et al.,* 2022). Thus, case studies can focus on an individual, a group, or an organisation, by collecting and analysing life stories, written documents, biographies, interviews, or even participant observation which are for deconstruction and the inherent reconstruction of the complex phenomenon(s) studied (Yin, 2009).

A case study is not a method of data gathering in and of itself, but a methodological approach which accommodates several data collection devices (Yin, 2009). Whatever the collection technique or techniques used, the information collected is generally rich and detailed. The case study method is also considered to be a “naturalistic” research design (Lincoln & Guba, 1985), most often of a qualitative nature, in contrast to “experimental” research designs where researchers have control over the environment and/or variables (such as clinical trials in laboratories), while the case studies focus on phenomena in real situations and not controlled (Berg, 2000; Runfola *et al.,* 2017).

According to Yin (2009), the case study method can be used to explain, describe or explore events or phenomena in their real context. This is a different approach from that of experimental designs where researchers test hypotheses in clinical laboratory conditions, which allow them to deliberately manipulate the environment (Mahendran *et al.,* 2022; Runfola *et al.,* 2017). According to Yin (2009), the use of the case study method is relevant when certain conditions are met, such as:

- The study must answer research questions such as "What", "How" & "Why".
- The behaviour of the study's informants cannot be controlled by the researcher.
- The investigator deals with contextual factors of the studied phenomenon which seem relevant.
- It is unclear where the boundaries between the phenomena under study and its surroundings lie.

Schriesheim *et al.* (1993) distinguished three main uses of the case study methodology: (1) the motivation to study an important research question in the light of a particularly interesting case; (2) inspiration for new ideas generated by immersion in a rich case using an inductive approach; and (3) the illustration of a theory by a value-added case, which will shed new light.

Depending on the appropriate epistemological framework, the case study technique can be comprehended in a variety of ways (Larsson, 1993). There are traditionally two main epistemological currents in the method of case studies in the social sciences and a fortiori in management and organisational sciences. The first is proposed by authors like Stake (1995) and Larsson (1993) and is situated in a socio-constructivist or interpretative paradigm, where the researcher has a personal interaction with the case. Here, the case study is developed in a relationship between the researcher and his informants and is presented in such a way as to invite the reader to join this interaction in the discovery of the case (Stake, 1995).

The second approach developed by authors like Yin (2009) fits more into a post-positivist paradigm, which involves the development of a careful study protocol and which carefully considers the validity of results obtained and its possible biases. In general, this approach involves a prior conceptual construct and/or an exploratory or pilot phase and ensures that all the elements of the case are described and analysed properly (Runfola *et al.,* 2017). This research work fits perfectly as an evaluative case study research in ICT as it has three essential characteristics as defined by Pinsonneault and Kraemer (1993):

- The purpose of the evaluative case study is to produce a quantitative description of the study population. The subjects studied could be individuals, groups, organisations or communities.
- The main method for collecting information is to ask structured and predetermined questions about the subjects to be studied.

- The information collected generally relates to only a portion of the study population - from the sample - nonetheless, it is gathered in a form that allows conclusions to be applied to a population or a group.

4.4 Population and Sample of the Research Study

4.4.1 Sampling Methods

The purpose of this section is to talk about how important it is to use suitable sampling strategies. Before selecting the most acceptable sample strategy for this Thesis, sampling approaches will be reviewed. According to Yahaya *et al.* (2022), “to accomplish the objectives of a scientific project, researchers must first determine the group or groups of people in which they are interested, also called the population of interest”. In general, a researcher's target audience is rather constrained and generally somewhat limited, it is critical to determine the particular community or group of individuals in which he is interested to develop an appropriate approach. However, it is not always practicable to obtain data from the entire population.

The researcher must choose a representative sample, also known as the study's sample, of an adequate number of people to characterise the desired community. It should be possible for researchers to believe that the sample they are using is representative of the population they are researching. (Urquhart *et al.*, 2016; Yahaya *et al.*, 2022). Participants in a representative sample must have characteristics that are proportional to those in the population., i.e., the trial should not be significantly distinct from the population. The information gathered from a representative sample may be claimed by the researcher to be true for the entire population. This is referred to as the generalisation of findings (Ahlan & Ahmad, 2015). However, a prejudiced sample that is not a true representation of the population that the researcher is aiming to generalise might result in unreliable findings (Urquhart *et al.*, 2016). The use of an adequate sample allows quantitative research results to be transferred to the study population (Burkholder *et al.,* 2020; Garz, 2020; Moore & Benbasat, 1991).

Moore and Benbasat (1991) argued that selecting a sample from the population and the findings obtained from that sample should be comparable to those obtained from the rest of the population. Simple random samples, stratified samples, multi-stage samples, quota samples, and systematic samples were all characterised by Moore and Benbasats (1991) and Bandura (1997) as distinct types of sampling. “The paper-and-hat approach, in which we write down names or numbers from the specified population on a piece of paper, place them in a hat, shake it vigorously, and pull out as many as we need for our sample” (Yahaya *et al.*, 2022) was compared by Moore and Benbasats to the random sample in 1991. The crucial aspect is that everyone has an equal probability of being represented in the sample. According to Bandura (1997), haphazard figures enable the choice of a trial without bias.

The Latin word strata, which meaning layer, is where the word stratified originates. Stratified sampling, in accordance with Moore and Benbasats (1991), guarantees that each of a population's 'layers' of subgroups is fairly represented. For instance, we should choose a representative sample from both of the layers inside a single business that employs both part- and full-time workers. According to Bandura (1997), the sample as a whole is more likely to be representative if each stratum is represented proportionally. Cluster sampling and stratified sampling are similar (Bandura, 1997). He suggests that rather than a collection of specific cases, cluster sampling should be thought of as an exhaustive list of clusters. Once the clusters have been established, a small number of clusters are selected using random sampling techniques (Yahaya *et al.*, 2022). Finally, data is gathered from the entire population inside designated clusters. For example, data may be sorted according to the kind of region using this approach.

Multi-stage sampling is required in research that spans a large geographic area. According to Moore and Benbasats (1991), “a nation or population is divided into a small number of extremely large areas, and two or three of these are chosen at random”. Within the two or three locations chosen, random sampling is utilised. Participants chosen in the last step of multi-stage random sampling are geographically concentrated in a few places but reflect the whole population. Multi-stage cluster sampling, as described by Bandura (1997), is a progression of cluster sampling. This strategy was presented by the author to overcome sampling issues with geographically distributed populations. However, this tactic may be applied to organisations that are not geologically based. According to Bandura (1997) recommendations, multi-stage cluster sampling might be employed in this thesis to study the viewpoints of healthcare professionals on a national scale.

When precision in the final results is not needed, a quota sample is used. When interviewers are instructed to pick the sample, this sampling method is commonly used in qualitative research. For example, jobless men between the ages of 20 and 30, or housewives between the ages of 18 and 35. This sampling strategy is frequently confused for random sampling, according to Martin *et al.* (2018), it shows that, while it is not random, it is statistically unpredictable and does not provide everyone an equal chance of getting chosen.

A systematic sample is the simplest non-random sample, in which the researcher selects a sample from a predetermined sample frame, such as every tenth individual in the population (Moore & Benbasat, 1991). “Selecting the sample at regular intervals,” (Bandura, 1997) defined systematic sampling. For this kind of sampling, a random integer is often chosen as the beginning sample. Moore and Benbasats (1991) eventually came to the conclusion that data gathered from a sample of this size wouldn't be as accurate as data gathered from a comprehensive census. Final quantitative statements are required to demonstrate the error proneness of the sample.

As per Noordzij *et al.* (2010) sampling a population is an important task, considering that if the sample is not accurately representative of the intended population (that is, if it is biased), the study is likely to produce non-generalizable results. However, the representativeness of the sample depends essentially on the sampling method used: Probability or non-probability sampling (Etikan & Bala, 2017; Sharma, 2017; Tansey, 2007). The crucial distinction between these two types of sampling is that probability samples are selected randomly from the target population, which is not the case for non-probability samples (Angkurawaranon *et al.*, 2020; Etikan & Bala, 2017). Because the selection is random for probability sampling, everyone in the target population has an equal chance of being included in the study, without possible researchers' biases influencing the selection process (Angkurawaranon *et al.*, 2020; Raghunath, 2017). For non-probability sampling, participants are chosen based on what the researchers think are the characteristics of the target population, without always knowing all of them (Angkurawaranon *et al.*, 2020).

One of the advantages of probabilistic methods is that we can make statistical inferences and generalise the conclusions from a sample for the whole population (Angkurawaranon *et al.,* 2020; Mellenbergh, 2019). However, non-probabilistic methods are not without interest, they are useful when the consistency of the sample is not important and, on the other hand, when the researcher wants to explore or study a poorly documented question (Mellenbergh, 2019). As per Angkurawaranon *et al.* (2020), the choice of method is made based on the following considerations: (1) The cost of using a sampling method- which is a combination of the cost of collecting the measurements, and of the frame; (2) the time taken is similarly a combination of the time spent in the field and the time spent beforehand obtaining the frame and drawing the sample, (3) the analysis stage, which largely determine the sample size and the methods which are feasible.

According to Richman and Zucker (2019), non-probability sampling relies on sound judgement based on experience and taking the circumstances into account rather than statistical calculations to decide sample size. This author recommended a viable minimum sample size based on resources available and an appropriate degree of accuracy relevant to the requirement for the results. Richman and Zucker (2019) also offered a comparison with other similar surveys carried out under similar circumstances. A sample size might be utilised as a starting point in such surveys. To obtain the statistical power needed for a significance test, the researcher must first pick the sample size. The sample size for statistical research involving two or more groups is determined by the number of participants required for each group. Type 2 (statistical) mistakes may arise if the study population was not accurately sampled or if the sample size was insufficient for a specific statistical test.

However, no sampling procedure, no matter how good it can be, cannot guaranteed that the sample is representative of the population. Even when an illustrative sample is selected, events that take place throughout the study may have an impact on the total sample size, diminish the efficacy of the concluding sample (such as the number and percentage of respondents), and raise the possibility of Type 2 errors. The sample's representativeness may be diminished by non-response bias, which occurs when members of certain sample groups refuse to reply.

Richman and Zucker (2019) introduced “the sampling cumulative approach, in which the researcher cannot know the sample size with confidence at the start of the inquiry”. As the inquiry progresses, sample sizes in these studies get bigger until the researcher has gathered enough information for the project. One of the most crucial elements of quantitative research is choosing a sample that effectively reflects the characteristics of the target population. The generalisation of study population results is made possible by achieving representativeness in quantitative research, and the research findings may be viewed as relevant to the entire community (Moore & Benbasat, 1991). The sample used in this study must accurately represent the population as a whole in order for the results to be generalised to the entire population. The proportion of participants in a research is known as the response rate, and it has a significant impact on how representative a sample is. Cope (2014) found that, on average, out of 350 studies that collected data for health services research, physicians answered in 57.5 percent of cases.

4.4.2 The chosen sampling method

The study's aims necessitated the identification of the relevant population. According to Urquhart *et al.* (2016), a good sample should reflect the population being investigated. A good sample is representative of the target population's characteristics.

The purpose of this study is to identify factors associated with the users' intention to adopt the e-health system at Fortis Hospitals in Mauritius. Thus, the chosen population are the users of the e-health system. According to Barber *et al.* (2000), a user of an ICT system is anyone whose work processes are part of the activities connected with the operation of the computer-based system. The inclusion criteria for this study are:

- Employee of the study sites (Fortis Hospitals).
- Be part-time or full-time.
- Be a doctor / a nurse/healthcare assistant.
- Will make use of e-health to support his/her practice.

The target population can be defined as all people or items with a common characteristic of interest to include in the research (Bruix & Llovet, 2003; Yahaya *et al.*, 2022; Zhao *et al.*, 2013). According to Delice (2010), when a researcher wants to conduct a poll or a survey, it is not always possible to interview each member of the population due to geographic, monetary or time constraints; however, it is still possible to learn more about the target population, in particular by analysing a sample (Johnson, 2013; Yankah *et al.*, 2017; Yeo *et al.*, 2017). Sampling is essentially about drawing information from a fraction of a large group or population, to conclude the whole population (Delice, 2010; Yankah *et al.*, 2017). Its purpose is to provide an illustration that represents the population and reproduces as faithfully as possible the main characteristics of the population studied

(Burmeister & Aitken, 2012). A representative sample has the same characteristics as the population from which it is drawn (Sandelowski, 1995; Sharma, 2017; Yahaya *et al.*, 2022).

As this empirical research is based on quantitative data obtained using questionnaires from a population of medical professionals of Fortis Hospitals in Mauritius, probability sampling is the chosen sampling method as it consists of randomly selecting participants within a sampling frame so that each person in this sampling frame has the same probability of being selected (Raghunath, 2017; Yahaya *et al.*, 2022).

4.4.3 Sampling Size

Another important aspect to determine if a sample is appropriate, is to consider its size (Etikan & Bala, 2017; Noordzij *et al.*, 2010; Sharma, 2017; Van den Putte, 1991). If a sample is too small, the study will not have the statistical power to detect a true effect, and researchers may draw inaccurate conclusions about that effect (Noordzij *et al.*, 2010). The sample size of a study is a critical factor in obtaining reliable data about a proportion of a population (Angkurawaranon *et al.*, 2020; Mellenbergh, 2019). Data reliability is never absolute but rather lies within a confidence interval (Angkurawaranon *et al.*, 2020; Mellenbergh, 2019). The smaller this interval must be, or the smaller the margin of error, the larger the sample size must be to obtain an accurate value for this proportion in the whole population (Kalton, 2020). As per Terrade *et al.* (2009), the need to fix a minimum sample size is linked to the need to have a margin of error determined at a certain level of confidence. According to Hair *et al.* (2010), different factors affect the calculation of the sample size among which there are:

1) The sampling method (sampling plan) contributes to the calculation of the sample size. The stratification method, for example, ensures a priori better representativeness than other sampling methods. In this case, the sample size may be smaller than other methods for the same degree of precision (Hair *et al.,* 2010).
2) The size of the parent population. This factor, which appears obvious and must be taken into account when the reference population has small numbers, becomes less and less important when the size of the parent population becomes very large. Its importance is therefore relative (Hair *et al.,* 2010).
3) The degree of certainty or the level of confidence that one wishes to have in the results. The more you want to have a small margin of error, the larger the sample is to be (Hair *et al.,* 2010). The margin of error is the percentage indicating the extent to which survey results are likely to reflect the opinion of the general population. The smaller the margin of error, the more likely you are to get an exact answer for a given confidence level (Anderson *et al.,* 2006; Bagozzi *et al.,* 1991).
4) Confidence level: percentage indicating how confident you can be that the population will choose an answer between two given values (Anderson *et al.,* 2006; Bagozzi *et al.,* 1991). For example, a confidence level of 95 percent means that you can be 95 percent certain that the results are between the numbers x and y.

There are several approaches to determining the sample size (Hair *et al.,* 2010; Howlett, 2013; Mahendran *et al.,* 2022; Miles & Huberman, 2003). These consist : employing a census for small populations, replicating the sample size of related research, using public tables, and using formulae to determine sample sizes (Schwartz *et al.,* 1998).

Cochran *et al.* (1954) have developed the following formula to calculate the sample size of a target population as follows:

$$\mathbf{n_0 = Z^2pq / e^2}$$

Which is valid where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails (1 - α equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is calculated at 1.96 when the confidence level is ninety-five percent (95%) as per the statistical table which contains the area under the normal curve (Kalton, 2020). Thus, for an event with a probability of occurrence (p) of 50%, taking a confidence level (Z) of 95% and a margin of error (e) of 5%, the calculated sample size is:

$$\mathbf{n_0 = ((1.96)^2 \times (0.5) \times (1 - 0.5)) / (0.05)^2}$$

$$\mathbf{n_0 = 385}$$

If the population is small, then the sample size can be reduced slightly (Cochran *et al.,* 1954; Kalton, 2020). This is because a given sample size provides proportionately more information for a small population than for a large population (Cochran *et al.,* 1954; Kalton, 2020). The sample size (n_0) can be adjusted using the below formula developed by Cochran *et al.* (1954). Where n is the adjusted sample size and N is the population size.

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

In the case of our study, the number of healthcare providers including doctors, nurses, healthcare assistants & other medical technicians; the target population (N) using the e-health system at Fortis Hospital Mauritius is 1580. The adjusted sample size calculation is as follows:

n = 385 / (1 + ((385 – 1) /1580))

n = 310

In a survey process, it is normal to have refusals from potential respondents or not be able to reach some respondents on the sample list (Hair *et al.*, 2010). For these reasons, a minimum response rate must be foreseen to compensate for this loss (Schwartz *et al.*, 1998). Based on a fifty percent (50%) desired response rate, the minimum number of participants to be surveyed is 310 x (100 /50) = 620. For this study, 800 healthcare professionals have been invited by email to participate in an online survey, to achieve the required sample size based on the expected response rate.

4.5 Materials/Instrumentation of Research Tools

4.5.1 Data Collection & Research Tool

Data gathering is one of the most crucial steps in the quantitative research process (Zyphur & Pierides, 2019). Data collection means the method that the researcher prepares and obtains information required about the target audience (Bryman, 2017). Data preparation includes determining the purpose of data collection, methods of obtaining information, and the sequence of data collection activities (Bryman, 2017; Kalton, 2020). One of the most important aspects of this process is to select the correct sample to collect the data (Bryman, 2017). Then, the data is carefully collected only from the people most relevant to the study objectives, known as a target segment, this sample represents a group of people who are similar across a series of variables (Bryman, 2017; Kalton, 2020).

The choice among the numerous methods used to collect data depends on the variables to be measured, where they come from and the resources available (Elmghaamez *et al.,* 2022; Gagnon *et al.*, 2016; Garavand *et al.,* 2019). Data collection methods and tools can differ depending on the type and size of the population to be analysed (Almaiah *et al.*, 2016). Data sources are also an important element regarding the choice and design of methods (Elmghaamez *et al.,* 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019). There are strong relationships between the types of data, where it can be obtained and the methods that can be used to collect it.

Data collection is a vital part of any research process (Elmghaamez *et al.,* 2022; Gagnon *et al.,* 2016; Garavand *et al.,* 2019). Data collection is described by (Elmghaamez *et al.*, 2022; Gagnon *et al.,* 2016; Garavand *et al.*, 2019) as the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer queries, stated research questions, test hypotheses, and evaluate outcomes. The techniques used to gather data will differ depending on the discipline or field, the type of information sought, and the purpose or aim of the researchers (Almaiah *et al.,* 2016). The approach for applying the methods may also vary, customized to suit the purpose and prevailing circumstances, without compromising the integrity, accuracy and reliability of the data (Almaiah *et al.*, 2016).

Data collection enables the researcher to gather the empirical information on which he will base his research (Igalens & Roussel, 1999; Kalton, 2020). To constitute this empirical basis, the researcher must, first of all, ask himself the question of the existence or not of already available data as the data collection process is a long and tedious process that requires rigour, patience and organisation (Igalens & Roussel, 1999). Data collection is also dependent on the types of data that researchers find themselves working with such as quantitative data or qualitative data (Igalens & Roussel, 1999; Kalton, 2020).

Quantitative data, are data that manage amounts, qualities or numbers, making them quantifiable (Zyphur & Pierides, 2019). Therefore, they are normally communicated in numerical structure, for example, length, size, sum, cost, and even span (Paola *et al.*, 2017). The utilization of measurements to create and accordingly investigate this sort of information adds belief and validity to it (Paola *et al.*, 2017).

Qualitative data manage quality, "so they are elucidating as opposed to numerical in nature" (Zyphur & Pierides, 2019). In contrast to quantitative data, they are commonly alluding to non-numeric data, and are just picked up for the most part through observations, interviews, case studies, life histories, and content analysis (Zyphur & Pierides, 2019). According to Paola *et al.* (2017), qualitative methodology intends to understand a complex reality and the meaning of actions in a given context, whereas the quantitative methodology seeks to acquire precise measurements that can support a statistical analysis.

4.5.2 Quantitative Data Collection Methods

As per Burkholder *et al.* (2020), quantitative research can be portrayed as "entailing the collection of numerical data and exhibiting the view of the relationship between theory and research as deductive, a predilection for natural science approach, and as having an objectivist conception of social reality". Some of the quantitative data collection methods are:

1. Structure Interviews
2. Closed-ended questions surveys
3. Quantitative systematic observations

4. Experimental analysis

4.5.2.1 Structured Interviews

Structured interviews can be demarcated as a quantitative research technique which involves "directing intensive individual interviews with several respondents to explore their perspectives on a particular idea, program or situation" (Heale & Twycross, 2015). The aim of this approach is to ensure that each interview is presented with the same questions in the same order (Bryman, 2017). This ensures that answers can be reliably aggregated and that comparisons can be made with confidence between sample subgroups or between different survey periods (Bryman, 2017). Quantitative data collection through interviews is more structured than when gathering qualitative data (Bryman, 2017; Burkholder *et al.,* 2020; Garz, 2020), it consists of a series of pre-determined questions. The questions are asked in a set / standardized order and the interviewer will not deviate from the interview schedule or probe beyond the answers received (Heale & Twycross, 2015). Answers to the questions are usually straightforward as researchers can compare and contrast different answers given to the same questions (Heale & Twycross, 2015). There are different types of structured interviews as per Paola *et al.* (2017):

(1) Face-to-face interviews, where researchers have direct control over the flow of process and a has a chance to clarify certain issues during the process if needed, on the other hand, this can be quite a challenging process when dealing with large sample size or group of interviewees (Chismar & Wiley, 2003; Paola *et al.,* 2017). When conducting face-to-face interviews, researchers should have an open mind and refrain from displaying disagreements in any form when viewpoints expressed by interviewees contradict their ideas (Burkholder *et al.,* 2020; Garz, 2020; Paola *et al.,* 2017). Chismar and Wiley (2003) stated that while

Conducting an interview, the interviewer should attempt to create a friendly, non-threatening atmosphere, the interviewer should give a brief, casual introduction to the study; stress the importance of the person's participation; and assure anonymity, or at least confidentiality, when possible.

(2) Telephone and/or online, web-based interviews. The use of telephone or the Internet for data collection may be cast wider since there is no need to travel through distances to get the data (Garavand *et al.*, 2019; Jeng & Tzeng, 2012). The personal characteristics of the interviewer are not visible to the interviewee and the physical safety of the interviewer is not an issue (Garavand *et al.*, 2019; Jeng & Tzeng, 2012) However, in this type of data collection, the data may be questionable, especially in terms of impartiality. The Internet may be cast wide, but it is only targeting a specific group of respondents, those internet connections and are knowledgeable about using such technologies (Garavand *et al.*, 2019; Paola *et al.*, 2017).

4.5.2.2 Closed-Ended Questions Surveys

One among the most typical and commonly used modes of primary data collection in quantitative research is the closed-ended questions survey through questionnaire (Elmghaamez *et al.*, 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019). Questionnaire is a series of consistent questions designed to standardize and facilitate the collection of evidence. It is a tool adapted to collect precise information from a large number of participants (Elmghaamez *et al.*, 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019). The questionnaire survey is a methodological data collection tool that includes a set of questions linked in a structured and logical manner (McGuirk & O'Neill, 2016). This type of survey aims to obtain quantifiable and comparable statistical data on a specific population (McGuirk & O'Neill, 2016)

Questionnaires can be classified as both, quantitative and qualitative methods dangling on the nature of questions (Elmghaamez *et al.*, 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019). Specifically, answers obtained through closed-ended questions with multiple choice answer options are analysed using quantitative (Elmghaamez *et al.*, 2022; Gagnon *et al.*, 2016; Garavand *et al.*, 2019). Questions need to be formulated unambiguously and straightforwardly, and they should be presented in a logical order.

Advantages of questionnaires include increased speed of data collection, low or no cost requirements, and higher levels of objectivity compared to other alternative methods of primary data collection (McGuirk & O'Neill, 2016). However, questionnaires have certain disadvantages such as selection of random answer choices by respondents without properly reading the question. Moreover, there is usually no possibility for respondents to express their additional thoughts about the matter due to the absence of a relevant question (McGuirk & O'Neill, 2016).

4.5.2.3 Quantitative systematic observations

Observation, as the term implies, is a way of collecting data through observing (Moghavvemi *et al.*, 2013). Observation data collection method is classified as a participatory study because the researcher has to immerse oneself in the setting while taking notes and/or recording (Garavand *et al.*, 2019; Moghavvemi *et al.*, 2013). Observation as a data collection method can be structured or unstructured. In structured or systematic observation, data collection is conducted using specific variables and according to a pre-defined schedule (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013). Unstructured observation, on the other hand, is conducted in an open and free manner in a sense that there would be no pre-determined variables or objectives (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013).

Data may be collected through systematic observation by, say, counting the number of users present and currently accessing services in a specific area, or the number of services being used within a designated vicinity (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013). When quantitative data is being sought, the approach is naturalistic observation, which mostly involves using the senses and keen observation skills to get data about the “what”, and not really about the “why” and “how” (Garavand *et al.*, 2019; Moghavvemi *et al.*, 2013). Systematic observation is a simple way of collecting data, and not as expensive as the other method, however, the problem is that senses are not infallible. Unwittingly, the observer may have an unconscious grasp on his senses, and how they perceive situations and people around. Bias on the part of the observer is highly possible (Moghavvemi *et al.*, 2013).

Advantages of observation data collection method include direct access to research phenomena, high levels of flexibility in terms of application and generating a permanent record of phenomena to be referred to later (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013). At the same time, the observation method is disadvantaged with longer time requirements, high levels of observer bias, and impact of observer on primary data, in a way that presence of an observer may influence the behaviour of sample group elements. It is important to note that observation data collection method may be associated with certain ethical issues (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013). Fully informed consent of research participant(s) is one of the basic ethical considerations to be adhered to by researchers. At the same time, the behaviour of sample group members may change with negative implications on the level of research validity if they are notified about the presence of the observer (McGuirk & O'Neill, 2016; Moghavvemi *et al.*, 2013).

4.5.2.4 Experimental analysis

Experimental analysis methods involve manipulation of an independent variable, while maintaining varying degrees of control over other variables, most likely the dependent ones (Bryman, 2017; Mahendran *et al.,* 2022). Usually, this is employed to obtain data that will be used later on for analysis of relationships and correlations (Bryman, 2017).

Experimental studies are done in carefully controlled and structured environments and enable the causal relationships of phenomena to be identified and analysed (Zyphur & Pierides, 2019). The variables can be manipulated or controlled to observe the effects on the subjects studied (Zyphur & Pierides, 2019). For example, sound, light, heat, the volume of work levels etc can be managed to observe the effects. Studies done in laboratories tend to offer the best opportunities for rigorously controlling the variables, although field studies can be done in a more ‘real world’ environment. However, with the former, artificiality of the situation can affect the responses of the people studied, and with the latter, the researcher has less control over the variables affecting the situation under observation (Zyphur & Pierides, 2019).

The success of experimental studies hinges on researchers confirming the change of a variable is based solely on the manipulation of the constant variable. The research should establish a notable cause and effect. Experimental research can be conducted in the following situations (Zyphur & Pierides, 2019):

1. Time is a vital factor in establishing a relationship between cause and effect.
2. Invariable behaviour between cause and effect.
3. Researchers wish to understand the importance of cause and effect.

4.5.3 The selected materials/instrumentation research tools

As indicated by Boonstra and Broekhuis (2010), in the medical industry there are predominantly two kinds of information data collection devices that are utilized as a part of the examination of variables that impact the use of Information Technology: an elucidating case study and cross-sectional investigations gathering quantitative information through questionnaires (Elmghaamez *et al.,* 2022). The most commonly used mode of primary data collection in quantitative research is the questionnaire (Elmghaamez *et al.,* 2022; Gagnon *et al.,* 2016; Garavand *et al.,* 2019). Questionnaire is a series of consistent questions designed to standardize and facilitate the collection of evidence. It is a tool adapted to collect precise information from a large number of participants (Garavand *et al.,* 2019).

The questionnaire survey is a methodological observation tool that includes a set of questions linked in a structured and logical manner (McGuirk & O'Neill, 2016). This type of survey aims to obtain quantifiable and comparable statistical data on a specific population (McGuirk & O'Neill, 2016). For this, the questionnaire is administered to a representative sample of the target population, that is to say to a group whose size is sufficient, regarding the amount of people, so that the answers given are representative of the overall opinion of this population (McGuirk & O'Neill, 2016; Quinlan *et al.*, 2019).

The objective of questionnaire surveys is to observe, analyse and understand a trend, a global behaviour, a phenomenon thanks to the data collected (Elmghaamez *et al.,* 2022; Gagnon *et al.,* 2016; Garavand *et al.,* 2019; Quinlan *et al.,* 2019). These surveys are submitted collectively to be representative and to obtain usable figures (Quinlan *et al.,* 2019). This tool is therefore part of the quantitative research methods. These quantitative methods use mathematical and statistical tools to describe, explain and understand phenomena based on the data (Quinlan *et al.*, 2019).

The questionnaire survey translates the study objectives into questions, established beforehand by the researchers, into precise and specific questions which the targeted individuals must answer (Quinlan *et al.*, 2019). It is by analysing the responses of respondents whether they are customers, prospects, suppliers or employees, that the research in question will obtain results in a statistical form usable in its analysis. These results must be interpreted and placed in the context of the case study to be useful and relevant. This tool has many advantages, which is why it is widely used and popular quantitative research. Among the advantages of this study method, the three main ones are: (1) it is simple to set up and generally inexpensive, (2) results are easy to obtain and measure and (3) it allows research in many strategic areas (McGuirk & O'Neill, 2016).

Several works in research methodologies emphasize that the choice of a method precise must be consistent with the objectives and hypotheses of the research (Igalens & Roussel, 1999). Therefore, the choice of a methodological approach is driven by the direction of the research (Igalens & Roussel, 1999; Quinlan *et al.*, 2019). As this study is to analyse the different variables such as "Performance Expectancy", "Effort Expectancy" and other variables, which affect the e-health adoption among the healthcare providers, we have adopted a questionnaire survey methodology as a mode of data collection. Several reasons justified this choice:

- As per Igalens and Roussel (1999), the questionnaire is a particularly suitable method for administering a survey of a significant number of individuals and interviewing a considerable number of employees.

- Questionnaire makes it easier to reach a geographically dispersed population (Quinlan *et al.*, 2019).
- The use of the questionnaire survey makes it possible to quantify the results of the research, thanks to numerous rigorous statistical tests, carried out on the data collected (Alam *et al.*, 2018).
- The questionnaire survey allows external validity and generalization of results to other statistical populations similar to that studied (Raymond *et al.*, 2015)
- The use of this technique offers a high degree of objectivity. Indeed, it is based on rigorous statistical analyses, which make it possible to test the research hypotheses and interpret the results (McGuirk & O'Neill, 2016).

For this research study, the questionnaire is the selected tool and it has been adopted from the "Unified Theory on Acceptance and Use of Technology" (UTAUT) model created by Venkatesh *et al.* (2003).

The "Unified Theory of Acceptance and Use of Technology" (UTAUT) model was proposed by Venkatesh *et al.* in 2003 after examining and synthesizing several technology acceptances models to improve the understanding of the factors determining the adoption of Information and Communication Technology (ICT) (Fan *et al.*, 2018; Featherman *et al.*, 2021).

4.5.4 Questionnaire as Research Instrument in Quantitative Method

Bourque and Fielder (2003) advised that questionnaires be created by doing a relevant literature search. The authors did, however, suggest that standardised questionnaires be used. The use of standardised questionnaires has a number of benefits, including the ability to compare results across studies and the knowledge that they have been tested in the past. It was also recommended by Bourque and Fielder (2003) to modify and incorporate questions from prior research while creating surveys. The order of the items on a questionnaire may be altered to suit the requirements of the inquiry, and it can be translated into a variety of languages (Bourdon & Hollet-Haudebert, 2009; Poissant *et al.*, 2015).

The fundamental research tool in survey investigations, the questionnaire, needs to be properly constructed and designed in order to provide high-quality data that can be efficiently evaluated and provide the answers to the research questions. When developing the research instruments for this doctoral dissertation, consideration was given to Chen *et al.* (2014) claim that a greater number of possible variables makes it more challenging to assess the regression model's results. Open-ended or closed-ended questions may be asked in a quantitative study survey (Patton, 2014). Respondents must select from a list of options while answering closed questions. According to Poissant *et al.* (2015), closed-ended questions produce a consistent collection of data that can be easily compared. Contrarily, open-ended questions require respondents to write their answers, which takes time and results in less consistent data than in surveys with closed questions (Mahendran *et al.*, 2022; Poissant *et al.*, 2015).

Three of the most popular techniques for evaluating attitudes are the Thurstone, Guttman, and Likert scales (Bourdon & Hollet-Haudebert, 2009; Poissant *et al.*, 2015). The Thurstone scale is an elaborate grading system based on claims about a particular subject, provides a numerical number for each claim indicating how favourable or unfavourable it is. A mean score describing an individual's attitude is calculated after each responder selects a sentence that best describes their attitude on a scale ranging from positive to negative. According to Mahendran *et al.* (2022); Poissant *et al.* (2015), the Guttman scale determines how simple or difficult it is to adopt particular views.

The Likert scale is the most widely used unidimensional metric for assessing every component. A five-point bipolar response scale was created in 1932. Using scales from two to 10, respondents rank quality from best to worst or from high to low. The most common Likert scales are five or seven points (Poissant *et al.,* 2015). The Likert scale, which integrates multiple variables addressing a certain problem, allows the participant to indicate "Strongly Agree" to "Strongly Disagree" to indicate how they feel about various topics. Since the middle response on the scale is typically a neutral alternative, even-numbered Likert-scales urge respondents to make a decision rather than provide a "Neutral" response. To understand the customers' emotions in greater detail, the Likert scale may be utilised (Poissant *et al.,* 2015). The Likert scale, on the other hand, has certain drawbacks, example as the same answers being given to inquiries, since people may click the same boxes without giving them much thought (Mahendran *et al.,* 2022; Poissant *et al.,* 2015).

The quantitative technique with questionnaire surveys has various advantages, including the fact that it is less expensive, takes less time, and may cover a large geographic region (Poissant *et al.,* 2015). Since the researcher can evaluate reality objectively and independently, the quantitative approach may be employed to obtain new knowledge (Mark & Poltrock, 2004). However, according to Mahendran *et al.* (2022), "there are drawbacks to questionnaire surveys, including low response rates postal surveys frequently have low response rates of thirty percent (30%) or less, reducing the sample's representativeness, respondents returning incomplete questionnaires with subpar or inappropriate responses, and the validity of survey responses not always being checked".

4.6 Quality of the Research

This section goes through the approaches for evaluating the research project's quality in detail. The major goal of this part is to determine the best instruments for ensuring that the research is of high quality. "The validity of the research study may be questioned for a number of reasons, including the development of the theory and the independence of the researchers" (Stake, 1995).

Qualitative studies employ confirmability, dependability, transferability, and credibility to assess the reliability and validity of the research (Stake, 1995). Quantitative studies try to generalise findings from small qualitative investigations, whereas qualitative studies do not (Mahendran *et al.*, 2022; Miles & Huberman, 2003). "Checking for generalizability, reliability, and validity is beneficial for both qualitative and quantitative research. Generalizability, reliability, and validity are easier to establish in quantitative research than in qualitative research" (Quillion-Dupré *et al.,* 2016). External validity, internal validity, external reliability, and internal reliability are all topics covered in quantitative investigations.

4.6.1 Generalisability

The level to which outcomes from a research based on an identifiable sample may be claimed to represent results from the whole population from which the sample was chosen is known as generalisability. The findings cannot be generalised if the theory is too restricted and unique (Laumer *et al.,* 2010). According to Martin *et al.* (2018), "selecting an appropriate sample and comparing the study population to the sample are equally crucial, and when done correctly, they allow quantitative research results to be transferred to the study population". The findings of a representative sample may be applied to the entire population, i.e., they can be generalised (Ali *et al.*, 2020; Almaiah *et al.,* 2016). It is possible to apply the results to the entire population if the sample size is sufficient (Patton, 2014).

4.6.2 Internal Consistency and Reliability

Internal consistency reliability is the uniformity of a research project or a piece of measurement equipment. As a result, the features of the research instrument and measurement consistency are related to the internal consistency reliability of quantitative investigations (Ali *et al.,* 2020; Almaiah *et al.,* 2016). Research findings can be regarded credible if they are consistently duplicated. A correlation coefficient can be used to evaluate internal consistency dependability. Strong positive correlations demonstrate the validity of the test by demonstrating that all components assess their intended outcomes in the anticipated manner. Internal and external reliability are both possible. Internal reliability analyses how consistent outcomes are across items on a scale, whereas external reliability assesses how much a measure differs from one usage to the next.

Cronbach's alpha (α) coefficient may be used to evaluate internal consistency reliability from pairwise correlations between items (Fan *et al.,* 2018; Straub, 2009). The range of internal consistency reliability is endless negative values to one. When there is more within-subject variability, Cronbach's is negative. In statistics, however, the most commonly used range is 0 to 1 (Ali *et al.,* 2020; Noordzij *et al.,* 2010).

When tests assess narrow constructs, Cronbach's must be greater, and when tests measure more wide constructs, Cronbach's must be lower. Cronbach's alpha values of.95

or higher, on the other hand, imply that certain measuring items may be redundant (Ali *et al.,* 2020; Noordzij *et al.,* 2010). Internal consistency reliability is a useful tool for determining whether or not two objects are connected (i.e., whether they are internally consistent), but it also provides distinctive information.

The correlations between various items within the questionnaire may be used to determine internal uniformity, or the dependability, of the questionnaire as a research medium in this thesis. A successful instrument must have internal consistency since it shows if components are linked and contribute to distinctive data. The reliability test therefore establishes if the recommended items assess the same fundamental notion and produce comparable findings. This may be determined using item pairwise correlations and given as Cronbach's alpha (α) coefficient (Fan *et al.,* 2018).

4.6.3 Validity

Validity enables the researcher to “assess if the planned measuring tool actually measures the things it claims to” (Ali *et al.,* 2020). By choosing the appropriate research instrument, validity confirms that the offered technique evaluates the specified constructs. Additionally, it guarantees that the study's final results may be used in practical circumstances. This device must verify that the research tool is measuring only the variables it was designed to measure and nothing else (Ali *et al.,* 2020; Kreif *et al.,* 2016). Validity may be addressed in quantitative research by way of construct validity, criterion validity, face validity, and content validity.

A validity assessment that is not dependent on statistics is called content validity. The tested material is methodically examined to see whether it is an accurate representation of the expected behaviour that is being assessed. Achieving content validity may be done in two ways: thorough literature examination, and the development of a research tool that accurately evaluates things (Carignan *et al.*, 2016). Only by carefully selecting the elements included in the research can a measuring instrument attain content validity. The expertise of experts acquainted with the measured constructs can also be used to assess content validity. Their input on proposed issues will ensure that each question is effective.

"The degree to which an assessment item measures what it is intended to measure is referred to as face validity" (Fan *et al.,* 2018). It uncovers how the measuring tool is seen intuitively and whether or not it captures the concept it is meant to assess. Face validity is related to the phrasing, question structure, and arrangement of the questionnaire (Fan *et al.,* 2018). It also relates to the measuring instrument's relevance and transparency among participants. Face validity is a subjective criterion that describes how sensible certain objects appear to be. It can be accomplished by having specialists examine the suggested things.

The criterion validity measure is used to calibrate the research tool against accepted standards or alongside itself. The study contrasts the results with similar results from previous well-known, pertinent investigations (Ali *et al.*, 2020; Carignan *et al.,* 2016). Concurrent validity is a method that compares a measuring tool to an established measure and result simultaneously. The validity and dependability of the data gathered for this study were investigated, and the next Chapter goes into great detail about these investigations.

4.7 The Research Model

The UTAUT model is used in our research as a theoretical and hypothetical foundation. Regarding reliability, validity, correlations, factor analysis, and hypothesis testing, we adhered as closely as we could to the fundamental and initial study, measurements, and analyses of Venkatesh *et al.* (2003). An altered version of the UTAUT will be used to fulfil the goal of the investigation and fulfil its objective. "Performance Expectancy", "Effort Expectancy", "Social Influence", and "Facilitating Conditions" are the four direct independents of "Behavioural Intention" and "Use Behaviour" that are present in the original UTAUT model (Momani, 2020; Razzak *et al.*, 2021; Rouidi *et al.*, 2022). In the UTAUT model the four main constructs are moderated by four variables (1) "Gender", (2) "Age", (3) "Experience" and (4) "Voluntariness of Use" (Momani, 2020).

Our study is to analyse the factors affecting the adoption of an e-health system but not the actual usage of the e-health system, thus, the dependent variable "Use Behaviour" and the moderating variables "Gender", "Age", "Experience" and "Voluntariness of Use" are not measured and analysed in our study. The study of Venkatesh *et al.* (2003) had three additional independent variables which were identified as not being direct determinants of 'Behavioural Intention' for adoption, they are "Self-efficacy", "Anxiety" and "Attitude towards using Technology". Researchers like Thomas *et al.* (2013) and Nadri *et al.* (2018), stated that, while employing the UTAUT paradigm to a study which is in other than western cultural setting, it is recommended to take all the constructs from the study of Venkatesh *et al. (*2003) including the three constructs which were not identified as direct determinants of "Behavioural Intention". Therefore, our research model consists of one dependent variable and seven independent variables as presented below.

4.7.1 Dependent variable

4.7.1.1 Behavioural Intention

The construct "Behavioural Intention" constitutes our dependent variable. It is a relevant construct for the pre-adoption of an Information System (IS). Abandoning the usage of technological innovation by users is a problem that is feared by any organisation that is in the pre-adoption stage. According to Rogers (1995), "discontinuance is a decision to reject an innovation after having previously adopted it". Two types of discontinuance are (1) replacement and (2) disenchantment.

- A replacement discontinuance is a decision to reject an idea to use a better idea that supersedes it (Rogers, 1995).
- A disenchantment discontinuance is a decision to reject an idea as a result of dissatisfaction with its performance (Rogers, 1995)

In a healthcare organisation like Fortis Hospital Mauritius, healthcare professionals may decide to abandon the e-health system and passively or actively resist the acceptance of technology in their workplace. The abandonment of the e-health system by health professionals is a sign or indicator that the system is not anchored in organisational routines, and therefore that calls into question the approach and the strategy for implementing the technological system (Barber *et al.*, 2000; Gander *et al.*, 2019).

The UTAUT model is designed to analyse this type of technological dropout due to partial or total user dissatisfaction (Momani, 2020; Venkatesh *et al.*, 2003). Several factors may help to explain this phenomenon in computerised e-health systems. For some authors, the incompatibility and perceived lack of usefulness of the system are important factors that can lead to the occurrence of this post-adoption phenomenon (Brangier *et al.*, 2010). From the construct of the "Behavioural Intention" proposed by Venkatesh *et al.* (2003), we can analyse and compare the determinants of the phenomenon of technological dropout (Burmeister & Aitken, 2012).

The importance of intention as a determinant of Information System acceptance and adoption behaviour has been largely elucidated by studies in the mainstream of systems acceptance research (Davis, 1989; Karahanna *et al.,* 1999; Momani, 2020; Venkatesh & Davis, 2000). The 'behavioural intention' to continue using the e-health system at Fortis Hospital was assessed based on three items as stated by Venkatesh *et al.* (2003) in which the user was asked on a scale of agreement about their future intention to adopt the e-health system.

4.7.2 Independent Variables

4.7.2.1 **Performance Expectancy**

"Performance Expectancy" is "the degree to which a user expects that utilising a system will help him perform better at work" (Su *et al.*, 2021), or "the degree to which a person thinks that using a certain system will help him make progress at work" (Shachak *et al.,* 2019). Professionals inside an organisation may only embrace an information system if they understood its applications concerning the demands of their job, its impact in terms of performance and productivity gains, and if they are convinced that this new technology will help them progress and be more efficient (Razzak *et al.*, 2021; Rouidi *et al.*, 2022; Wilson *et al.,* 2021). Thus, the construct "Performance Expectancy" is retained as a determinant of the acceptance of the e-health system by the employees of Fortis Hospitals Mauritius. This construct is held to defend hypothesis H1 defined in Chapter 3, as it is postulated to have a positive relationship between the "Performance Expectancy" and the "Behavioural Intention" to adopt (Fan *et al.*, 2018; Momani, 2020) and answer question Q1 defined in Chapter 1.

4.7.2.2 **Effort Expectancy**

"Effort Expectancy" is the notion that a person may adopt an information system with the least amount of effort as per Venkatesh and Zhang (2010). This construct is used to measure the level of simplicity involved in using a system (Momani, 2020; Razzak *et* *al.,* 2021; Rouidi *et al.,* 2022; Wilson *et al.,* 2021). If the employees of Fortis Hospitals Mauritius find the characteristics of the e-health system to be user-friendly, they will embrace it more quickly. According to Shachak *et al.* (2019), the ease of use of a technological system is a key component that influences users' willingness to utilise the system over time. This variable is held to justify hypothesis H2 defined in Chapter 3 and answer the Q3 question defined in Chapter 1, as it is postulated to have a confirmed relationship with the dependent variable "Behavioural Intention" (Fan *et al.,* 2018; Momani, 2020).

4.7.2.3 Social Influence

"Social Influence" is the extent to which a person permits the opinions of others to affect their choice of how to utilise the system and the extent to which a person considers it vital that others think they should accept the new system (Bawack & Kamdjoug, 2018; Momani, 2020; Razzak *et al.,* 2021; Rouidi *et al.,* 2022; Wilson *et al.,* 2021). This construct derived from the construct of "Subjective Norms" by Fishbein and Ajzens (1975) and Davis *et al.* (1989); and from the construct of 'Social Factors'. This variable is held to measure hypothesis H3 defined and to respond to question Q3 defined in Chapter 3 and Chapter 1 respectively, as it is postulated to have a positive relationship upon the dependent variable "Behavioural Intention" (Momani, 2020; Venkatesh *et al.,* 2003).

4.7.2.4 Facilitating Conditions

This construct is defined as "the degree to which an individual believes that organisational and technical infrastructure exists to support the adoption of the system" (Venkatesh *et al.,* 2003). Venkatesh *et al.* (2003) stated that in the presence of "Performance Expectancy" and "Effort Expectancy", "Facilitating Conditions" will have a non-significant influence on the user's "Behavioural Intention" to adopt (Momani, 2020;

Williams *et al.*, 2015). The construct "Facilitating Conditions" is retained as a determinant of the acceptance of the e-health system by the employees of Fortis Hospitals Mauritius. This construct is held to defend hypothesis H4 defined in Chapter 3 and answer question Q4 defined in Chapter 1.

4.7.2.5 **Self-Efficacy**

According to Venkatesh *et al.* (2003), "Self-efficacy", "Anxiety" and "Attitude Towards Using Technology" are three independent variables that are not retained in the UTAUT model as direct determinants of intention to adopt. "Self-efficacy" is defined as the notion of a person that he or she can engage in activities that exerts influence over occurrences (Bandura, 1997; Momani, 2020). H5 is the hypothesis defined based on this construct to answer the Q5 question.

4.7.2.6 **Anxiety**

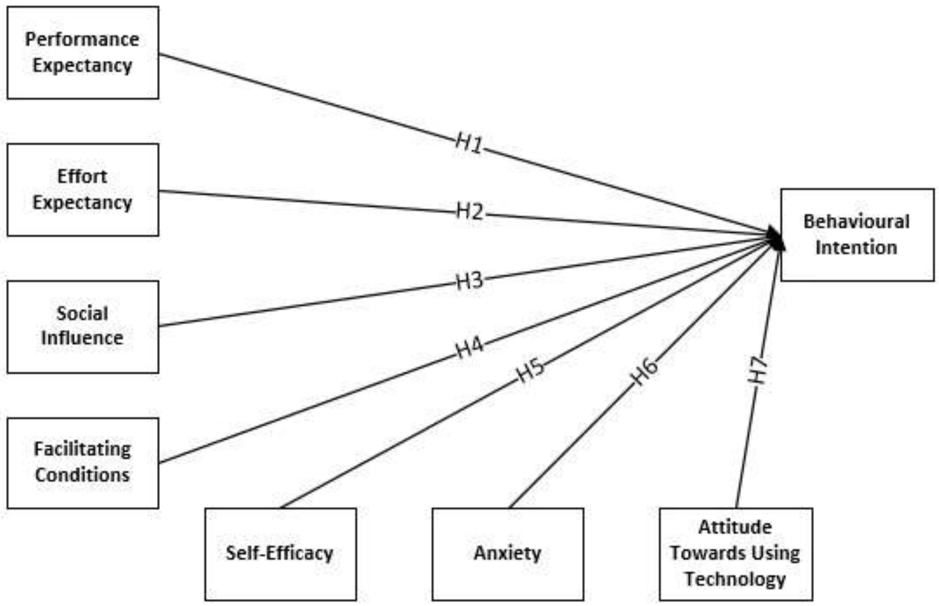
Anxiety refers “to the participant's self-reported hesitation when using the Information System” (Venkatesh *et al.*, 2003). This construct is measured using four items (Kijsanayotin *et al.*, 2009; Razzak *et al.*, 2021; Rouidi *et al.*, 2022; Wilson *et al.*, 2021) to respond to Question Q6 and Hypothesis H6.

4.7.2.7 **Attitude towards using technology**

Smith *et al.* (2015) define attitude “as an evaluative judgment, either favourable or unfavourable, towards performing an activity”. Following the study of Venkatesh *et al.* *(*2003), we postulated hypothesis H7 in Chapter 3 and this variable is held to answer the Q7 question defined in Chapter 1.

Figure 4.1

The Proposed Research Model



Our research model comprises of one dependent variable which is the Behavioural Intention and seven independent variables, "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Self-efficacy", "Anxiety" and "Attitude Towards Using Technology". The research model has been used in previous studies such as Magsamen-Conrad *et al.* (2015), Nadlifatin *et al.* (2019); Nuq and Aubert (2013); Latifi and Alizadeh (2016); Sepeame and Ajala (2013); Aggelidis and Chatzoglou (2009)

4.8 Research Ethics

This section addressed research ethics to emphasise the need of following ethical protocols while doing research that involves human participants and data about them. Before designing a study approach, ethical problems must be examined. International treaties and national regulations recognise the fundamental principles of research ethics.

According to Flack and Morris (2017), “ethical guidelines have lately been created in many nations, and several ethics committees have been established with the goal of authorising research involving human subjects”. It should be made clear to the researcher that breaking these guidelines may result in legitimate action. The study participants should not suffer any financial hardship as a result of the research tool (Sandelowski, 1995; Schneider *et al.*, 2010).

Adhering to the principles of honesty, integrity, and transparency is a need for doing research in accordance with ethical standards. For instance, the researcher should perform a study without endangering individuals and with honesty, integrity, and cultural sensitivity. The researcher is in charge of assessing the study's ethical propriety (Urquhart *et al.*, 2016; Zyphur & Pierides, 2019). Research ethics ensure that participants' rights and dignity are protected and that they are not harmed throughout their contact with the research (Flack & Morris, 2017). The security and well-being of study participants, as well as the researcher's own safety and the security of co-researchers and collaborators, should always come first.

According to Day *et al.* (2007), ethical conduct within research efforts assists to protect people, communities, and environments. High-risk research is not always to be shunned in the sake of ethics. The researcher should identify risks and make plans to control them before starting a study. As a result, competent research attempts to manage risks appropriately and is risk-averse but not risk-averse. Ethical concerns are a crucial element of research, and an ethical assessment by a qualified committee is required (Day *et al.*, 2007; Zyphur & Pierides, 2019). It is necessary to address some ethical principles and best practices. This framework includes crucial elements such as research monitoring and reporting undesirable consequences.

4.8.1 Informed Consent of Participants

The informed consent procedure should offer participants enough information about the study to make an educated decision (Flack & Morris, 2017). Consent is intended to allow participants to freely and voluntarily decide whether or not they wish to take part in the study. Informed consent should cover the study's objectives, anticipated duration, research procedures, right to refuse or depart from the study, possible dangers, unpleasant side effects, advantages of the study, and incentives. Depending on how challenging and dangerous the research is, different amounts of information are provided in the informed consent process.

The procedure for getting informed consent varies depending on the study context, methodology, and participant sample (Baharuden *et al.*, 2019). Before they begin participating in the study, individuals must give their informed permission. Written or oral permission from participants should be used to document informed consent. The most common method is to have participants sign and date a written consent form. On the other hand, the creation of a code that identifies the participant should not be covered by written consent. A formal consent form must be obtained and maintained separately from the participant data.

Obtaining explicit permission ensures that potential participants are adequately educated about the study to make an informed decision regarding participation without being subjected to excessive pressure or coercion. Most of the time, all the details required to make an informed choice should be made available in writing. It is critical to give participants enough time to consider whether or not they wish to participate. Implicit consent varies from explicit permission in that it is suggested when research participants complete a questionnaire rather than being formally secured through formal procedures like written or verbal acceptance.

4.8.2 Anonymity and Confidentiality

The researcher does not obtain any identifying information from respondents due to the anonymity of the data obtained (from participants), and the project is unable to connect particular replies to participants' identities. When no one, not even the researcher, is aware of which participant supplied which response, full anonymity has been attained. Pseudonymity is achieved by substituting a new identity for the participant's name and other personal information in order to avoid being recognised.

Every researcher wants to get accurate and honest feedback from their subjects. Participants may be unwilling to give personal information because they fear it would interfere with their daily practice or perhaps make vulnerable their employment, perks, or social standing (Baharuden *et al.,* 2019; Kline, 2013). Participants' replies are accurate since anonymous data is collected from them. Participants should feel secure in the knowledge that neither their names nor other identifying information, nor any replies they offer, will be made public. Participants' identities are protected, but neither they nor the data they provide may be pinpointed. Since individuals and the information, they contribute cannot be identified, confidentiality differs from anonymity. The researcher is aware of who said what under the terms of confidentiality, but they do not identify the comments of participants in order to safeguard their identities. So, protecting someone's privacy is the act of keeping something secret.

4.8.3 Study Procedures and Ethical Assurances

Before developing the study's research plan, all ethical considerations were evaluated. The framework for the study's research ethics placed a strong emphasis on the virtues of ethical and honest research practises. The research tool should not degrade the subject population or put them at a material disadvantage, according to Bandura's (1997) criteria. The research was performed with honesty, transparency, and cultural sensitivity. According to Howlett's (2013) criteria, the researcher accepted the study's ethical acceptability.

According to Bandura (1997) recommendations, “the researcher made sure that all study participants' rights and dignity were upheld and that they suffered no harm as a result of participating in the research”. According to King and He's (2006) suggestions, one of the researcher's key obligations was to ensure the safety, security and well-being of the study participants, as well as his security and safety. The study research instrument was created in such a way that participants' personally identifying information was not collected.

Our study procedure complies with the requirements of the Unicaf Research Ethics Committee (UREC). The research protocol presented had previously been approved by UREC before data collection. The targeted population are the healthcare professionals of Fortis Hospitals Mauritius. The questionnaires were sent to 800 employees following the sample size calculation and a buffer has been added due to the COVID-19 situation. The issues, method and objectives of the research were presented to the health professionals. An announcement letter has been sent to all heads of departments and we took the time to assure respondents of the confidentiality of the study.

According to Taherdoost (2018), “Ethics is a set of values that researchers must respect to ensure the protection of stakeholders involved in research projects”. To the extent, this exploration is concerned the following ethical measures (Min *et al.,* 2008) have been embraced to guarantee the security of our respondents:

Informed Consent - We have unveiled to the targeted population all significant information to assist them with deciding on their cooperation in the examination venture (Baharuden *et al.,* 2019; Min *et al.,* 2008).

Note: Due to the COVID-19 situation, the consent form was signed electronically by the participants.

Autonomy – A clear and straightforward dialect proclamation indicating the reason for the examination, the personality of the analyst, the nature of the research and clarification of the participant's duties to enable the participants to decide to participate or not (Min *et al.,* 2008).

Confidentiality and Anonymity – while responding to the questionnaires, the respondent does not need to insert their name or any identifications.

Justice – Each participant had the same respect and consideration. Each participant has been assessed on an equal level (Min *et al.*, 2008)

Withdrawal – Participants had the privilege to pull back their assent for the exploration whenever they want. Affirmation has been given to participants that they won't endure any bother or striking back because of their withdrawal (Min *et al.*, 2008)

Principle of non-maleficence – We have ensured not to cause any moral or physical harm to the participant (Min *et al.*, 2008)

4.9 Data Collection and Analysis

4.9.1 Data Collection Strategy

The administration of our research questionnaire was carried out over the Internet, by sending an electronic mail (e-mail), to potential participants, using the Survio platform. As such, we emphasize as per Cerdin and Peretti (2001) that e-mail can be used to administer a questionnaire in three different ways:

- A simple e-mail - This contains, in the body of the message, the questions to which the respondent must answer (Cerdin & Peretti, 2001).
- An email with an attached file - In this case, the research questionnaire can be accessed from a file attached to the email. Often this takes the form of a Word document (Cerdin & Peretti, 2001).
- An email with a URL included - In this case, the email contains an electronic link that the respondent must click to access the questionnaire, in the form of a website (Cerdin & Peretti, 2001).

As part of this work is concerned, the questionnaires were administered using the third method, i.e., email and URL address. Several reasons justify our choice of this mode of administration:

a) Speed of sending and receiving: The Internet is considered to be the fastest means of communication for administering a questionnaire and collecting responses, compared to traditional means such as paper questionnaires, face-to-face or by telephone (Collis *et al.,* 2000; James, 2007; Kent & Brandal, 2003; Sarosa & Zowghi, 2003).

b) Anonymity: The dissemination of the questionnaire over the Internet and more particularly via a website does not systematically guarantee the anonymity of the respondent, it can however be ensured by configuring the application (Davenport, 2002). Anonymity and confidentiality were additionally guaranteed in the invitation letter.

- Social desirability: This is defined as a behaviour whereby the respondent provides answers in line with the interviewer's expectations (Igalens & Roussel, 1999). This bias often occurs in face-to-face and telephone surveys (Sproull & Kiesler, 1986). Administering our questionnaire over the Internet reduces this bias and thus collects more reliable data.
- Respondents geographically dispersed: “The Internet questionnaire provides access to a very large number of potential respondents, located in different geographic locations” (Walsh *et al.*, 2004).
- The results of the online questionnaires are automatically incremented in a database thus avoiding possible manual re-entry errors (Gander *et al.*, 2019).

To avoid a low response rate of the quantitative questionnaire studies with the health professionals, we carried out several series of targeted reminders and intensive promotion of the study. Study participants were contacted and informed by email and were informed of the research objectives through their professional committees. A letter signed by the management of the hospital was sent in the days preceding the survey to inform the participants of the importance and the justification of the study. The questionnaire was administered via the Internet to a sample of 800 Fortis Hospital employees, 512 usable questionnaires were collected, for a return rate of around sixty-four percent (64%).

4.9.2 Data Analysis Techniques

Several works in research methodologies emphasize that the choice of a precise data analysis technique must be consistent with the objectives and hypotheses of the research (Igalens & Roussel, 1999). Therefore, the choice of data analysis approach is induced by the direction of the research (Baumart & Ibert, 2007). To test the data collected and the hypotheses built around the conceptual model of our research, we have chosen to go through two phases as suggested by Miles and Huberman (2003): (1) an exploratory phase, and (2) a confirmatory phase.

The exploratory phase: corresponds to a descriptive analysis of the data (Ivankova *et al.*, 2006; Subedi, 2016) - aimed at describing the characteristics of e-health users and the dimensions. Our research study's questionnaire is based on the UTAUT acceptability model's dimensions, which are assessed on a seven-point Likert scale (1 = Strongly disagree to 7 = Strongly agree), developed by Venkatesh *et al.* in 2003. The surveys were then coded and entered for analysis into SPSS Statistics v26.0, which is a statistical package for social sciences. Frequency tables and crosstabs will be used for the descriptive analysis. Associations among variables will be analysed using regression analysis and factor analysis through principal component analysis. These descriptive analyses enable the expression of distribution parameters (position and dispersion) such as mean, standard deviation, median, mode, skewness and kurtosis (Mwau *et al.*, 2019). For each dimension, an aggregated variable will be calculated i.e., the arithmetic means of the variables of the concerned dimension.

The confirmatory phase: Following the exploratory step which allowed us to test the internal consistency and dimensionality of the proposed items, it enabled us to perform the confirmatory analysis which allows us to analyse the relationships between the variables of the model studied (Ivankova *et al.,* 2006; Subedi, 2016). To this end, we will first apply a Pearson r correlation test (with a two-sided significance at the threshold of 0.01) and then a regression test to test the previously posed hypotheses (Baharuden *et al.,* 2019; Benesty *et al.,* 2009). To confirm or deny the hypotheses, the responses will be subjected to statistical analysis by SPSS 26.0 software. Linear regression analysis between variables is suitable for our conceptual research model since it tends to explain a variable (dependent) by explanatory variables i.e., independent variables (Benesty *et al.,* 2009; Subedi, 2016).

4.9.3 Hypothesis Testing

4.9.3.1 Linear Regression Analysis

Testing research hypotheses requires mobilizing statistical analysis techniques (Subedi, 2016). We have employed the approach of linear regressions to study the impact of the independent factors on the dependent variables, as a means of finding the presence of the effect and of deducing the intensity of the effect (Schneider *et al.,* 2010; Zyphur & Pierides, 2019). The choice is to use simple linear regression analysis; this method is widely used to predict one variable (the dependent variable) from another (Schneider *et al.,* 2010; Zyphur & Pierides, 2019). Simple linear regression is part of the analyses where the values of the dependent variable (Y) are estimated from the independent variable (X) by the linear equation: $Yi = aC + bXi + e$

Where:

Yi = is the estimated value of Y

b = the slope (regression coefficient)

a = the constant

e = an error term

We read the results of the regression using the following indices as instructed by Montgomery *et al.* (2012):

- R^2: the multiple squared correlations, called the coefficient of determination, is "an index of the share of the variance of the dependent variable, explained by the independent variables that are in the equation". It thus gives the share of variance explained by the independent variable.
- Beta: this standardized coefficient makes it possible to compare the contribution of each variable since it is the regression coefficient reduced to a standard scale (between -1 and 1)
- The T-test: its value must be greater than 1.96 to be significant (noted *** at $p < 0.001$, ** $p < 0.01$, * $p < 0.05$). It indicates whether each of the coefficients of the variables present in the equation is significant.

Simple regression is used for the relationships present, in the research model:

- "Performance Expectancy" → "Behavioural Intention"
- "Efforts Expectancy" → "Behavioural Intention"
- "Social Influences" → "Behavioural Intention"
- "Facilitating Conditions" → "Behavioural Intention"
- "Self-Efficacy" → "Behavioural Intention"
- "Anxiety" → "Behavioural Intention"
- "Attitude Towards Using Technology" → "Behavioural Intention"

4.10 Summary

In this chapter we have led to defining the research approach, quantitative research approach is the chosen method for this research, as it is usually the tool for researchers who examine phenomena from a positivist perspective (Howlett, 2013; Mahendran *et al.,* 2022; Miles & Huberman, 2003; Zyphur & Pierides, 2019). Case study is the research design which aims to collect sufficient information on a person, an event or a social system (group of individuals or organisation) to allow the researcher to understand how it functions or behaves in a real situation (Berg, 2000; Runfola *et al.*, 2017). The questionnaire is the selected research tool for data collection which was distributed to 800 employees of Fortis Hospital Mauritius following the sample size calculation. The elements of the UTAUT acceptability model developed by Venkatesh *et al.* (2003) were used as the foundation for the questionnaire for our research project. These aspects were assessed on a seven-point Likert scale (1 = Strongly disagree to 7 = Strongly agree). The surveys were then coded and entered for analysis into SPSS Statistics v26.0, for investigation, analysis and examination. Associations among variables will be analysed using regression analysis and factor analysis through principal component analysis.

CHAPTER 5: FINDINGS

5.1 Introduction

The main goal of this study is to identify and examine the determining elements that influence healthcare professionals' adoption of e-health systems as a part of primary care in their everyday activities. This work aims to validate in the context of Mauritius, the model of adoption of e-health technology by the employees of Fortis Hospitals (Wellkin and Darné) situated in the city of Moka and Curepipe respectively. The study has a quantitative approach, it analyses the different variables such as "Performance Expectancy", "Effort Expectancy", "Social Influence" and "Facilitating Conditions", adopted from the UTAUT model of Venkatesh *et al.* (2003), which affect the e-health system adoption among the healthcare providers. To verify the hypotheses, build around the UTAUT model, we conducted an empirical investigation based on measurable data, obtained through validated questionnaires survey from a randomly selected population of 800 medical professionals of Fortis Hospitals in Mauritius. The statistical details of this study are presented in this chapter. The objective of this phase of the analysis is to study the operationalisation and empirical validity of the conceptual model built around a set of assumptions. Firstly, it involves describing the statistical properties of each construct of the model in terms of factor structures and reliability, and secondly, testing the various links proposed by the research model.

The purpose of this chapter is to provide the data's findings and outcomes, obtained from the questionnaire survey done at Fortis Hospitals (Mauritius). The results are organised as follows: description of the respondents' characteristics, the next section is devoted to the presentation of the results of exploratory statistical processing, which involved the result while performing the factor analysis using the principal component analysis (PCA) on the various constructs to explore their structure and test their reliability. During this phase of purification of the measurement scales, the results are justified and explained. The third section is devoted to the presentation of the results of the confirmatory analysis. The regression tests are carried out on the different variables retained at the end of the factor analysis. The results are organised by the research hypotheses H1 to H7.

5.2 Trustworthiness of data

In quantitative research, we must be rigorous in our approach, because the results must be reliable and valid (Abbad, 2021; Schwandt *et al.,* 2007). To do this, several authors including Lincoln and Guba (1985), have established a consensus on quality criteria, to make it possible to assess the scientific value of the results of research through credibility, transferability and confirmability.

Along with internal validity, which aims to verify the capacity of positivist research to produce data attributable to the intervention rather than to other phenomena (Abbad, 2021; Cohen *et al.,* 2011; Khalili *et al.,* 2017), the criterion of credibility in interpretative research is important in verifying the congruence between the meaning conveyed by the subject and the meaning released by the researcher, in particular in the collection, analysis and interpretation of the data (Carignan *et al.,* 2016; Savoie-Zajc, 2011). Ultimately, the criterion of credibility aims to answer the question: Are we in front of an authentic portrait of what has been observed (Carignan *et al.,* 2016)?

The question of credibility is one of the relationships between data and reality (Cope, 2014). According to Carignan *et al.* (2016), the researcher's commitment to the subject, triangulation method and researcher-reflective journaling are techniques that help to support the credibility of research data and results. However, according to Lincoln and Guba (1985), subject verification of research text is considered to be the most important strategy for building credibility. In our case, we have used a structured validated questionnaire adopted from the UTAUT model of Venkatesh *et al.* (2003) to collect quantitative data from our targeted population.

Transferability corresponds to external validity in quantitative research (Savoie-Zajc, 2011). This criterion is used to assess the possible application of findings to other contexts or groups (Carignan *et al.,* 2016). It is akin to generalization. An important aim of the positivist paradigm is to develop and verify rules generalizable to a large number of different contexts (Cohen *et al.,* 2011; Yahaya *et al.,* 2022). Positivists believe that a study is reliable if the results can be replicated by other researchers, and they attribute to lack of reliability to several factors such as the researcher's bias, inconsistency of the procedures employed, differences in contexts where research was applied and measurement errors (Lee, 1991). Thus, the transferability criterion aims to determine whether the conclusions of a research can have meaning in a context other than that studied (Finfgeld-Connett, 2010; Yahaya *et al.,* 2022). This criterion is shared between the researcher and the one who seeks to use the results of the research in his environment. It is to the researcher to provide rich descriptions of the context and study sample (Savoie-Zajc, 2011). Therefore, the result and the subjects have been sufficiently described so that those seeking to use the research results can make connections with their environment.

Dependability is the use of overlapping approaches and an in-depth explanation of the methodology to allow a repeat of the study (Pourtois *et al.,* 2006). According to Gohier (2004), dependability aims to demonstrate the transparency of the researcher. It is asked that the context be explained clearly as if this framework existed independently of the one expressing it (Heale & Twycross, 2015; Yahaya *et al.*, 2022). In this sense, Barber *et al.* (2000) intended to explain the methodology to allow a repeat of the study and a framework for making sense of the data for the results and the research being conducted. The choice of the determinants of adoption retained within the framework of this research is strongly inspired by the UTAUT model of Venkatesh *et al.* (2003). The latter has the advantage of being a general model of the set of theoretical models that have been developed in the context of the explanation of adaptive behaviour of human behaviours.

Confirmability or validation corresponds to neutrality or objectivity in quantitative research (Roberts & Priest, 2006). This criterion is used to assess the integrity of a study by referring to the objectivity or neutrality of the data and their interpretation (Oluwatayo, 2012). To test the data collected and the hypotheses built around the conceptual model of our research, we have chosen to go through two phases as suggested by Miles and Huberman (2003): (1) an exploratory phase, (2) confirmatory phase. Hair *et al.* (2010) contend that the two stages approach has a favourable position over the one-stage approach since it guarantees that the valid structural model reflects successful constructs which have been measured. Schumacker and Lomax (2004) also suggested a two-step model building approach, a measurement model followed by the structural model. “The structural model defines the links among latent variables as proposed by theory, whereas the measurement model specifies the relationships among measured (observed) variables that underlie the latent variables” (Miles & Huberman, 2003). The measurement model provides an assessment of convergence and discriminant validity, and the structural model provides an assessment of nomological validity (Subedi, 2016).

The exploratory phase corresponds to a descriptive analysis of the data (Ivankova *et al.*, 2006; Subedi, 2016) – aimed at describing the characteristics of e-health users and the dimensions. Our research study's questionnaire is based on the UTAUT acceptability model's dimensions, which are assessed on a seven-point Likert scale (1 = Strongly disagree to 7 = Strongly agree), developed by Venkatesh *et al.* in 2003. The surveys were then coded and entered for analysis into SPSS Statistics v26.0, a statistical package for social sciences. Associations among variables have been analysed using regression analysis and factor analysis through Principal Component Analysis (PCA). These descriptive analyses have enabled the expression of distribution parameters (position and dispersion) such as mean, standard deviation, median and mode (Mwau *et al.,* 2019). For each dimension, an aggregated variable has been calculated i.e., the arithmetic means of the variables of the concerned dimension.

The confirmatory phase: Following the exploratory step which allowed us to test the internal consistency and dimensionality of the proposed items, the confirmatory phase, enabled us to perform the confirmatory analysis which enables us to study the links between the model's analysed variables (Ivankova *et al.,* 2006; Subedi, 2016). To confirm or deny the hypotheses, the responses have been subjected to statistical analysis by SPSS 26.0 software. Linear regression analysis between variables is suitable for our conceptual research model since it tends to explain a variable (dependent) by explanatory variables - independent variables (Benesty *et al.,* 2009; Subedi, 2016; Yahaya *et al.*, 2022).

5.3 Reliability and Validity of data

Exploratory factor analysis constitutes a set of statistical methods whose main objective is to purify the measurement scales of a questionnaire (Samuels, 2017). This is to ensure that the scale is accurately and exclusively assessed the variable it is intended to measure. It is the test of the homogeneity of the scale (Goretzko *et al.*, 2019). It allows us to explore the factor structure and to check the internal consistency of the scales (Auerswald & Moshagen, 2019). Exploratory factor analysis ensues by synthesizing and structuring the data, as explained by Gorsuch (1988), starting from a table of observations where a certain number of objects are evaluated in function of various attributes, then summarized this information in a smaller set of linear combinations of the initial attributes while taking care to minimize the loss of information due to this reduction. In other words, tried to identify a small number of independent factors, grouping some of the initial attributes and contrasting the objects studied as well as possible.

Several methods exist to conduct an exploratory factor analysis, such as "Principal Components Analysis", "Principal Axis Factoring" and "Maximum Likelihood" (Samuels, 2017). Comparative research on these different methods has been carried out and shows that in most cases, the same factor structure is suggested (Samuels, 2017). We have chosen to use the Principal Component Analysis (PCA) method as it simplifies the complexity of large data while maintaining trends and patterns (Hadi *et al.,* 2016; Liquet & Commenges, 2003). To do this, the data is transformed into fewer dimensions which are summaries of the functionality (Hadi *et al.,* 2016; Yahaya *et al.,* 2022). Indeed, it is the most relevant method for synthesizing information and discovering the underlying structure of a concept, since it is a method of analysing multivariate data that makes it possible to explore simultaneously the relationships that exist between several variables (Hadi *et al.,* 2016).

The goal of the PCA is thus to optimally summarize the information contained in the items of each scale while making a compromise between the quality and the quantity of the information (Costello & Osborne, 2005). PCA allows us to overcome the phenomenon of multicollinearity between the variables of the study (Liquet & Commenges, 2003). It, therefore, makes it possible to recover several factors which accumulate the majority share of the variance explained by all the items (Ivankova *et al.*, 2006). Only the axes whose eigenvalue is greater than or equal to 1 are retained. Items whose commonalities are less than 0.5 and those which alone form a factor should be eliminated (Kootstra, 2004). PCA allows us to answer, three very specific questions:

1. Are the data of the scale factorizable?
2. How many axes (of dimensions) should we retain?
3. How to interpret the results?

Are the data of the scale factorizable?

According to Evrard *et al.* (2009), the application of factor analysis requires compliance with factorizable data criteria. Thus, to assess the effectiveness of PCA, two techniques are used: the "Kaiser-Meyer-Olkin" test (KMO) and the "Bartlett Sphericity" test (Hadi *et al.*, 2016). Bartlett's sphericity test makes it possible to test the correlations between certain variables that are pointedly significant (Jolibert & Jourdan, 2006). According to Tobias and Carlson (1969), Bartlett's sphericity test is “a test to measure whether the correlation matrix is an identity matrix, which would indicate that the factor model is not suitable”. It must be significant for a factor analysis to be feasible ($p < 5\%$) p must be less than 5% (Reddon & Jackson, 1984; Tobias & Carlson, 1969). This test is completed by the "Kaiser-Meyer-Olkin" (KMO) index, which indicates in what proportion the variables selected form a coherent together, adequately measure a concept and are appropriate for a factor analysis (Jolibert & Jourdan, 2006). Kaiser-Meyer-Olkin test

(KMO) is a measure of the relevance of the data for factor analysis. This test measures the sampling adequacy for each variable in the model, and for the full model (Jolibert & Jourdan, 2006). The KMO criterion: it is a measure of the adequacy of the sampling, it gives a global overview on the quality of the inter-item correlations, it varies between 0 and 1 and gives additional information examining the correlation matrix (Hill, 2011). The KMO test must be greater than 0.5 to be useful (Williams *et al.*, 2010). The KMO is an index of the adequacy of the factorial solution (Hill, 2011), it indicates to what extent the set of variables selected is a coherent set and makes it possible to constitute adequate measures of Exploratory factor analysis. The acceptability thresholds for these tests and indices as per Malhotra *et al.* (2006) are presented in the following table:

Table 5.1

Acceptability Thresholds of Bartlett's Test of Sphericity & KMO

Test & Acceptability Thresholds		**Comments**
Bartlett's Test of Sphericity	$P < 0.05$	It checks the null hypothesis that the variables are not correlated in the population. A high value will favour the rejection of the null hypothesis (Malhotra *et al.*, 2006)

Kaiser-Meyer-Olkin (KMO)	< 0.5 Unacceptable. < 0.6 Miserable. < 0.7 Mediocre. < 0.8 Middling. < 0.9 Meritorious. < 1.0 Marvellous.	If the KMO index is between 0.5 and 1, it can be concluded that the data can be factored (Malhotra, *et al.*, 2006). Variables with values less than or equal to 0.5 are excluded from the analysis (Jolibert & Jourdan, 2006).

Note: Adapted from *Acceptability Threshold of KMO,* by Malhotra *et al.*, 2006

Note: This table did not fit on the bottom of the previous page.

How many axes (of dimensions) should we retain?

The number of factors obtained using a PCA is normally equal to the *n* number of initial variables (Jolibert & Jourdan, 2006). As the purpose of the PCA is to summarize the information, only the most informative factors, those which best describe the phenomenon, shall be analysed (Jolibert & Jourdan, 2006). To define several factors to remember, the criterion of the percentage of variance can be used. This is a pre-set threshold corresponding to the minimum total explained variance, set in advance. The variance threshold that we used for our study is as per Hair *et al.* (2010), who imposed a percentage of explained variance equal to sixty percent (Hair *et al.*, 2010).

5.3.1 Reliability analysis

Furthermore, PCA cannot be dissociated from reliability analysis (internal consistency). The reliability of an instrument indicating its ability to reproduce similar results if administered several times to the same people (Igalens & Roussel, 1999).

It is a matter of verifying the existence of consistency in the replies of respondents to a set of statements used to measure a variable, a concept, a dimension or a construct. The most used indicator in this sense is Cronbach's alpha test (Igalens & Roussel, 1999), it is often represented as follows:

$$\alpha = \frac{k}{k-1} / 1 - \frac{\sum \sigma_i^2}{\sigma_x^2}$$

Where:

k is the number of items

$\Sigma\sigma_i^2$ is the sum of the variance of each item

σ_x^2 is the variance of the total (column)

with: $\sigma_x^2 = \Sigma\sigma_i^2 + 2\Sigma\sigma_{ij}$

where $\Sigma\sigma_{ij}$ is the sum of covariances between items i and j of the scale

The alpha Cronbach's is an estimate of the variance of the total score due to all common factors specific to the items of the tested scale. It indicates how much of the total score depends on general factors specific to all statements rather than specific items (Cronbach & Meehl, 1955). The goal is to reduce random errors due to mood swings and circumstances that alter the response to the questions (Igalens & Roussel, 1999).

The Alpha Cronbach acceptability threshold varies depending on the objective of the research. For an exploratory study, the lower acceptable coefficient is 0.7 (Nunally & Bernstein, 1994). The table below shows the Cronbach's alpha values threshold as per DeVellis, (2016):

Table 5.2

Cronbach's Alpha Threshold

Cronbach's Alpha Threshold	Result
Less than 0.6	Insufficient
Between 0.6 and 0.65	Poor
Between 0.65 and 0.7	Minimum acceptable
Between 0.7 and 0.8	Good
Between 0.8 and 0.9	Excellent
Greater than 0.9	Consider reducing the number of items.

Source: Adapted from *Cronbach Alpha Threshold*, as per DeVellis (2016)

From a practical and convenient point of view, the work of Evrard *et al.* (2009) suggests that for an exploratory study, the alpha is acceptable if it is between 0.5 and 0.8, and for a confirmatory study, a value greater than 0.8 is recommended. Estimating the dimensionality and the reliability of constructs are therefore two inseparable approaches. Indeed, the internal consistency reliability of a scale is not sufficient to test for unidimensional. Likewise, the extraction of the factors of the principal components does not allow us to identify the dimension underlying the constructs without reliability analysis.

5.3.2 Validity Analysis

According to Liquet and Commenges (2003), when dealing with data, it is important to follow a rigorous methodology that is transversal to all scientific disciplines, such as ensuring the fidelity (reliability) of the measuring device, managing the validity where the device must effectively measure the quantity studied and paying attention to the sensitivity of the device's ability to distinguish two close measurements (Liquet &

Commenges, 2003). The purpose of validity tests is to check whether the different items of an instrument are giving a good representation of the phenomenon studied, such as, “Are we measuring what we are trying to measure” (Evrard *et al.*, 2009). To check the validity of our data, we have used the exploratory factor analysis method.

5.4 Results

5.4.1 Pilot Study

Our questionnaire was designed in accordance of the existing literature of Venkatesh *et al.* (2003). Before administering it, we conducted a pilot study following Malhotra's recommendations (Malhotra *et al.*, 2006). The questionnaire was sent to 25 employees of Fortis Wellkin Hospital via email presenting the questionnaire and its purpose. A total of 22 participants responded, giving a return rate of around 88 percent (88%). They provided us with feedback on how long it took to answer all the questions on our questionnaire. A final validation was carried out with the Director of Human Resources of Fortis Hospitals Mauritius. This enabled us to make him aware of the work we were doing within the company, explain its purpose, and obtain the ticket for agreement to distribute the questionnaire to a group of employees of the organisation.

Following the pilot study result, item (question) PE4 “If I use the system, I will increase my chances of getting a raise” and item (question) FC4 “A specific person (or group) is available for assistance with system difficulties” were removed from the final questionnaire.

5.4.2 The demographic characteristics of participants

The questionnaire was sent via the Internet using the Survey Survio platform for the creation and distribution of the questionnaires, to 800 randomly selected individuals of

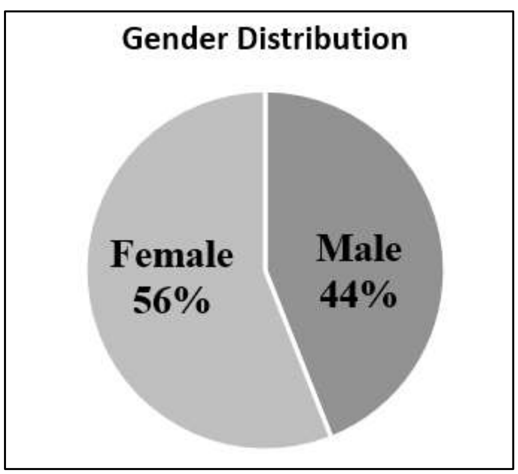
Fortis Hospitals in Mauritius. It was aired over a period of three months between 01 July 2020 till 02 October 2020. To avoid a very low response rate, we sent out three reminders to participants, first at the end of July 2020, second at the end of August 2020 and third at the end of September 2020. A letter signed by the management of the hospital was also sent in the days preceding the survey to inform the participants of the importance and the justification of the study. We received 512 responses, which corresponds to a response rate of sixty-four percent (64%), which is acceptable under the Churchill Jr (1979) paradigm. The questionnaires were then coded and transcribed into the "Statistical Package for Social Sciences" (SPSS) Statistics v 26.0 for analysis. The demographic characteristics were summarised using descriptive statistics, the results are mentioned below.

The proportion of male/female

According to the results, 56% (*n* = 287) of respondents are female and 44% (*n* = 225) are male as shown in the following pie-chart below:

Figure 5.1

The proportion of males/females in the responding population.

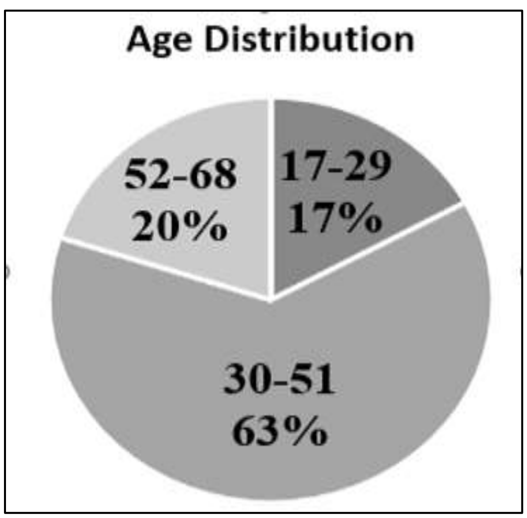


Age of respondents

We have opted for a generational perspective for the age of the respondents. To do this, we relied on the deterministic approach of Strauss and Howe (1991). We, therefore, categorised the age of the users into three generations, 17-29 years old, between 30-51 and between 52-68 years old. We noted that the majority of our respondents, that is 63%, (*n* = 323) were between 30-51 years old. Respondents aged between 52-68 years old were the second most numerous in our sample 20% (*n* = 102), followed by those aged 17-29 years old 17% (*n* = 87) as shown in Figure 5.2. The response is made up of individuals with an average age of 40.75 years. The median value for age is 40 years (minimum 19, maximum 62), which means that individuals under 40 years of age represent 50% of the workforce.

Figure 5.2

The distribution of age categories of the responding population.

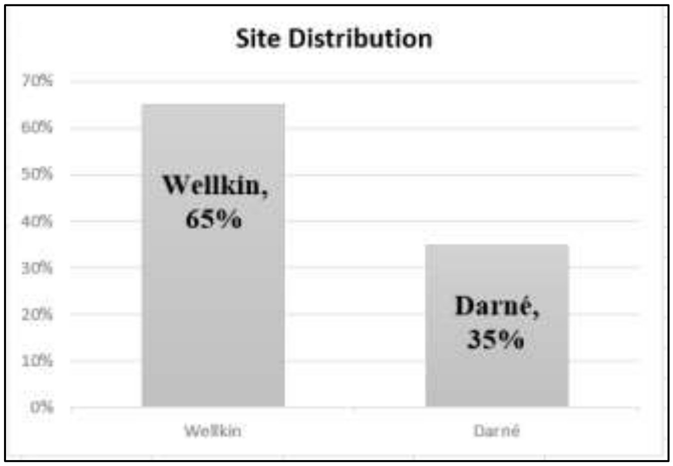


Location of respondents

The response is made up of 65% (*n* = 333) of individuals working at Fortis Welkin Hospital and 35% (*n* = 179) of individuals working or attached to Fortis Darné Hospital as shown in the figure below.

Figure 5.3

The distribution of respondents by location

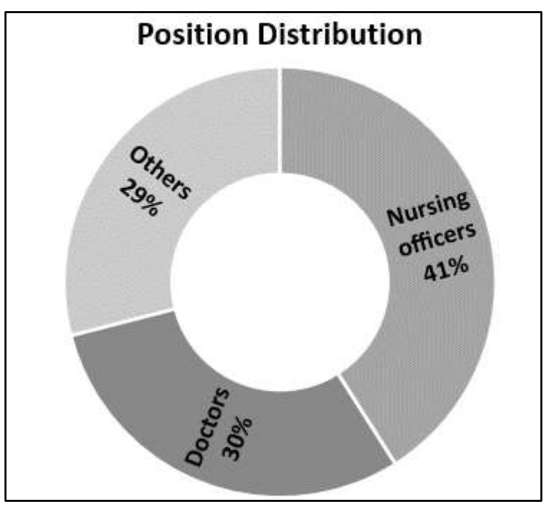


Position of respondents

The sample is made up of 41% (*n* = 210) of individuals belonging to the Nursing officer category, followed by 30% (*n* = 154) of individuals in the Consultant / Resident Doctor category and 29% (*n* = 148) to that Others including Technicians / Pharmacy officers / Lab Assistants as shown in Figure 5.4 below.

Figure 5.4

Positions of respondents



5.4.3 The Exploratory Approach

5.4.3.1 Distributions of the items

At this stage, we tried to have a normal distribution of the items. There are two reasons for this: first to tackle the relevance significance where a distribution centred on the left or the right indicates irrelevance: everyone responds in the same way (Kitchens, 1998), on the other hand, a Gaussian distribution guarantees that the item has been evaluated on a 7-point Likert scale (where 1 = Strongly disagree to 7 = Strongly agree), can be considered as an interval scale and thus deviates from its real status as an ordinal scale. To analyse the normality of the results obtained, we calculated the Kurtosis as well as the Skewness, which represent the two most common indices used to test the normality of results (Kitchens, 1998). To highlight the results obtained, the histograms are annexed (see Appendix A) thus making it possible to visualize the distribution of the responses. We were able to observe a fairly good distribution overall, the items did not deviate too much from a normal distribution, however, some items do present a homogeneous distribution, and some are sometimes-marked asymmetry.

5.4.3.2 Reliability of measurement scales

The reliability of measurement refers to “the degree to which the instrument is free from random errors” (Evrard *et al.*, 2009). The measurement of reliability allows us to affirm that, if we measure several times with the same measuring instrument, we will obtain the same results (Evrard *et al.*, 2009). In our study, there are seven independent scales and one dependent scale used in the survey questionnaire to measure the construct of the proposed UTAUT model. The independent scales are "Performance Expectancy" (PE); "Effort Expectancy" (EE); "Social Influence" (SI); "Facilitating Condition" (FC); "Self-Efficacy" (SE); "Anxiety" (AN) and "Attitude Towards Using Technology" (AT). The dependent scale is "Behavioural Intention" (BI) to adopt the e-health system. A scale reliability study was carried out to evaluate the internal consistency in order to demonstrate that the set of scales properly and consistently conveys the meaning of the model components. The Cronbach's coefficient alphas were used to measure the internal consistency. The construct that makes up the UTAUT should have strong internal consistency, with a reported Cronbach's alpha (α) value greater than 0.70, according to Venkatesh *et al.* (2003). A reliability coefficient was executed for each construct on SPSS V26.0 and the results are presented in Table 5.3. As a consequence of the investigation, it was determined that the Cronbach's alpha value ranged from 0.687 for Facilitating Conditions to 0.972 for "Behavioural Intention". All of the research instrument's alpha values showed adequate construct dependability, according to the reliability analysis.

Table 5.3

Cronbach Reliability Statistics Results

Constructs	No. of Items	Cronbach's Alpha (α)	Comments
Performance Expectancy (PE)	3	0.834	Excellent Reliability
Effort Expectancy (EE)	4	0.832	Excellent Reliability
Social Influence (SI)	4	0.885	Excellent Reliability
Facilitating Conditions (FC)	3	0.687	Minimum Acceptable
Self-Efficacy (SE)	4	0.707	Good Reliability
Anxiety (AN)	4	0.847	Excellent Reliability
Attitude Towards Using Technology (AT)	4	0.902	Excellent Reliability
Behavioural Intention (BI)	3	0.972	Excellent Reliability

5.4.3.3 Validity of measurement scales

The purpose of validity tests is to check whether the different items of an instrument are giving a good representation of the phenomenon studied, such as, “Are we measuring what we are trying to measure” (Evrard *et al.*, 2009). It is necessary to check whether the indicators supposed to measure the same phenomenon are sufficiently correlated (convergent validity) and whether they are distinguished from the indicators supposed to measure different phenomena - discriminant validity (Evrard *et al.*, 2009). To check the validity of our data, we used the exploratory factor analysis using the "Principal Component Analysis" (PCA) method.

We started our factor analysis by analysing the correlations between our variables because a factor analysis is relevant only if there are strong correlations between the explanatory variables of the model (Evrard *et al.*, 2009). To measure the inter-item correlations, we chose the MSA test (Measure of Sampling Adequacy) also called the coefficient of the Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity test (Daghfous & Kah, 2006). The acceptability thresholds for the two tests are explained in Table 5.1.

The second step of our factor analysis in PCA consisted of extracting the factors, to determine the number of factors explaining the total variance of our sample on all of our variables (Daghfous & Kah, 2006; Evrard *et al.*, 2009). To do this, we analysed the table of the Total Explained Variance to retain only the factors having an eigenvalue greater than or equal to 1 (Eigenvalue rule), and those explaining at least sixty percent (60%) of the variance - percentage rule cumulative total variance (Hair *et al.*, 2010). The individual items’ commonalities show for each item how well the model performs. Items whose commonalities are less than 0.5 should be removed as they did not meet the criterion of convergent validity (Hair *et al.*, 2010; Kootstra, 2004).

Ultimately, factor loading of scale items was assessed. This is done by analysing the Matrix of Components, as well as the weights of the variables. The greater the weight of the variable, the more representative it is in the factor. According to Daghfous and Kah (2006), low-loading items should be suppressed when factor loadings are below 0.4 in general. To guarantee that all variables in this investigation had practical importance, the suggested cut-off factor loading of 0.5 was applied (Hair *et al.*, 2010).

The exploratory factor analysis was carried out using the Statistical Package for Social Sciences (SPSS) Statistics version 26.0. The study model's scales were each individually examined, and the specifics of the validation procedure and its findings are covered in the following subsections.

Analysis of the Performance Expectancy (PE) scale

Table 5.4 shows the three questionnaire statement items, which were used to measure the "Performance Expectancy" scale. We can see in Table 5.5, the result of the KMO index is 0.714. Generally, a KMO measure should be greater than 0.5 (Malhotra, *et al.,* 2006), as the KMO result in our study is greater than the minimum acceptable level, it means that we have an excellent correlation between the items of our scale (Daghfous & Kah, 2006). Bartlett's test of sphericity (chi-square = 604.305) is significant given that our probability is 0.000 which is less than 0.001 ($p < 0.001$); this means that there is a significant correlation between the variables and that they are factorizable.

Table 5.4

Performance Expectancy Variables

Construct	Code	Questionnaire Statement
Performance Expectancy (PE)	PE1	"I would find the system useful in my job".
	PE2	"Using the system enables me to accomplish tasks more quickly".
	PE3	"Using the system increases my productivity".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.*, 2003

Table 5.5

KMO and Bartlett's test result for Performance Expectancy scale

Test		Results
KMO Measure of Sampling Adequacy		0.714
Bartlett's Sphericity Test	Approx. Chi-Square	604.305
	Degree of Freedom	3
	Significance Level	0.000

The factorial analysis was done using the three items of the Performance Expectancy scale, for which the level of communalities is greater than 0.7 for all three items as shown in Table 5.6; Table 5.7 shows the Total Explained Variance, which has made it possible to explain seventy-five percent (75%) of the upper variance, which is above the sixty percent (60%) recommended, therefore, none of the items from this scale should be removed.

Table 5.6

Communalities Level for Performance Expectancy Scale

Performance Expectancy Items	Initial	Extraction
PE1	1.000	0.797
PE2	1.000	0.727
PE3	1.000	0.731

Table 5.7

Total Variance Explained for Performance Expectancy Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.255	75.174	75.174	2.255
2	0.430	14.347	89.521	
3	0.314	10.480	100.000	

Extraction Method: Principal Component Analysis

Finally, the factor loading of the scale was examined. As shown in Table 5.8, the loading factor for the three items in the Performance Expectancy scale exceeds the cut-off level of 0.5, therefore, the structural coefficients (0.894, 0.856, 0.854, respectively) tell us that the items meet the criterion of convergent validity and is unidimensional.

Table 5.8

Factor Loading for Performance Expectancy Scale

Component Matrix[a]	Component
	1
PE1	0.894
PE2	0.856
PE3	0.854

Extraction Method: Principal Component Analysis

a. 1 component extracted

Analysis of the Effort Expectancy (EE) scale

The Effort Expectancy scale had four items on the questionnaire as shown below.

Table 5.9

Effort Expectancy Variables

Construct	**Code**	**Questionnaire Statement**
Effort Expectancy (EE)	EE1	“My interaction with the system would be clear and understandable”.
	EE2	“It would be easy for me to become skilful at using the system”.
	EE3	“I would find the system easy to use”.

EE4	"Learning to operate the system is easy for me".

Note: Adapted from *UTAUT model*, by Venkatesh *et al.*, 2003

Results for sample adequacy are shown in Table 5.10, where the KMO index is 0.745, which is above the recommended value of 0.5, on the other hand, Bartlett's Sphericity Test (Chi-Square=963.185), is highly significant as the significance level p = 0.000, indicating that there are inter-items correlations and the data is factorizable.

Table 5.10

KMO and Bartlett's test result for Effort Expectancy scale

Test		**Results**
KMO Measure of Sampling Adequacy		0.745
Bartlett's Sphericity Test	Approx. Chi-Square	963.185
	Degree of Freedom	6
	Significance Level	0.000

Following the factor analysis realised on the items of the Effort Expectancy scale, Table 5.11 revealed that the commonalities of all items are all over 0.5 supporting further the overall assessment of the performance of the model.

Table 5.11

Communalities Level for Effort Expectancy Scale

Effort Expectancy Items	**Initial**	**Extraction**
EE1	1.000	0.625

EE2	1.000	0.503
EE3	1.000	0.784
EE4	1.000	0.786

On the other hand, Table 5.12 revealed the total variance explained of the four items for Effort Expectancy scale which solution together explaining sixty-seven percent (67%) of the variation among the items.

Table 5.12

Total Variance Explained for Effort Expectancy Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.699	67.465	67.465	2.699
2	0.634	15.841	83.306	
3	0.487	12.170	95.476	
4	0.181	4.524	100.000	

Extraction Method: Principal Component Analysis

As shown in Table 5.13, the factor loadings of the items of the Effort Expectancy scale are higher than the cut-off level of 0.5, which indicates that the structural coefficients (0.886; 0.885; 0.790; 0.708) telling us that the items satisfy the criterion of convergent validity and is unidimensional.

Table 5.13

Factor Loading for Effort Expectancy Scale

Component Matrix[a]	Component
	1
EE1	0.886
EE2	0.885
EE3	0.790
EE4	0.708

Extraction Method: Principal Component Analysis

a. 1 component extracted

Analysis of the Social Influence (SI) scale

Table 5.14 presents the four questionnaire statements used to study the construct of Social Influence.

Table 5.14

Social Influence Variables

Construct	**Code**	**Questionnaire Statement**
Social Influence (SI)	SI1	“People who influence my behaviour think that I should use the system”.
	SI2	“People who are important to me think that I should use the system”.

	SI3	"The senior management of this business has been helpful in the use of the system".
	SI4	"In general, the organization has supported the use of the system".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.*, 2003

Table 5.15

KMO and Bartlett's test result for Social Influence scale

Test		Results
KMO Measure of Sampling Adequacy		0.741
Bartlett's Sphericity Test	Approx. Chi-Square	870.464
	Degree of Freedom	3
	Significance Level	0.000

The factorial examination was done utilizing the four elements of the Social Influence scale, for which the degree of commonalities is more noteworthy than 0.7 for all four variables as appeared in Table 5.16.

Table 5.16

Communalities Level for Social Influence Scale

Social Influence Items	Initial	Extraction
SI1	1.000	0.785
SI2	1.000	0.822
SI3	1.000	0.841
SI4	1.000	0.753

The Total Variance Explained is displayed in Table 5.17, which has made it conceivable to clarify sixty-two percent (62%) of the upper variance, hence, none of the items from the Social Influence scale should be taken out from the study.

Table 5.17

Total Variance Explained for Social Influence Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.449	62.463	62.463	2.449
2	0.654	15.821	78.284	
3	0.472	12.131	90.415	
4	0.292	9.585	100.000	

Extraction Method: Principal Component Analysis

As displayed in Table 5.18, the factor loading for all four variables in the Social Influence scale surpasses the cut-off degree of 0.5, subsequently, the structural coefficients (0.886, 0.907, 0.914, 0.701) disclose to us that the variables meet the rule of convergent validity.

Table 5.18

Factor Loading for Social Influence Construct

Component Matrix[a]	Component 1
SI1	0.886

SI2	0.907
SI3	0.914
SI4	0.702

Extraction Method: Principal Component Analysis

a. 1 component extracted

Analysis of the Facilitating Conditions (FC) scale

Table 5.19 provides the three questionnaire statements which were used to study the Facilitating Conditions scale. The KMO index is 0.669 as shown in Table 5.20 is over the suggested value of 0.5, subsequently, Bartlett's Sphericity Test (Chi-Square=255.655), p = 0.000, indicates that there is a significant association between the items and the data is factorizable.

Table 5.19

Facilitating Conditions Variables

Construct	Code	Questionnaire Statement
Facilitating Conditions (FC)	FC1	"I have the resources necessary to use the system".
	FC2	"I have the knowledge necessary to use the system".
	FC3	"The system is not compatible with other systems I use".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.*, 2003

Table 5.20

KMO and Bartlett's test result for Facilitating Conditions scale

Test	Results
KMO Measure of Sampling Adequacy	0.669

Bartlett's Sphericity Test	Approx. Chi-Square	255.655
	Degree of Freedom	3
	Significance Level	0.000

The factor analysis acknowledged the variables of the Facilitating Condition scale, Table 5.21 uncovered that the commonalities of the variables are all over 0.5 supporting further the general evaluation of the exhibition of the model where none of the items from this scale should be removed. Table 5.22 uncovered the Total Variance Explained of the three variables of Facilitating Condition scale which has made it possible to explain sixty-one percent (61%) of the upper variance.

Table 5.21

Communalities Level for Facilitating Conditions Scale

Facilitating Conditions Items	Initial	Extraction
FC1	1.000	0.636
FC2	1.000	0.626
FC3	1.000	0.594

Table 5.22

Total Variance Explained for Facilitating Conditions Scale

	Initial Eigenvalues	Extraction Sum of Squared Loadings

Component	Total	% of Variance	Cumulative %	Total
1	1.859	61.901	61.901	1.857
2	0.592	19.915	81.816	
3	0.541	18.184	100.000	

Extraction Method: Principal Component Analysis

To finish, scale factor loading was tested. The loading factor for all three items on the Facilitating Conditions construct, as shown in Table 5.23, reaches the cut-off level of 0.5, so the structural coefficients (0.798, 0.792, 0.771 respectively) inform us that the items follow the convergent validity criterion and are strongly correlated with the component.

Table 5.23

Factor Loading for Facilitating Conditions scale

Component Matrix[a]	Component 1
FC1	0.798
FC2	0.792
FC3	0.771

Extraction Method: Principal Component Analysis

a. 1 component extracted

<u>Analysis of the Self-Efficacy (SE) scale</u>

As shown in Table 5.24, the Self-Efficacy scale had four items on the questionnaire.

Table 5.24

Self-Efficacy Variables

Construct	Code	Questionnaire Statement

Self-Efficacy (SE)	SE1	"I could complete a job or task using the system. If there was no one around to tell me what to do as I go".
	SE2	"I could complete a job or task using the system. If I could call someone for help if I got stuck".
	SE3	"I could complete a job or task using the system. If I had a lot of time to complete the job for which the software was provided".
	SE4	"I could complete a job or task using the system. If I had just the built-in help facility for assistance".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.*, 2003

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The measure of sample adequacy analysis is summarized in Table 5.25, where the KMO is 0.723, which is above the recommended threshold of 0.5, on the Bartlett test of Sphericity, as the significance level p = 0.000, it is highly significant, implying that there is inter-item correlation and the data can be factorized.

Table 5.25

KMO and Bartlett's test result for Self-Efficacy scale

Test		Results
KMO Measure of Sampling Adequacy		0.723
Bartlett's Sphericity Test	Approx. Chi-Square	369.795
	Degree of Freedom	6
	Significance Level	0.000

Table 5.26 revealed that the communities are average (between 0.40 and 0.65). Where two items not exceeding the threshold of 0.5 and the other two are slightly higher

than 0.5, on the other hand, Table 5.27 revealed the total variance explained of the four items for the Self-Efficacy scale, which explain only fifty-three percent (53%) of the variation among the items, a result much lower than the sixty percent (60%) recommended by Hair *et al.* (2010).

Table 5.26

Communalities Level for Self-Efficacy Scale

Self-Efficacy Items	Initial	Extraction
SE1	1.000	0.578
SE2	1.000	0.446
SE3	1.000	0.630
SE4	1.000	0.486

Table 5.27

Total Variance Explained for Self-Efficacy Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.140	53.499	53.499	2.140
2	0.788	19.712	73.211	
3	0.559	13.978	87.189	
4	0.515	12.811	100.000	

Extraction Method: Principal Component Analysis

With regards to the low level of commonality of two out of four items SE2 – "I could complete a job or task using the system. If I could call someone for help if I got stuck" and SE4 – "I could complete a job or task using the system. If I had just the built-in help facility for assistance", and a low level of explanation for the variance, we decided to remove the "Self-Efficacy" construct, as recommended by Hair *et al.* (2010).

<u>Analysis of the Anxiety (AN) Scale</u>

The four questionnaire statement items that were used to measure the Anxiety scale are shown in Table 5.28. The outcome of the KMO index as shown in Table 5.29 is 0.784, as the KMO result in our analysis is higher than the minimum acceptable level, indicating that we have an excellent association between the elements of the Anxiety scale. The sphericity test of the Bartlett (chi-square = 915.791) is significant since $p = 0.000$, which is less than 0.001; this means that the variables are strongly correlated and that they can be factorized.

Table 5.28

Anxiety Variables

Construct	**Code**	**Questionnaire Statement**
Anxiety (AN)	AN1	"I feel apprehensive about using the system".
	AN2	"It scares me to think that I could lose a lot of information using the system by hitting the wrong key".
	AN3	"I hesitate to use the system for fear of making mistakes I cannot correct".
	AN4	"The system is somewhat intimidating to me".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.,* 2003

Table 5.29

KMO and Bartlett's test result for Anxiety Scale

Test		Results
KMO Measure of Sampling Adequacy		0.784
Bartlett's Sphericity Test	Approx. Chi-Square	915.791
	Degree of Freedom	6
	Significance Level	0.000

The factorial study was carried out using the four items of the Anxiety scale for which, as seen in Table 5.30, the level of communalities is greater than 0.6 for all the four variables; Table 5.31 shows the Total Variance Explained result which has made it possible to understand sixty-nine percent (69%) of the upper variance which is higher than the sixty percent (60%) recommended, thus, none of the items of this scale should be eliminated.

Table 5.30

Communalities Level for Anxiety Scale

Anxiety Items	Initial	Extraction
AN1	1.000	0.607
AN2	1.000	0.732
AN3	1.000	0.787
AN4	1.000	0.639

Table 5.31

Total Variance Explained for Anxiety Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.766	69.144	69.144	2.766
2	0.505	12.612	81.756	
3	0.486	12.141	93.897	
4	0.245	6.103	100.000	

Extraction Method: Principal Component Analysis

The loading factor for all four variables of the Anxiety scale reaches the cut-off degree of 0.5, as seen in Table 5.32, so the structural coefficients (0.770, 0.846, 0.885, 0.802) inform us that the variables conform with the convergent validity and none must be removed.

Table 5.32

Factor Loading for Anxiety Scale

Component Matrix[a]	Component
AN1	0.779
AN2	0.846
AN3	0.885
AN4	0.802

Analysis of the Attitude Towards Using Technology (AT) scale

Table 5.33 displays the four questionnaire elements that were used to assess the Attitude Towards Using Technology scale. The findings of the sample adequacy are presented in Table 5.34, where the KMO index is 0.822, which is above the recommended value of 0.5, while the Bartlett sphericity test (Chi-Square=1422.300) is highly significant where p = 0.000, indicating that associations between items occur and that they can be factorized.

Table 5.33

Attitude Towards Using Technology Variables

Construct	Code	Questionnaire Statement
Attitude Towards Using Technology (AT)	AT1	"Using the system is a good idea".
	AT2	"The system makes work more interesting".
	AT3	"Working with the system is fun".
	AT4	"I like working with the system".

Note: Adapted from *UTAUT model*, by Venkatesh *et al.*, 2003

Table 5.34

KMO and Bartlett's test result for AT scale

Test		Results
KMO Measure of Sampling Adequacy		0.822
Bartlett's Sphericity Test	Approx. Chi-Square	1422,300
	Degree of Freedom	6
	Significance Level	0.000

Following the factor analysis performed on the Attitude Towards Using Technology scale items, Table 5.35 revealed that the commonalities of all items are over 0.7 thus supporting the overall evaluation of the model's results, on the other hand, Table 5.36 revealed the total explained variance of the four items, which together explained seventy-eight percent (78%) of the upper variance.

Table 5.35

Communalities Level for AT scale

Attitude Towards Using Technology Items	Initial	Extraction
AT1	1.000	0.740
AT2	1.000	0.771
AT3	1.000	0.770
AT4	1.000	0.869

Table 5.36

Total Variance Explained for AT Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	3.148	78,702	78,702	3.148
2	0.381	9.530	88,232	
3	0.301	7.532	95.764	
4	0.169	4.236	100.000	

As seen in Table 5.37, the factor loading exceeds the cut-off degree of 0.5 for all four variables of the AT scale, so the structural coefficients (0.922, 0.882, 0.877, 0.861) tell us that the variables agree with the convergent validity and they are unidimensional.

Table 5.37

Factor Loading for AT scale

Component Matrix[a]	Component
	1
AT1	0.922
AT2	0.882
AT3	0.877
AT4	0.861

Extraction Method: Principal Component Analysis

a. 1 component extracted

Analysis of the Behavioural intention (BI) scale

The three questionnaire statements that were used to evaluate the Behavioural Intention scale are given in Table 5.38. As seen in Table 5.39, the KMO index is 0.772 which is above the recommended value of 0.5, and that the Bartlett sphericity test (Chi-Square=2084.324), p=0.000, suggests that there is a substantial correlation between the items and that the results can be factorized.

Table 5.38

Behavioural Intention Construct Variables

Construct	Code	Questionnaire Statement
Behavioural Intention (BI)	BI1	"I intend to use the system in the next six (6) months".
	BI2	"I predict I would use the system in the next six (6) months".
	BI3	"I plan to use the system in the next six (6) months".

Note: Adapted from *UTAUT model,* by Venkatesh *et al.,* 2003

Table 5.39

KMO and Bartlett's test result for Behavioural Intention scale

Test		Results
KMO Measure of Sampling Adequacy		0.772
Bartlett's Sphericity Test	Approx. Chi-Square	2084.324
	Degree of Freedom	3
	Significance Level	0.000

Following the factor study carried out on the items of the Behavioural Intention scale, Table 5.40 shows that the commonalities of all the items are above 0.9 which indicates that none of the items must be removed, on the other hand, Table 5.41 showed the overall explained variance of the four items, which together explained ninety-four percent (94%) of the upper variance.

Table 5.40

Communalities Level for Behavioural Intention Scale

Behavioural Intention Items	Initial	Extraction
BI1	1.000	0.923
BI2	1.000	0.952
BI3	1.000	0.949

Table 5.41

Total Variance Explained for Behavioural Intention Scale

	Initial Eigenvalues			Extraction Sum of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	2.832	94.604	94.604	2.838
2	0.107	3.534	98.138	
4	0.54	1.862	100.000	

Extraction Method: Principal Component Analysis

Finally, scale factor analysis has been tested. The loading factor for all three items on the Behavioural Intention scale, as seen in Table 5.42, reaches the cut-off threshold of 0.5, so the structural coefficients (0.963, 0.978, 0.976, respectively) inform us that the items satisfy the convergent validity criterion and is unidimensional.

Table 5.42

Factor Loading for Behavioural Intention Scale

Component Matrix[a]	Component 1
BI1	0.963
BI2	0.978
BI3	0.976

Extraction Method: Principal Component Analysis

a. 1 component extracted

5.4.4 Summary of the Exploratory Factor Analysis

The scale purification step showed that almost all the scales exhibit an acceptable level of reliability and validity. However, the Self-Efficacy construct was eliminated following the factor analysis due to its low level of commonalities and low level of explained variance. Thus, the retained constructs for the confirmatory approach are "Performance Expectancy"; "Effort Expectancy"; "Social Influence"; "Facilitating Conditions"; "Anxiety"; "Attitude Towards Using Technology" and the dependent scale, "Behavioural Intention".

5.4.5 The Confirmatory Approach / Hypothesis Testing

The Factor Analysis conducted in the previous section was useful as a preliminary technique, our measurement scales being reliable and valid, we, therefore, continue our study and perform linear regression analyses to accept or reject our research hypotheses. The linear regression analysis is used to study the influences of the independent variables upon the dependent variables. We have used the method of linear regressions, as a means to accept or reject our research hypotheses (Schneider *et al.*, 2010). In our study regression analysis was conducted to explain the influence of the independent variables' "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Anxiety" and "Attitude Towards Using Technology" on the dependent variable "Behavioural Intention". This method is widely used to predict one variable (the dependent variable) from another or other variable(s). In our case, we used simple regression analysis, with a single independent variable. It was used for all the present relationships retained at this stage of the research:

"Performance Expectancy" (PE) → "Behavioural Intention" (BI)

"Effort Expectancy" (EE) → "Behavioural Intention" (BI)

"Social Influence" (SI) → "Behavioural Intention" (BI)

"Facilitating Conditions" (FC) → "Behavioural Intention" (BI)

"Anxiety" (AN) → "Behavioural Intention" (BI)

"Attitude Towards Using Technology" (AT) → "Behavioural Intention" (BI)

SPSS V26 was used to analyse the relationships and answer each of the study hypotheses by applying common methods of data analysis consistently used in other previous UTAUT research, even adhering to the original Venkatesh *et al.* (2003) research methods. As per Montgomery *et al.* (2012), we read the effects of the regression analyses using the following indices:

- R^2: The multiple squared correlations, called the coefficient of determination, is an index of the share of the variance of the dependent variable, explained by the independent variables that are in the equation. It thus gives the share of variance explained by the independent variable. The nearer the R^2 value towards 1, the better the model fits.

- β: Beta, this standardized coefficient makes it possible to compare the contribution of each variable since it is the regression coefficient reduced to a standard scale (between -1 and 1). The higher the Beta value (β) for independent variables, the higher the user's intention towards adopting the system.
- The T-test (*t*): its value must be greater than 1.96 to be significant, in absolute value *p* with a level of significance of 0.05.

5.4.5.1 Results Following the Linear Regression Analysis

To investigate further, a linear regression was done to observe the relationships between the independent variables and the dependent variable the result summary is shown in Table 5.43. The detailed SPSS result is in annexed (see Appendix B) – Results of Regression Analysis.

Table 5.43

Result of Regression analysis

Independent Variables	Dependent Variable	R^2	β	*t*	*p*
PE	**BI**	0.235	0.485	12.527	P < 0.001
EE	**BI**	0.242	0.492	12.767	P < 0.001
SI	**BI**	0.128	0.358	8.671	P < 0.001
FC	**BI**	0.157	0.396	9.737	P < 0.001
AN	**BI**	0.018	-0.135	-3.077	P < 0.01
AT	**BI**	0.221	0.470	12.021	P < 0.001

Research Hypothesis 1 (H1)

H1: There is a positive relationship between performance expectancy and healthcare provider's behavioural intention to adopt the E-health system.

A linear regression was conducted to examine the predictive relationship between the factor "Performance Expectancy" and healthcare provider's Behavioural Intention to adopt the e-health system. In this analysis, the predictor variable corresponded to "Performance Expectancy" and the criterion variable corresponded to "Behavioural Intention". The results of the overall linear regression analysis shown in Table 5.43 is highly significant ($p < 0.001$), indicating that the relationship between the independent variable "Performance Expectancy" and the dependent variable "Behavioural Intention" to adopt the e-health system is positive and significant ($t = 12.527 > 1.96$). The R^2 value of 0.235 indicates a direct positive outcome and effect of the factor "Performance Expectancy" on the construct "Behavioural Intention". The R^2 value suggests that approximately twenty-four percent (24%) of the variance in the factor "Behavioural Intention" toward adopting the e-health system can be explained by the factor "Performance Expectancy". The Beta value ($\beta = 0.485$) is positive which means that "Performance Expectancy", is directly proportional towards "Behavioural Intention". Thus, the H1 hypothesis is accepted. Like the UTAUT model of Venkatesh *et al.* (2003), the variable "Performance Expectancy" remains one of the most significant predictive variables of our model. Our results are in accordance with those from previous research (Nadlifatin *et al.,* 2019; Osifeko *et al.,* 2019; Venkatesh *et al.,* 2003), which showed that "Performance Expectancy" is a good predictor of "Behavioural Intention". Our results suggest that the stronger the performance expectancy of the e-health system among the healthcare providers, the stronger their behavioural intention to adopt it. However, the prediction remains relatively weak explaining only twenty-four percent (24%) of the "Behavioural Intention" which is not in line with the work of Venkatesh *et al.* (2003).

Research Hypothesis 2 (H2)

H2: There is a positive relationship between effort expectancy and healthcare provider's behavioural intention to adopt the E-health system.

Following the linear regression analysis which was carried out to analyse the predictive positive association between healthcare provider's Effort Expectancy and Behavioural Intention to adopt the E-health system. The independent variable is "Effort Expectancy" and the dependent variable corresponded to "Behavioural Intention". The result obtained as shown in Table 5.43, is highly significant ($p < 0.001$), the relationship between the factor "Effort Expectancy" and "Behavioural Intention" is positive and significant ($t = 12.768 > 1.96$). The Beta ($\beta = 0.492$) and the R^2 of 0.242 indicate a direct positive effect of the factor "Effort Expectancy" on the scale "Behavioural Intention" to adopt the e-health system. The R^2 of 0.242 value suggests that approximately twenty-four percent (24%) of the variance in "Behavioural Intention" toward adopting the e-health system can be explained by the factor "Effort Expectancy". The H2 hypothesis is accepted. Our results are in accordance with those from previous research (Jawadi, 2014; Osifeko *et al.*, 2019; Venkatesh *et al.*, 2003), which showed that the factor "Effort Expectancy" is a good predictor of "Behavioural Intention" for system adoption.

However, the prediction remains relatively weak as the model explains only twenty-four percent (24%) of the Behavioural Intention. Nevertheless, like the UTAUT model, the "Effort Expectancy" variable remains one of the most significant predictive variables of our model. Our results suggest that the stronger the factor effort expectancy to adopt e-health among healthcare providers, the stronger their behavioural intention to adopt it. Results corroborate with those presented in the work of Venkatesh *et al.* (2003).

Research Hypothesis 3 (H3)

H3: There is a positive relationship between social influence and healthcare provider's behavioural intention to adopt the E-health system.

Linear regression was conducted to analyse the predictive positive association between the perceived social influence and the behavioural intention of the healthcare provider to adopt the e-health system. The predictor variable corresponded to "Social Influence" in this investigation and the criterion variable corresponded to the "Behavioural Intention".

The result obtained as appeared in Table 5.43, is highly significant ($p < 0.001$), the relationship between the factor "Social Influence" and the factor "Behavioural Intention" is positive and significant ($t = 8.671$, which is greater than the threshold 1.96). The R^2 value of 0.128 indicates a direct positive of the factor "Social Influence" on the "Behavioural Intention" construct. The R^2 value 0.128 suggests that around thirteen percent (13%) of the variance in "Behavioural Intention" toward adopting the e-health system can be explained by the factor of "Social Influence". The Beta value ($\beta = 0.358$) is positive which means that the factor "Social Influence", is directly proportional towards the healthcare provider's Behavioural Intention to adopt the e-health system. Therefore, the H3 hypothesis is accepted. The results are in accordance with those from previous research such as Davis *et al.* (1989); Venkatesh *et al.* (2003); Shih and Fang (2006); Tosuntaş *et al.* (2015); Jawadi, (2014); Osifeko *et al.* (2019). However, the prediction remains weak. The model explains only thirteen percent (13%) of the "Behavioural Intention". The factor "Social Influence" is thirteen percent (13%) of the shared explained variance in our model (although weak) it is a significant predictive variable. These results suggest that the more healthcare providers perceive encouragement from their social environment to adopt the system, the stronger their behavioural intention to do it.

<u>Research Hypothesis 4 (H4)</u>

H4. There is no relationship between facilitating conditions and healthcare provider's behavioural intention to adopt the E-health system.

To investigate the predictive association between facilitating conditions and the behavioural intention of healthcare providers for adopting an e-health system, a simple linear regression was performed. In this study, the predictor variable corresponded to facilitating conditions and the criterion variable is the behavioural intention to adopt the e-health system. Table 5.43 shows the model obtained is significant ($p < 0.001$), and the relationship between the variable "Facilitating Conditions" and the dependent variable "Behavioural Intention" is positive and significant ($t = 9.737 > 1.96$). Thus, the H4 hypothesis is rejected, the Beta ($\beta = 0.396$) is significant and the R^2 of 0.157 (16% of the variance explained) indicates a direct positive effect of the scale "Facilitating Conditions" on the factor "Behavioural Intention". Our results are in accordance with the research of Alsharif *et al. (*2013) and Attuquayefio and Addo (2014).

Unlike Venkatesh *et al. (*2003) who postulate that in the presence of the construct "Effort Expectancy", the "Facilitating Conditions" variable will have only a non-significant influence on "Behavioural Intention", explaining this by the fact that the construct of "Facilitating Conditions" is already largely captured by that of the factor "Effort

Expectancy". This implies as part of our study that the desire to embrace the e-health system is influenced by the user's perception of the existence of an organisational and technological infrastructure that supports them. Thus, the more the respondents believe in the existence of an organizational and technical infrastructure that supports the e-health system, the more their intention to adopt the e-health system will be high.

<u>Research Hypothesis 6 (H6)</u>

H6. There is no relationship between Anxiety and healthcare provider's behavioural intention to adopt the E-health system.

To analyse the predictive relationship between healthcare provider's Anxiety and behavioural intention to adopt the e-health system, a simple linear regression was carried out. The predictor component in this study corresponded to "Anxiety". The dependent component corresponded to "Behavioural Intention". Table 5.43 above shows the results of the Linear Regression for the relationship between the factor "Anxiety" over "Behavioural Intention". The model obtained is significant ($p < 0.01$), the relationship between the variable "Anxiety" and dependent variable "Behavioural Intention" is significant ($t = 3.077 > 1.96$). The Beta ($\beta = -0.135$) indicates a negative effect of the "Anxiety" factor on the "Behavioural Intention" to adopt the e-health system. The R^2 of 0.018 value explains two percent (2%) of the behavioural intention to adopt the e-health system. As the relationship between "Anxiety" and "Behavioural Intention" is statistically acceptable, we decided to accept hypothesis H6. Like the UTAUT model, the results suggest that the Anxiety of users for making use of a computer tool, in our case the e-health system, is not a determining factor in the "Behavioural Intention" to adopt the system. Our results corroborate with the results presented in the work of Venkatesh *et al.* (2003) and Venkatesh *et al.* (2012).

<u>Research Hypothesis 7 (H7)</u>

H7. There is no relationship between Attitude towards using technology and healthcare provider's behavioural intention to adopt the E-health system.

A linear regression was conducted to examine the predictive relationship between healthcare provider's attitude towards using technology and behavioural intention to adopt the e-health system. In this analysis, the predictor variable corresponded to "Attitude towards using technology" (AT) and the criterion variable corresponded to "Behavioural Intention" (BI). The results of the overall linear regression analysis shown in Table 5.43 is highly significant ($p < 0.001$), indicating that the relationship between "Attitude towards using technology" (AT) and "Behavioural Intention" to adopt the e-health system is positive and significant ($t = 12.021$ is greater than the threshold 1.96). The R^2 value 0.221 suggests that approximately twenty-two percent (22%) of the variance in "Behavioural Intention" toward adopting the e-health system can be explained by the factor "Attitude Towards Using Technology" (AT). The Beta value ($\beta = 0.470$) is positive which means that "Attitude Towards Using Technology" (AT), is directly proportional towards "Behavioural Intention". Thus, the H7 hypothesis is rejected.

Despite the presence of "Performance Expectancy" and "Effort Expectancy" variables, "Attitude Towards Using Technology" (AT) variable, is significantly predictive in our model which represents twenty-two percent (22%) of the share of explained variance, unlike the UTAUT model which postulates that "in the presence of the Performance Expectancy and Effort Expectancy variables, the Attitude towards using technology variable will have an insignificant influence on Behavioural Intention to use the system” (Venkatesh *et al.*, 2003). Our results corroborate with the results presented in the work of Thomas *et al.* (2013).

5.4.6 Summary of the Hypothesis Testing

Table 5.44

Summary of the hypothesis test

Hypothesis	Relationship	Decision
H1	Performance Expectancy → Behavioural Intention	Accepted
H2	Effort Expectancy → Behavioural Intention	Accepted
H3	Social Influence → Behavioural Intention	Accepted
H4	Facilitating Conditions → Behavioural Intention	Rejected
H6	Anxiety → Behavioural Intention	Accepted
H7	Attitude Towards Using Technology → Behavioural Intention	Rejected

By averaging the R^2 values from all the investigations, the R^2 0.20 value for Behavioural Intention has been determined and confirmed to be significant. In light of this, the overall concept of our results is in agreement with the original theory of UTAUT (Venkatesh *et al.*, 2003), however, it is still far from the Seventy percent (70%) expressed by the UTAUT model. This situation has been seen in previous studies such as Hsieh *et al.* (2017) and Zuiderwijk *et al.* (2015).

Regressions by moderator level were performed only on relationships that were significantly predictive at the end of the previous hypothesis tests, i.e., "Performance

Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions" and "Attitude Towards Using Technology" upon "Behavioural Intention" to adopt the e-health system. The results of the overall linear regression analysis shown in Table 5.45 is highly significant $p < 0.01$ for all the moderating socio-demographic variables on the relationship between the different independent variables on the dependent variable. Having a positive value for the Beta (β) and the R^2 for all the moderating variables, indicate a positive effect of the independent variables on the Behavioural Intention to adopt the e-health system.

Table 5.45

Result of Regression analysis by moderator level on Behavioural Intention

Relations	**β** / **R^2**	**Gender**		**Age**			**Site**		**Position**		
		Male	**Female**	**17-29**	**30-51**	**52-68**	**Wellkin**	**Darné**	**Doctor**	**Nurse**	**Others**
PE →BI	β	0.481***	0.490***	0.496***	0.474***	0.558***	0.510***	0.534***	0.530***	0.424***	0.421***
	R^2	0.232	0.24	0.246	0.224	0.312	0.26	0.285	0.281	0.18	0.177
EE →BI	β	0.499***	0.489***	0.446***	0.496***	0.494***	0.526***	0.478***	0.525***	0.440***	0.482***
	R^2	0.249	0.239	0.199	0.246	0.244	0.276	0.228	0.276	0.194	0.232
SI →BI	β	0.343***	0.371***	0.299**	0.392***	0.232**	0.346***	0.336***	0.244**	0.439***	0.421***
	R^2	0.117	0.137	0.089	0.154	0.054	0.12	0.113	0.059	0.192	0.177
FC →BI	β	0.409***	0.386***	0.321**	0.386***	0.477***	0.427***	0.353***	0.440***	0.291***	0.440***
	R^2	0.167	0.149	0.103	0.149	0.227	0.182	0.124	0.194	0.085	0.194
AT →BI	β	0.519***	0.432***	0.540***	0.437***	0.553***	0.487***	0.545***	0.626***	0.292***	0.413***
	R^2	0.27	0.187	0.291	0.191	0.306	0.237	0.297	0.392	0.085	0.17
	N	227	285	87	323	102	335	177	153	208	151

***$p < 0.01$; **$p < 0.001$

Note: PE = "Performance Expectancy"; EE = "Effort Expectancy"; SI = "Social Influence"; FC = "Facilitating Conditions"; AT = "Attitude Towards Using Technology"; BI = "Behavioural Intention"

5.5 Evaluation and Findings

The process of validating the theory has resulted in forward findings, which have constituted input from various perspectives, giving us the ability to understand and comment on the behavioural intention of the medical staff of Fortis Hospital Mauritius, to adopt an e-health system. The findings of the longitudinal analysis, focused on the participation of 512 healthcare providers, show the significance of such variables in describing their intentions in their everyday routine to adopt an e-health system as part of primary care. The research study had a quantitative approach, evaluating various variables adopted from the UTAUT model by Venkatesh *et al.* (2003). Based on the UTAUT framework the independent variables considered in this research are "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Self-Efficacy", "Anxiety", and "Attitude Towards Using Technology". Furthermore, "Behavioural Intention" is used to explain actual adoption as an explanatory variable. It has been determined and validated that the R^2 0.20 value for Behavioural Intention is significant by averaging the R^2 values across all the results. Due to this, the main concept of our findings is coherent with the original theory of UTAUT (Venkatesh *et al.*, 2003), but it is still far from the 70 percent indicated by the UTAUT model. The following sections present the evaluation of the findings regarding the adoption of an e-health system. The different hypotheses used in the study are discussed below according to the relevant variables of the UTAUT theory.

5.5.1 Relationship between Performance Expectancy and Behavioural Intention

The relevance of hypothesis H1 illustrates its level of conformity with the definition from Venkatesh *et al.* (2003), which explains that “Performance Expectancy” is the degree to which users believe that the use of technology (e-health system in our case) could help them increase their job performance (Nadlifatin *et al.,* 2019; Osifeko *et al.,* 2019). It is related to our research question Q1. To measure the "Performance Expectancy" construct, four questionnaire statements were initially adopted from the UTAUT model, however following a pilot study one statement was removed from the final questionnaire. Thus, this construct was measured using three questionnaire statements. Several studies have supported this endeavour such as Al-Qeisi *et al.* (2015); Zuiderwijk *et al.* (2015) and Seethamraju *et al.* (2018).

A positive and significant result was revealed by the statistical analysis of this hypothesis (β=0.485, t = 12.527, $p < 0.001$), indicating that in general, the participants of the survey have favourable perceptions of the e-health system’s usefulness and impact on productivity. The results of our work exhibit that the factor "Performance Expectancy" exerts a significant influence on the explanatory variable "Behavioural Intention" to adopt the e-health system. The observations are in accordance with those from previous research (Davis *et al.,* 1989; Hoque & Sorwar, 2017; Kristiawan & Harisno, 2016; Li *et al.,* 2018; Nadlifatin *et al.,* 2019; Osifeko *et al.,* 2019; Shih & Fang, 2006; Tosuntaş *et al.,* 2015;

Venkatesh & Davis, 2000; Venkatesh *et al.,* 2003), which showed that the factor "Performance Expectancy" is a good predictor of Behavioural Intention to adopt.

Therefore, we accepted the proposed hypothesis H1 and acknowledged that "Performance Expectancy" is an important factor in the healthcare providers' behavioural intention to adopt an e-health systems. These findings showed that the greater the performance expectancy of the e-health system's among healthcare providers, the greater their behavioural intention to adopt the e-health system. Hence based on our results and answering our research question Q1, we can state that there is a positive relationship between the factor "Performance Expectancy" and Fortis hospitals' healthcare providers' Behavioural Intention to adopt an e-health system.

According to Venkatesh *et al.* (2003), "Performance Expectancy" is the strongest predictor of "Behavioural Intention" to adopt technology, however, in our study the factor "Performance Expectancy" is the second highest aspect, after "Effort Expectancy" that influence the "Behavioural Intention". The dominance of "Effort Expectancy" over "Performance Expectancy" is in accordance with prior research such as Vermaut 2016 and Germonpré *et al.,* 2019. The research findings of Anandarajan *et al.* (2000) also support the view that effort expectancy is more significant than performance expectancy in Africa due to greater social-cultural influence on the continent.

The coefficient of determination (R^2), is an index of the percentage of the variance of the dependent variable, explained by the independent variables. According to the suggestions of Hair *et al.* (2010), the R^2 values of 0.25, 0.50 and 0.75 respectively represent the weak, medium and strong explanatory power. The result we obtained is on the weak side (R^2 = 0.235), which is still far from the 70 percent expressed by the UTAUT model

(Venkatesh *et al.*, 2003), however, as the result of the R^2 value (0.235) is positive, it is clear that there is substantial impact of the factor "Performance Expectancy" on the factor "Behavioural Intention" (Hsieh *et al.,* 2017; Zuiderwijk *et al.,* 2015).

According to Venkatesh *et al.* (2003), "Performance Expectancy" is a determinant factor of behavioural intention, and the frequency of the relationship is moderated by "Gender" and "Age", rendering it more relevant for men and younger employees. Our results show that age and gender are moderators as their standard coefficient is significant ($p < 0.01$) for behavioural intention with performance expectancy, however, our results opposed to the observations of Venkatesh *et al.* (2003); our results show that the effect for male (β=0.481, R^2 = 0.232) and female (β=0.490, R^2 = 0.24) is more-or-less same, and older people between 52 and 68 years of age (β=0.558, R^2 = 0.312) constitute a more demanding category in terms of the performance expectancy of the e-health system comparing to younger employees of between 17 and 29 years old (β=0.496, R^2 = 0.246). This situation has been noticed in the research of Magsamen-Conrad *et al.* (2015), and Nadlifatin *et al.* (2019).

5.5.2 Relationship between Effort Expectancy and Behavioural Intention

The nature of hypothesis H2 illustrates its degree of consistency with the Effort Expectancy construct, which is defined according to Venkatesh *et al.* (2003) as “the level of ease connected with the use of the system”. "Effort Expectancy" is used in our situation to assess the expectations of the ease of use of the e-health system, as well as the ease of understanding how to learn these systems. This hypothesis is linked with the research question Q2. In the questionnaire, this hypothesis was answered by four questions that considered how Fortis Hospitals (Mauritius) healthcare providers viewed the ease of use of the e-health system, how much effort they considered appropriate to complete a transaction through the e-health system, thereby determining if the e-health system was structured straightforwardly and was not difficult to use.

To analyse the predictive positive correlation between "Effort Expectancy" and "Behavioural Intention" of the healthcare provider to adopt the e-health system, a linear regression analysis was conducted. The statistical study of the hypothesis found a positive and significant finding, where (β=0.492, $t = 12.768$, $p < 0.001$), which shows that the respondents, in general, have favourable views of e-health ease of use and tend to adopt a system which is easy to use and needs less effort and time than conventional methods to carry out their everyday transactions. The findings of our work indicate that "Effort Expectancy" has a substantial effect on the behavioural intention of adopting the e-health system. These observations are in harmony with those from previous research such as (Davis *et al.,* 1989; Jawadi, 2014; Osifeko *et al.,* 2019; Shih & Fang, 2006; Tosuntaş *et al.,* 2015; Venkatesh *et al.,* 2003), which showed that the factor "Effort Expectancy" is a strong predictor of behavioural intention to adopt. In the healthcare industry, Nuq and Aubert (2013); Latifi and Alizadeh (2016); Sepeame and Ajala (2013); Aggelidis and Chatzoglou (2009) have noted that effort expectancy is an important factor for healthcare providers to adopt the clinical informatics system.

Our results, therefore, accept the proposed hypothesis H2 and acknowledged that "Effort Expectancy" is an influential factor in the behavioural intention to adopt an e-health system. These findings indicate that the greater the anticipation of effort to accept e-health among healthcare providers, the greater their behavioural aim to embrace it. Therefore, based on our findings and in response to study question Q2, we can say that the factor

"Effort Expectancy" and the healthcare professionals' behavioural intention to adopt an e-health system at Fortis Hospitals Mauritius are positively correlated.

According to Venkatesh *et al.* (2003), "Performance Expectancy is the strongest predictor of behavioural intention to adopt technology", however in our study the highest factor affecting the behavioural intention to adopt the e-health system is Effort Expectancy. As explained previously, the dominance of effort expectancy over performance expectancy is in accordance with prior research such as Vermaut (2016); Germonpré *et al.* (2016); Anandarajan *et al.* (2000).

According to Venkatesh *et al.* (2003) gender and age moderate the impact of effort expectancy on behavioural intention, making it more relevant for women and older workers. A simple linear regression was performed with the moderators of age and gender both are significant at ($p < 0.01$) on the relationship between the factor "Effort Expectancy" on "Behavioural Intention". However, our results show that the moderator effect is more or less the same for males (β=0.499, R^2 = 0.249) and females (β=0.489, R^2 = 0.239), and middle age group 30-51(β=0.496, R^2 = 0.246) compared to older people 52-68 (β=0.494, R^2 = 0.244).

5.5.3 Relationship between Social Influence and Behavioural Intention

The extent to which an individual allows the opinions of others to influence their decisions to use the system is what Social Influence is all about. Social influence takes into account a person's perception of what other people think, the subjective culture of their reference group, specific interpersonal agreements with others, and the extent to which using an innovation is professed to improve one's image or status in their social environment (Venkatesh *et al.*, 2003; Yahaya *et al.*, 2022). The applicability of hypothesis

H3 adheres to our research question Q3. The level to which a person considers the opinions of others in making the decision to use an e-health system was described as the social influence construct. The four questionnaire items that made up this concept were examined.

A linear regression analysis was done to analyse the predictive positive association between "Social Influence" and "Behavioural Intention" of the healthcare provider to adopt the E-health system. A positive and significant result was acknowledged by the statistical analysis of the hypothesis ($\beta=0.358$, $t = 8.671$, $p < 0.001$). The findings of our work indicate that the factor "Social Influence" has a substantial effect on the dependent variable behavioural intention for adopting the e-health system, the more the healthcare providers perceive an encouragement from their social environment to adopt the e-health system, the stronger their behavioural intention to do it. The results are in accordance with previous research such as Davis *et al.* (1989); Venkatesh and Davis (2000); Venkatesh *et al.* (2003); Latifi and Alizadeh (2016); Sepeame and Ajala (2013) and corroborate with those presented in the healthcare area such as Jung and Loria (2010); Hoque and Bao (2015) and Chen *et al.* (2014). Results, therefore, accept the proposed hypothesis and confirm that social influence is a significant influential factor on the behavioural intention to adopt e-health system.

Our findings support the hypothesised hypothesis H3 and show that the factor "Social Influence" has an impact on behaviour and the decision to use an e-health system. These results suggest that healthcare professionals' behavioural intentions to adopt e-health are correlated with the social effect of such acceptance. We can thus conclude from our research, and in response to study question Q3, that there is a good correlation between the social influence component and the healthcare professionals' behavioural desire to adopt an e-health system at Fortis Hospitals Mauritius.

According to Venkatesh *et al.* (2003), the impact of "Social Influence" on the intention to use is moderated by age and gender and is more pronounced in older women, in the early stages of exposure to the new tool and when the use is compulsory (Bawack & Kamdjoug, 2018; Venkatesh *et al.*, 2003). A simple linear regression was performed with the moderators of age and gender and both are significant at ($p < 0.01$) on the relationship between "Social Influence" on "Behavioural Intention" to adopt e-health system. Our results show that the moderator effect is more significant for females (β=0.371, R^2 = 0.137) and males (β=0.343, R^2 = 0.117), which is in agreement with the observation of Venkatesh *et al.* (2003), however, the middle age group 30-51(β=0.392, R^2 = 0.154) are more significant compared to older people 52-68 (β=0.232, R^2 = 0.054).

5.5.4 Relationship between Facilitating Conditions and Behavioural Intention

The "Facilitating Condition" construct is “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh *et al.*, 2003). Venkatesh *et al.* (2003) stated that in the presence of the "Effort Expectancy" construct, the "Facilitating Conditions” construct will have a non-significant influence on the dependent variable "Behavioural Intention" (Williams *et al.*, 2015). This can be explained by the fact that the concept of "Facilitating Conditions" was already largely captured by that of "Effort Expectancy" (Bawack & Kamdjoug, 2018; Williams *et al.*, 2015). The availability of technological and organisational resources that are utilised to assist the implementation of the e-health system is referred to in this study as one of the enabling circumstances. It was evaluated by measuring the understanding of access to the information available, the expertise required, and the technical assistance required for the adoption of the e-health system through the proposed hypothesis H4 and the research question Q4. Four questionnaire statement items adopted from the UTAUT model were initially planned to measure the scale of the "Facilitating Conditions", however, following the pilot study, one statement item was removed from the final questionnaire. Thus, this construct was measured using three questionnaire statement items.

The results indicated that despite the presence of "Effort Expectancy", there was a significant, positive relationship between the factor "Facilitating Conditions" and the user's behavioural intention to adopt (β=0.396, $t = 9.737$, $p < 0.001$). Thus, the H4 hypothesis is rejected. As part of our analysis, confidence in the presence of a user-supporting technological and organizational framework is a deciding factor in the intention of adopting the e-health system. Therefore, the more the respondents agree that an operational and technological framework promoting the e-health system exists, the greater their goal would be to adopt the e-health system. Thus, in response to study question Q4, it would be feasible to state that there is a significant correlation between the factor "Facilitating Conditions" and healthcare providers' "Behavioural Intention" to accept an e-health system.

Few studies reported the outcome of the effect of facilitating conditions on behavioural intention. The findings in this study were consistent with that of Alsharif *et al.* (2013); Attuquayefio and Addo (2014) and Foon and Fah (2011), who reported that facilitating condition was significant in predicting behavioural intention.

5.5.5 Relationship between Self-Efficacy and Behavioural Intention

The hypothesis H5 developed for this construct is stated as follows: There is no relationship between self-efficacy and healthcare provider’s behavioural intention to adopt the E-health system. It is related to our research question Q5. Self-efficacy is defined as “an individual's belief about his or her capability to perform a behaviour that exercises influence over events” (Bandura, 1997). Bandura (1982, 2006) explained the concept of self-efficacy, by using the term "Efficacy Expectations", which represents a person's conviction that he can achieve the necessary behaviour to produce the desired result. Venkatesh and Davis (2000) have shown that "Self-Efficacy" and "Anxiety" are conceptually and empirically distinct from "Effort Expectancy". Thus, "Self-Efficacy" and "Anxiety" were seen as indirect determinants of "behavioural intention" (Venkatesh & Davis, 2000; Venkatesh *et al.*, 2003).

This construct was evaluated using four questionnaire items. However, the "Self-Efficacy" construct was eliminated following the factor analysis due to its low level of commonalities and low level of explained variance. This situation has been seen in previous studies by Moghavvemi *et al.* (2013) and Liu and Huang (2015). The effect of the contribution of "Self-Efficacy" in the intention to adopt a computer system has been demonstrated in several studies (Compeau *et al.*, 1999; Sardi *et al.*, 2017; Venkatesh & Davis, 2000). However, as indicated by Venkatesh & Bala, 2008, regulatory mechanisms such as perceived behavioural control can accentuate or, on the contrary, disturb the feeling of self-efficacy. The effect of the factor "Perceived Behavioural Control" on the intention to adopt information systems is also highlighted in the studies of Chau and Hu (2001) and Lin (2006).

As a consequence, our findings support the theorised hypothesis H5 and show that "Self-Efficacy" has no impact on a person's decision to use an e-health system. We can thus conclude from our research, and in response to study question Q5, that there is no relationship between the component "Self-Efficacy" and the "Behavioural Intention" of healthcare workers at Fortis Hospitals Mauritius to embrace an e-health system.

5.5.6 Relationship between Anxiety and Behavioural Intention

The hypothesis H6 tested for this scale is specified as follows, there is no relationship between Anxiety and the healthcare provider's behavioural intention to adopt the E-health system. It is linked with the research question Q6. Anxiety refers to the participant's self-reported hesitation when using the Information System (Venkatesh *et al.,* 2003). This construct has been measured using four items in the questionnaire. As mentioned previously anxiety was seen as an indirect determinant of behavioural intention (Venkatesh & Davis, 2000; Venkatesh *et al.,* 2003). After analysing the correlation matrix between the constructs of our model using Pearson's correlation coefficient, we found that the variable "Anxiety" is only significantly related to four variables: "Effort Expectancy", "Social Influence", "Facilitating Conditions" and "Behavioural Intention". These correlations are notably significant and are negative, that is, the variables involved, vary in the opposite direction. For example, when "Anxiety" increases, the variable "Effort Expectancy" decrease, in other words, the more the anxiety increases, the fewer respondents think that the adoption of the e-health system will be easy and vice versa. These results are in accordance with previous research by Latifi and Alizadeh (2016); Sepeame and Ajala (2013); and Venkatesh and Davis (2000).

A simple linear regression was conducted to assess the predictive association between the anxiety of the healthcare provider and behavioural intention to adopt the e-health system. The result indicates a negative effect of the Anxiety factor on the Behavioural Intention to adopt the e-health system (β = -0.135, t = -3.077). The findings suggest that healthcare providers' anxiety is not a determining factor in the behavioural intention for adopting the e-health system. Hypothesis H6 is therefore accepted. Results are therefore in line with previous research such as Venkatesh *et al.* (2003); Birth and Irvine (2009); Heale and Twycross (2015); Shih and Fang (2006); Tosuntaş *et al.* (2015). We may respond to research question Q6 by stating that there is no correlation between the factor "Anxiety" and the healthcare professionals' behavioural intention to adopt an e-health system at Fortis Hospitals Mauritius.

5.5.7 Relationship between Attitude Towards Using Technology and Behavioural Intention

Smith *et al.* (2015) define attitude "as an evaluative judgment, either favourable or unfavourable, towards performing an activity". In our scenario Attitude towards using technology refers to the positive or negative emotions of the healthcare providers regarding conducting an operation, such as using an e-health system to record their medical results. This construct is analysed through hypothesis H7 and research question Q7. Venkatesh *et al.* (2003) stated that in the presence of the 'Effort Expectancy,' the construct attitude towards using technology will have a non-significant influence on the behavioural intention to adopt the e-health system (Williams *et al.,* 2015). The construct was measured using four questionnaire items. The overall linear regression analysis results are highly significant (β=0.470, t = 12.021, $p < 0.001$), indicating that the relationship between attitude towards using technology and behavioural intention to adopt the e-health system is positive and significant. Despite the existence of "Effort Expectancy" factors, the attitude towards using technologies in our model is substantially predictive, describing twenty-two percent (22%) (R^2 = 0.221) of the explained variance share. Hence hypothesis H7 is rejected and in response to research question Q7, we can state that there is a positive relationship between the factor "Attitude Towards Using Technology" and the dependent variable "Behavioural Intention" of the healthcare professionals at Fortis Hospitals Mauritius to implement an e-health system.

The result is not in accordance with previous research of Venkatesh *et al.* (2003); Venkatesh and Davis (2000). However, researchers like King and He (2006) and Gohier (2004) stated: that attitude towards using technology did have a positive and significant impact on the behavioural intention. In the healthcare arena, our study result is in accordance with Araújo *et al.* (2000); Rahman (2017); Lin (2006); and García-Gómez *et al.* (2014).

5.6 Summary

This chapter revealed the results of our research at the level of individual factors affecting the adoption of the e-health system by the healthcare providers of Fortis Hospitals in Mauritius. To test the hypotheses of our research, a quantitative analysis was carried out based on measurable data collected from a randomly selected population. From the 800 distributed questionnaires, we received 512 validated returns, corresponding to sixty-four percent (64%) of the response rate. The questionnaire of our research study was based on the dimensions of the UTAUT acceptability model of Venkatesh *et al.* (2003), which was measured on a seven-point Likert scale (1 = Strongly disagree to 7 = Strongly agree). The questionnaires were coded and transcribed into the Statistical Package for Social Sciences (SPSS) Statistics v 26.0 for analysis.

In our study, there were seven independent variables and one dependent variable used to measure our proposed model based on the UTAUT theory. The independent variables were "Performance Expectancy" (PE); "Effort Expectancy" (EE); "Social Influence" (SI); "Facilitating Condition" (FC); "Self-Efficacy" (SE); "Anxiety" (AN) and "Attitude Towards Using Technology" (AT). The dependent variable was "Behavioural Intention" (BI) to adopt the e-health system. To measure the quality of the measurement instruments, we tested the reliability and validity of measurement scales. The scale reliability analysis was conducted using the alpha coefficient of Cronbach (Cronbach & Meehl, 1955) to calculate the internal accuracy and to show that the scale collection is consistently and reliably capturing the essence of the constructs model. The results of the analysis showed that the Cronbach's alpha value for all the construct was within the threshold value of 0.5 and 0.8, as suggested by Evrard *et al.* (2009) and thus the study instrument exhibits appropriate construct reliability.

Then, to check whether the different items of our constructs were giving a good representation of the phenomenon studied the validity test was carried out using the exploratory factor analysis through Principal Component Analysis (PCA) method. The exploratory factor analysis revealed that nearly all scales had a reasonable degree of validity except for the "Self-Efficacy" construct. Due to its low level of commonalities and low level of explained variance, the Self-Efficacy construct was take away from the study. Thus, the constructs maintained for the confirmatory approach were "Performance Expectancy"; "Effort Expectancy"; "Social Influence"; "Facilitating Condition";

"Anxiety"; "Attitude Towards Using Technology" and the contingent scale, "Behavioural Intention". To confirm the validity of our constructs, we analysed the convergent and discriminant validity using the Pearson correlation coefficient. After evaluating the matrix of correlation between our model's constructs, we observed that all the independent variables were highly significant at $p < 0.01$ with the dependent variable Behavioural Intention.

Our measurement scales being reliable and valid, we, therefore, decided to continue our study and perform the linear regression analysis to accept or reject our research hypotheses. Subsequently, linear regressions were carried out to highlight the relationships between the different independent variables and the dependent variable. According to Venkatesh *et al.* (2003) research method, the effects of the regression analysis were read using the following indices: the coefficient of determination (R^2), the beta (β) and the t-student test. Where R^2 gives us the share of variance explained by the independent variable; the beta allows us to compare the contribution of each variable and the t-student test allows us to analyse if the variables are significant.

As a result of the regression analysis five variables Performance Expectancy (β=0.485; T=12.527), Effort Expectancy (β=0.492; T=12.768), Social Influence (β=0.358; T=8.671), Facilitating Conditions (β=0.396; T=9.737) and Attitude Towards Using Technology (β=0.470; T=12.021), were found to be significant and positive determinants of Behavioural Intention to adopt the e-health system. The adoption of the e-health system by medical professionals, however, is not significantly impacted by the elements of anxiety and self-efficacy. We have the ability to accept or reject the study hypotheses thanks to the linear regression analysis. H1 hypothesis was accepted, which states that there is a positive correlation between healthcare providers' performance expectations and their behavioural intention to use the E-health system. Our H2 research hypothesis was also accepted stating that there is a positive correlation between Effort Expectancy and Behavioural Intention of the healthcare provider to adopt the E-health system. Social Influence also tended to have a significant impact on behavioural intention to adopt the e-health system, thus the H3 hypothesis was also accepted, but the impact was marginally significant. In the context of our research, the facilitating conditions, which are known to explicitly affect the use of the system in the initial UTAUT model without being filtered by the behavioural intention, have a major effect on the intention to adopt, hence, the H4 hypothesis was rejected which stated that there is no relationship between healthcare provider's facilitating conditions and behavioural intention to adopt the E-health system. The H6 hypothesis was accepted which state that there is no relationship between healthcare provider's Anxiety and behavioural intention to adopt the E-health system. The H7 hypothesis is rejected, Attitude Towards Using Technology is found in our model to be a significantly predictive determinant of behavioural intention. It is the third most significantly predictive determinant of our model after the Effort Expectancy and the Performance Expectancy, wherein the initial UTAUT model, should not have a significant influence because it is already operating through the Effort Expectancy construct.

Two factors which were not retained as significant determinants by Venkatesh *et al.* (2003), offer a different result in our research and turn out to be significant determinants, they are the Facilitating Conditions and Attitude towards using technology. Suggesting the importance given by the respondents in the belief of the existence of an organizational and technical structure, supporting the adoption of the e-health system, and by a positive attitude of these same respondents, towards this type of technology. Lastly, moderator-level regressions were only carried out on relationships that were strongly predictive after the previous hypothesis experiments. The effects of the overall linear regression study were significant for all the moderating socio-demographic variables on the relationship between the independent variables on the dependent variable.

The result of our study emerges that the two most significant factors determining the behavioural intention to adopt the e-health system are Performance Expectancy and Effort Expectancy, thus corroborating the work of (Venkatesh *et al.*, 2003). In contrast with earlier studies (Kijsanayotin *et al.*, 2009; Lin, 2006; Venkatesh *et al.*, 2003), in our study Effort Expectancy was found to be the strongest predictor of behavioural intention, although closely followed by performance expectancy. The fact that both constructs are found to be important predictors is consistent with prior findings (Chang *et al.*, 2008; Phichitchaisopa & Naenna, 2013). Our results show that factors such as "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions" and "Attitude Towards Using Technology" are factors that have positive and significant impact on the healthcare providers' Behavioural Intention to adopt an e-health system.

CHAPTER 6: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

6.1 Introduction

Digital innovations, according to the World Health Organization (2016), contribute to sustainable development goals, including access to universal health coverage. Over the last ten years, the pace of acceptance of new technology in the healthcare industry has increased, resulting in substantial improvement (Karamagi *et al.*, 2022; Rahman, 2017). As a result, ICT is being seen as a possible alternative to the problems of inadequate patient coverage and rising healthcare costs. E-health is among the most promising developments to evolve in recent years, and it has the potential to be very beneficial to both healthcare providers and patients in meeting sustainable growth goals (Hoque & Sorwar, 2017). However, there are many challenges to e-health adoption, including cultural, technical, personal, operational, and social problems that must be tackled (Karamagi *et al.*, 2022; Latifi & Alizadeh, 2016).

The aim of this study is to explore the key factors that influence the behavioural intention of healthcare professionals to adopt an e-health system in their daily routine. The research model has been adapted from the "Unified Theory on Acceptance and Use of Technology" (UTAUT) model of Venkatesh *et al.* (2003). A cross-sectional descriptive study is conducted from a randomly selected population of healthcare professionals of Fortis Hospitals in Mauritius. Our study procedure complies with the requirements of the Unicaf Research Ethics Committee (UREC). The research protocol presented had previously been approved by UREC before data collection. Quantitative research approach is the chosen method for this research, as it is usually the tool for researchers who examine phenomena from a positivist perspective (Zyphur & Pierides, 2019). The study has analysed the different variables such as "Performance Expectancy", "Effort Expectancy", "Social Influence" and "Facilitating Conditions", adopted from the UTAUT model of Venkatesh *et al.* (2003), which affect the e-health system adoption among the healthcare providers. Case study was the research design which aims to collect sufficient information on a person, an event or a social system (group of individuals or organization) to allow the researcher to understand how it functions or behaves in a real situation (Berg, 2000; Runfola *et al.*, 2017). We used a questionnaire as the selected research tool for data collection which was distributed to 800 employees of Fortis Hospital Mauritius following the sample size calculation, 512 participants responded favourably representing a response rate of sixty-four percent (64%). The questionnaire of our research study has been adapted to the dimensions of the UTAUT acceptability model of Venkatesh *et al.* (2003).

In the previous chapter we presented the results of our reliability and validity analysis, principal component factor analysis, and linear regression analysis. We were thus able to test our research hypotheses and discussed the results of our data analysis. The result of our study demonstrates that factors such as "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Condition" & "Attitude Towards Using Technology" had noteworthy effect on the intention to adopt e-health services for the healthcare professionals of Fortis Hospitals in Mauritius. This segment specifies an overview of the study's results and covered the advantages of our research from both an academic and a professional standpoint. Researchers made theoretical contributions, technique contributions, and practical contributions. Also mentioned are the study's weaknesses and ideas for additional investigation. Finally, the conclusion of the study is presented.

6.2 Implications

6.2.1 Theoretical Contribution and Practical Implications of the Research

Our research consisted of identifying and evaluating the factors determining the adoption in professional situations of the e-health system by healthcare providers at Fortis Hospitals in Mauritius. We relied on the UTAUT theory of Venkatesh *et al.* (2003) to design a research model, which was tested via a questionnaire survey with the participation of 512 individuals. This study makes significant theoretical additions to the corpus of knowledge about the use of information technology and e-health studies. According to the knowledge of the researcher, the UTAUT model is being used for the first time in the Mauritian context to assess and examine the factors influencing healthcare providers' intentions to adopt an e-health system, which is particularly significant given the existing literature review on e-health that is concentrated in Mauritius.

In this investigation, all the UTAUT scales showed an adequate and satisfactory level of concurrent and discriminant legitimacy, dependability, and fit files through all the exploration stages. The outcome of our research confirms the employment of the UTAUT model as a framework to assess the intention to adopt an e-health facilities in the setting of Mauritius. This research adds to the body of knowledge by analysing the feasibility and relevance of the UTAUT paradigm that was initially reputable and well-known in an occidental culture (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021), to understand a related behaviour in a non-western society. This examination portrays an investigation concerning the use of the UTAUT model to clarify healthcare providers' adoption of the e-health system. Given that, UTAUT initially evolved outside the medical care setting (Bawack & Kamdjoug, 2018; Razzak *et al.*, 2021), we based upon this structure to supplement earlier related exploration on technology adoption by investigating the pertinence of the UTAUT model in the e-health field.

Our study is focused on an updated UTAUT recommended by Venkatesh *et al.* (2003) as a fundamental theoretical model where the only dependent variable is the "Behavioural Intention" of the healthcare providers to adopt the e-health system and the independent variables measured in this research are "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Self-Efficacy", "Anxiety", and "Attitude Towards Using Technology" (Shih & Fang, 2006; Tosuntaş *et al.*, 2015; Venkatesh *et al.*, 2003). The stepwise linear regression of our study revealed that healthcare providers' behavioural intention to adopt the e-health at Fortis Mauritius Hospitals depends on "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions" and "Attitude Towards Using Technology" factors. This methodological contribution lies mainly in the fact of having transposed and partially validated an integrative model such as UTAUT and generated measurement tools specific to e-health deployed in a private hospital. Simple linear regression techniques have enabled us to measure, relationship by relationship, the predictive strength of the various factors involved.

Theoretically, our results partially validate the UTAUT model and confirm our work on adapting the framework of UTAUT to the context of e-health within the Mauritian context. Following the empirical investigations carried out, of the eight hypotheses formulated, five were accepted. The variables traditionally used in acceptance models, namely "Performance Expectancy" and "Effort Expectancy", remain the most significant predictive determinants in our model, like the initial UTAUT model (Davis *et al.*, 1989;

Hassani *et al.*, 2019; Hoque & Sorwar, 2017; Li *et al.*, 2018; Nadlifatin *et al.*, 2019; Osifeko *et al.*, 2019; Shih & Fang, 2006; Tosuntaş *et al.*, 2015). We thus confirm the fundamental importance of these two factors in explaining the intention to adopt an e-health system.

The results of our work show that the factor "Performance Expectancy" exerts significant influence on adoption intention. The results are in-line with those of previous studies (Davis *et al.*, 1989; Venkatesh and Davis, 2000; Venkatesh, 2003; Dishaw and Strong, 1999 and 2002, Yi *et al.*, 2006), which showed that the factor "Performance Expectancy" is a good predictor of technology adoption. The importance of this construct from the UTAUT model shows its level of consistency with the concept of Venkatesh *et al.* (2003), which describes that “Performance Expectancy is the degree to which users believe that the use of technology could help them increase their job performance”.

The significance of the "Performance Expectancy" variable in our study shows that the responded healthcare providers accept that the e-health system is useful for their daily activities. Healthcare providers believed that digitalisation of the health system is not only improving their efficiency at work but also making it faster and easier for them to complete their tasks which is in line with the research of Nuq and Aubert (2013); Latifi and Alizadeh (2016); Sepeame and Ajala (2013). As performance expectancy is closely similar to the perceived usefulness by Davis (1989) from the TAM model, our findings suggest that the perceived utility of the e-health system greatly influences its adoption. In this way, the e-health system should be promoted to be embraced by healthcare providers as it increases their performance by reducing mistakes and time essential for treatment (Bagozzi *et al.*, 1991; Rouidi *et al.*, 2022).

The linear regression analysis conducted in our study, uncovered a fascinating finding, affirming that "Effort Expectancy", which refers to the simplicity of use of the e-health system (Nadlifatin *et al.*, 2019; Rouidi *et al.*, 2022; Venkatesh *et al.*, 2003) is the most significant cause of technology adoption among the Fortis Hospitals Mauritius healthcare providers. This finding is not the same from the study of Devane *et al.* (2010); Holden and Karsh (2010); Venkatesh *et al.* (2003); Venkatesh and Davis, (2000); and Wilkins (2009); who acknowledged that "Performance Expectancy" is the strongest predictor of "Behavioural Intention" to adopt technology. Venkatesh and colleagues found that the factor "Performance Expectancy" in deciding the usage of technology was 50 per cent more influential than the factor "Effort Expectancy", however, their research examined the behaviours of administrators and workers in big companies, which could be distinct from healthcare environments in our context (Heale & Twycross, 2015; Yeo *et al.*, 2017). The research results of Anandarajan *et al.* (2000) support the opinion that due to the greater social-cultural impact on the African continent, the factor "Effort Expectancy" is a more important factor than "Performance Expectancy" for the adoption of technology. As "Effort Expectancy" has a direct similarity with the factor “Perceived Ease of Use" from the TAM by Davis (1989). Our results suggest that the greater the "perceived ease of use" of the e-health by healthcare providers, the greater their behavioural intention of adopting it. According to Ouadahi and Guérin (2007), perceived ease of use of a software application comprises that the product sought should not be difficult to use, should be easy to learn, easy to perform a task, and should be flexible for adaptation.

The findings of our study suggest that the factor "Social Influence" significantly affects healthcare providers' behavioural intentions to adopt the e-health system.

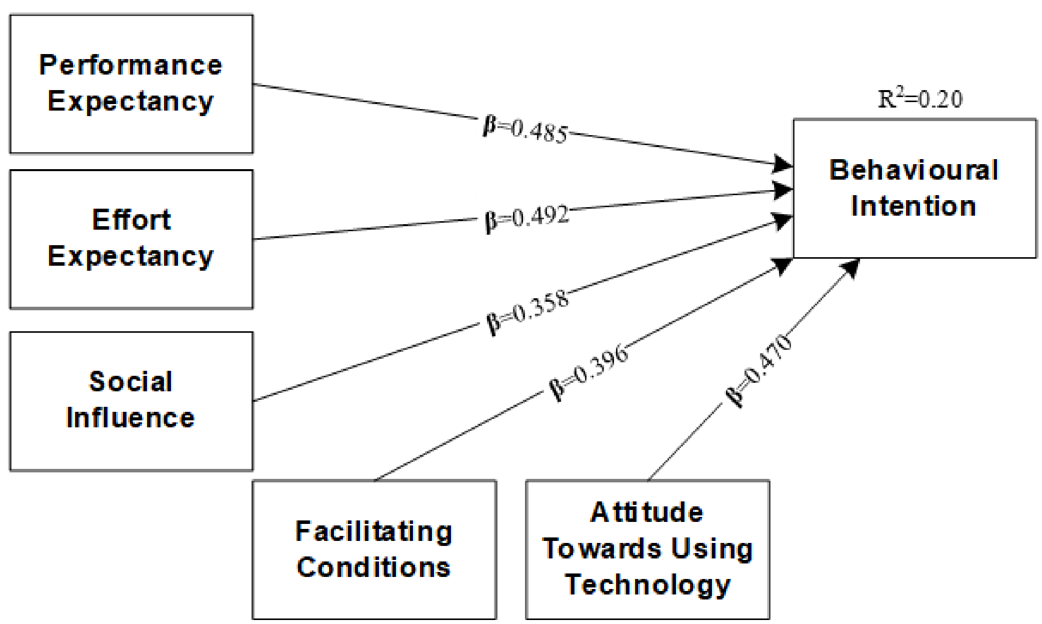
Accordingly, the more strongly healthcare providers feel social pressure to adopt the e-health system, the more social pressure they perceive. The results are in coherence with previous research such as Davis *et al.* (1989); Venkatesh and Davis (2000); Venkatesh *et al.* (2003); Latifi and Alizadeh (2016); Sepeame and Ajala (2013) and corroborate with those presented in the healthcare area such as Jung and Loria (2010); Hoque and Bao (2015) and Chen *et al.* (2014). In most studies on the adoption of technologies in the workplace, the influence of colleagues and the influence of the supervisor have been considered as "social influence" and they have shown that each of these constructs exert a significant influence on technology adoption. The significance of the implication of the e-health system shows that the healthcare providers attach a capital importance to the impetus of a policy of presence and activity of their leaders *et al.* before engaging in the adoption of the e-health system for professional purposes. Thus, as recommended by (Sepeame & Ajala, 2013) a better management of the social surrounding of users does promote its adoption.

The facilitating conditions, which in the initial UTAUT model are considered to directly influence the usage without being filtered by the behavioural intention to adopt, have in the context of our study, a significant influence (although relatively weak) on the "Behavioural Intention" to adopt (Nadlifatin *et al.*, 2019; Rouidi *et al.*, 2022). Venkatesh *et al.* (2003) reported that the factor "Facilitating Conditions" would have a non-significant effect on "Behavioural Intention" in the existence of the "Effort Expectancy" construct (Williams *et al.*, 2015). However, our study results indicate that despite the presence of the "Effort Expectancy" factor, there is still a significant, and positive relationship between the factor "Facilitating Conditions" and the user's "Behavioural Intention" to adopt the e-health system. Our study is in accordance with the research work of Singh and Shoura (2006); Alsharif *et al.* (2013); Attuquayefio and Addo (2014) and Foon and Fah (2011) who confirmed that "Facilitating Conditions" is an essential factor in explaining the adoption of technology in an enterprise. Facilitation conditions according to Singh and Shoura (2006) refer to “the organizational support, existence of tools and expertise needed to use the system, the degree to which the current system is consistent with existing process in place, and the provision of assistance in the event of system difficulties”. Our result is in line with the findings by Delice (2010) who indicate that inadequate facilitating conditions of the hardware, software, and internet connection causes frustration among users, which is counterproductive, and constitutes significant barriers to adopting the new technology. The significance of the construct facilitating conditions is explained simply by the fact that despite the goodwill of the healthcare providers to adopt the e-health system if there is no adequate technical infrastructure, or technical assistance and support, there can be no pretension to adopt the e-health system (Singh & Shoura, 2006).

Venkatesh *et al.* (2003), stated that "Self-Efficacy", "Anxiety" and "Attitude Toward Using Technology" constructs are theorised not to be direct determinants of intention to adopt technology. In terms of the factors "Self-Efficacy" and "Anxiety", our results are in line with the statement of Venkatesh *et al.* (2003). However, attitude toward using technology is found in our model to be a significant predictive determinant of intention to adopt the e-health system. It is found to be the third most significantly predictive determinant of our model after Effort Expectancy and Performance Expectancy, wherein the initial UTAUT model, should not have a significant influence because it is already operating through the Effort Expectancy construct. Our result corroborates with the studies of Araújo *et al.* (2000); Rahman (2017); Lin (2006); and García-Gómez *et al.* (2014). Our result is also in accordance with the study of Fishbein and Ajzen (1975), who stated that "an individual's behaviour is dictated by his intention to perform the behaviour, and intention is influenced jointly by attitude and the subjective norms". The Figure 6.1 below shows our empirical framework based on the findings of our study. The degree to which variables interact can be expressed by the standardised path coefficient (β). The explanatory strength of the model may be determined by the square multiple correlations (R^2) of endogenous latent variables.

Figure 6.1

The empirical framework following our study



As per Venkatesh *et al.* (2003), the UTAUT model can explain a variance of seventy percent (70%) for intention to adopt and fifty percent (50%) for actual usage of the system (Bawack & Kamdjoug, 2018; Nadlifatin *et al.*, 2019; Razzak *et al.*, 2021; Rouidi *et al.*, 2022). It is for this reason that Venkatesh *et al.* (2003) present the UTAUT model as the best model for explaining the user's intention to adopt an information system (Oechslein *et al.,* 2014). We find in this analysis that our model's explanatory capacity which is twenty percent (20%), dropped below the seventy (70%) indicated by Venkatesh *et al.* (2003). This dropped is explained mainly by the cultural and regional disparities as explained by Almaiah *et al.* (2016) who indicate that, the “UTAUT model is moderated by variations in culture and region”. Our research is conducted in a developing African country, while the UTAUT model is focused on data obtained from a developed Western context. The findings of this study indicate a need for more cross-cultural evaluations of the UTAUT model to strengthen the current knowledge base. Such studies should focus simultaneously on Western and non-Western countries.

According to the study of Ammenwerth (2019), the "Technology Acceptance Model" (TAM) of Davis (1989) and the "Unified Theory of Acceptance and Use of Technology" (UTAUT) of Venkatesh *et al.* (2003) are the two most commonly used models in the health informatics in the last decade to better understand why users adopt or reject a given technology. Almaiah *et al.* (2016) have used the UTAUT model to examine the intention to use a clinical decision support system among 335 doctors in 12 hospitals in Malaysia and found that the influential factors were "Performance Expectancy", "Effort Expectancy", "Self-efficiency", and "Social Influence". Maillet *et al.* (2015) used the UTAUT model to study the intention to use electronic patient records among 616 nurses from 4 hospitals in Thailand and reported that "Performance Expectancy" was the most influential factor in terms of actual use and that "Effort Expectancy" was the second highest one. Almaiah *et al.* (2016) conducted research using a model that incorporated both the UTAUT and the TAM to confirm the degree of acceptance of e-health applications among

German healthcare professionals, they found that both factors "Perceived Usefulness" (PU) and "Perceived Ease of Use" (PEOU) positively influenced the intention to use. Lin (2006) used TAM to understand the different factors that can influence users' intentions to participate in virtual communities for health, he argued that "Perceived Usefulness" and "Perceived Ease of Use" positively affect user’s behavioural intention. In 2012, Gagnon *et al.* led a survey to examine factors impacting the selection of ICT by health practitioners they concluded that "Perceived Usefulness" and "Perceived Ease of Use" of the TAM model are the two most persuasive elements in technology acceptance (Gagnon *et al.*, 2012). The two concepts taken from the TAM is consistent with the "Performance Expectancy" and "Effort Expectancy" of the UTAUT model (Gagnon *et al.*, 2012; Nadlifatin *et al.*, 2019; Rouidi *et al.*, 2022). The result of our study is in line with those studies stated that the two most significant factors determining the behavioural intention to adopt the e-health system are "Performance Expectancy" and "Effort Expectancy".

The practical implications of this analysis are that usefulness and easy-use applications, interoperability and connectivity with other information systems, convenient access to computers, educational facilities, built-in assistance and continuing IT support are crucial factors that affect the behavioural intention to adopt technologies. The study provides information to hospital management and policymakers, about e-health planning and how to boost adoption factors by creating good attitudes toward the e-health system. Policymakers can use these results to increase adoption and the progress of emerging technology programs. Results of our study were shared with the Fortis Hospitals (Mauritius) and discussed how they might select an e-health system to be more acceptable by the healthcare providers.

6.3 Recommendations for application

In practice, the results of our evaluative research contain information likely to be of interest to healthcare establishments embarking on a process of computerising their clinical processes. Indeed, the establishment of an electronic health record requires concerted and coordinated interventions in which the articulation of knowledge of acceptability and adaptability factors must be at the heart of winning strategies for the health system. Our results may prove to be relevant and interesting for healthcare establishments positioned in pre-adoption or post-adoption in the deployment of an e-health system.

The computerisation of the health system raises technological, organisational and cultural challenges (Konttila *et al.*, 2019). Its considerable influence on the relationship between the health professional and the adoption of the e-health system requires us to question the determinants of its success (Brown *et al.*, 2020). Even if a technology that supports these computerised systems in healthcare establishments has reached a stage of maturity, characterized by a high rate of penetration in other sectors of activity such as banking industries or finance, the fact remains that their diffusion in medical activity meets enormous obstacles and resistance from health professionals (Cilliers & Flowerday, 2013; Konttila *et al.*, 2019).

The results of our study, based on the UTAUT model, show that it is imperative for organisations implementing an e-health system to first think about an implementation strategy in which the usefulness of the transition to IT must be shared and understood at all levels of the organisation (Crutzen *et al.*, 2011), since the Performance Expectancy factor on the behavioural intention of the healthcare providers is a major determinant of the achievement of the adoption of e-health system (García-Gómez *et al.,* 2014). To appropriately understand the usefulness of the e-health system for the healthcare professional, it is necessary to know and integrate the complexity of clinical processes in all phases of the computerisation process (Magsamen-Conrad *et al.,* 2015). In the background, the analysis of clinical processes makes it possible, on the one hand, to better understand the complexity of the profession and the resulting user profile in the performance of business tasks (Hsieh *et al.,* 2017). On the other hand, our analysis provides a framework for expression and listening to end users, in which the analysis of expectations for the e-health system is an essential step to be considered (Anja *et al.*, 2014).

The findings of our work indicate that "Performance Expectancy" from the UTAUT model which has its root in the "Perceived Usefulness" construct of the TAM framework have a substantial effect on the purpose of e-health adoption. The importance of Perceived Usefulness indicates that healthcare professionals understand that the e-health system is valuable for their everyday practices. According to Davis (1989) the more useful the technology is perceived by the potential user, the more likely it is to adopt it. Perceived usefulness refers to "the degree to which the use of technology improves user performance and performance" (Davis, 1989). It is the overall perception of the performance and benefits that the user expects to obtain through the use of the technology, it also depends on the degree of an application's contribution to improving the performance of the user. According to Davis (1989), the term 'useful' means "the ability to use a product/service profitably and advantageously". Thusly, the e-health system ought to be elevated and awareness needs to be created (Anja *et al.,* 2014), so as the healthcare providers adopt it. Awareness is key to the advancement of e-health programs in an e-health implementation program. A greater understanding of the e-health system and its benefits contributes to an increased rate of e-health system acceptance and adoption. It is therefore essential to carry out extensive advertising campaigns by the projects team towards the end users to address any misunderstandings or concerns surrounding e-health programs and the benefits of their adoption.

According to Hamid *et al*. (2016) when users perceived usefulness is a determinant factor for technology adoption, it is important to take into account the needs of users in designing the system. Thus, confirmation of the healthcare providers' expectations is important. If the choice of the e-health system is dictated only by the governing organisation, then we must expect discrepancies between what the system offers and what real users expect (Anja *et al.,* 2014; Doolin, 2016), especially for healthcare providers who occupy a central place in the e-health system. The magnitude of the gaps between technological supply and the needs of healthcare business processes inexorably influences the adoption and diffusion curve of healthcare innovation (Pare *et al.,* 2014; Razzak *et al.,* 2021). Therefore, expectations must be circumscribed, aligned and confirmed while implementing an e-health system.

The intensity to which an individual expects that using a certain system won't be difficult or need extra work is known as their effort expectancy. This describes how simple a system is to use (Bawack & Kamdjoug, 2018; Razzak *et al.,* 2021). The findings of our study also show a substantial correlation between the behavioural intention of employing the e-health system and effort expectancy. This suggested that using the system would improve their behavioural intention if medical care professionals believed that engagement with the e-health system would be straightforward, intelligible, and simple to use (Cilliers

& Flowerday, 2013). Clodfelter (2010) also explains that the extent to which a human being perceives the system to be effortless to use has been found to significantly affect intention to use. Carayon and Xie (2011) demonstrate that improved technological exposure will improve the system's familiarity, and clinicians will find the system simple to use. Dharmarajan and Gangadharan (2013) also demonstrated that nurses with advanced skills in computer applications, users perceived the systems as easy to use; Seifert and Schelling (2015) claimed that computer skills affect "Perceived Ease of use" and "Perceived Usefulness"; skilful users will consider the system simple to use, more useful for them in terms of benefits, cost reductions, and enhancing the workflow. The above findings have administrative-level implications. Maximizing experience in dealing with e-health systems will increase healthcare providers' perception of their worthwhileness and effortlessness of use, which will ease the adoption (Dharmarajan & Gangadharan, 2013). This can be accomplished by providing proper and adequate training on the systems. Further, offering basic computer skills training sessions will be worthwhile since these skills, as demonstrated in the study of Carayon and Xie (2011) would enhance users' perceptions of simplicity of use.

When analysing the behaviour of individuals in the adoption of new technologies, one cannot overlook the social aspect and its important influence on the choice and confidence in new technologies (Davis *et al.*, 1989; Razzak *et al.*, 2021). This aspect is widely discussed and verified by theorists who are interested in the adoption behaviours of new technologies. Our research findings show that social influence has a significant impact on the behavioural intention of healthcare providers to adopt the e-health system, so the more healthcare providers perceive an incentive from their social environment to adopt the e-health system, the greater their behavioural intention to do so (Olise *et al.,* 2014). Social influence refers to the fact that the behaviour of individuals changes under the influence of others (Chen *et al.,* 2014; Zhang *et al.,* 2014). The impact of social influence depends on the characteristics of individuals, the relationships between them, distances from the network and the effect of time (Leung & Chen, 2019). According to Leung and Chen (2019), the influence of peers and managers in the workplace is seen as a social influence. The relevance of the e-health system's consequences indicates that healthcare providers give considerable value to the encouragement of their leaders and colleagues' strategies of involvement and activity before participating in the adoption of the e-health system for professional purposes (Zhang *et al.,* 2014). Therefore, as stated by Moxey *et al.* (2010) in an e-health system implementation, leadership participation at all levels of the design and implementation processes would help enhance the successful adoption of the e-health system. According to Hassani *et al.* (2019), to allow the adoption of an information system, it would be beneficial to ask line managers to open a parenthesis discussion with work colleagues to explain to them the advantages and benefits that will be brought by the adoption of the Information system. Thus, the colleagues will discuss with the individuals in question to push them to reason positively about the adoption of the information system, thus, this positive reasoning will allow the individuals to adopt the information system. Based on all of the previously cited theories that deal with social influence on technology adoption, it can be concluded that this aspect is crucial for understanding users' decision-making process (Zhang *et al.,* 2014). The role of the entourage, the reference group, leaders, friends, the media and not to mention social networks and forums of them have been able to acquire certain credibility and an important influence on the decisions of users to adopt a system (Hassani *et al.*, 2019).

Our research results show that "Facilitating Conditions" have a significant impact on the behavioural intention of healthcare providers to adopt the e-health system. According to Zhou (2011), one can consider that ‘technical assistance or support’ constitutes facilitation of great importance for the acceptance of new technologies. The quality of user support is important. Norman (1999) described technical assistance as “knowledgeable individuals aiding users of computer hardware and software products; this support can be provided through help desks, information centres, online, over the phone, via email, and/or at other facilities”. Technical assistance is one of the prominent variables in the adoption of e-applications, like the e-health system in our instance, and in the acceptance and use of technology in general, according to Williams *et al.* (2015) and Zhou (2011). According to Singh and Shoura (2006), the requirements for facilitating conditions apply to operational support, the accessibility of the resources and skills required to use the system, the degree to which the new system is compliant with the actual mechanism in operation, and the provision of assistance in the event of system issues. Delice (2010) indicate that “inadequate facilitating conditions of the hardware, software, and slow network connection cause frustration among users, which is counterproductive, and constitutes significant barriers to adopting the new technology”. The significance of the construct facilitating conditions is explained simply by the fact that despite the goodwill of the healthcare providers to adopt the e-health system if there is no adequate technical infrastructure, or technical assistance and support, there can be no pretension to adopt the e-health system (Hassani *et al.*, 2019).

According to Davis (1989), a person's views about the behaviour's consequences, compounded by their assessment of those consequences, will shape their attitude towards that conduct. When discussing attitude towards behaviour, Mceachan *et al.* (2011) defined it as "the extent to which a person has a positive or negative assessment of the respective behaviour". The findings of our study imply that the behaviour intention to take advantage the e-health system is substantially influenced by the factor "Attitude Towards Using Technology". Our research has shown that the perceptions that healthcare providers have over the adoption and usability of a new system markedly influences their attitude towards it. In a hospital, a system which is easy to learn, but, above all, which proves useful to the medical staff, simplifies their work and allows them to devote more time to the patients does have a better chance of winning attitude than a complex tool that hinders the execution of the processes in place (Czaja & Lee, 2002; Dickinson & Gregor, 2006; Min *et al.,* 2008). Attitude, or an individual's global emotional reaction to use a system, is found in four constructs and six models among the eight models which have been served as a reference in the development of UTAUT model; (a) the construct attitude toward behaviour was taken from the TRA, TPB, TAM and C-TAM-TPB models; (b) intrinsic motivation from the MM; (c) affect toward use from the MPCU and affect from SCT. All constructs related to attitude convey user's enjoyment, pleasure, and liking connected with the use of technology (Hassani *et al.,* 2019). Attitude was omitted from the UTAUT model because the authors believed that attitude would not have a straight or interactive influence on intention to use technology due to the strong relationships that exist between the factors "Performance Expectancy" and "Effort Expectancy" upon "Behavioural Intention" (Bawack & Kamdjoug, 2018; Razzak *et al.,* 2021). However, in our study, attitude towards using technology is significant and a predictor of behavioural intention, like the TRA, TPB, and MM models. Nadri *et al.* (2018), stated that users have positive attitudes toward using technology in professional environments. Anderson *et al.* (2006); Wang and Yang (2005) found that users who were provided with technology to generate their work were much more likely to possess a positive attitude than when provided with traditional materials such as paper. Our result posits that technology used in a hospital setting can increase healthcare providers motivation, promote higher levels of confidence, and allow for more behavioural intention to adopt.

6.4 Limitations and Recommendations for Future Research

Like any other research effort, this one also has its weaknesses. The study's first drawback is its cross-sectional design, in which data was gathered at a certain time. The time allotted for the inquiry was its biggest drawback. Numerous longitudinal studies conducted by UTAUT researchers, such as those by Alsharif *et al.* (2013), Attuquayefio and Addo (2014), and Venkatesh *et al.* (2003), allowed for the quantification of "Behavioural Intention" (BI). The results of the cross-sectional research might not be conclusive on cause-and-effect relationships. This is because such studies only provide a snapshot of a particular instant in time, without taking into account events that occur before or after the snapshot is obtained.

There are also inherent limitations of the UTAUT model. UTAUT focuses exclusively on individual perceptions of the external circumstances that lead to Behavioural Intention. This eliminates consideration of objective environmental factors that may influence Behavioural Intention. The UTAUT model is unable to define organisational adoption or assess the contribution of organisational initiatives to the success or failure of e-health functionality. Validating the complementarity of the analytical perspectives of the adoption phenomena would be achievable using complementary methodologies.

Our research study helped us to accomplish our research objective, which was to identify the determinant factors that affect the behavioural intention of healthcare professionals to adopt the e-health system as part of primary care in their daily routine. However, we believe that our study opens up interesting potential future research avenues for other researchers. It should be noted that the results of the studies conducted in this research can be used to support clinicians, organizations and decision-makers in choosing strategies for implementing an e-health system with more evidence-based. For reason of time constraints, we only surveyed staff from the Fortis Hospitals Mauritius, thus our results apply to this population. It would be interesting to test the research model on a larger population or populations of other hospitals in Mauritius and other developing countries, to increase the external validity of the results (Jimenez-Buedo & Miller, 2010; McDermott, 2011). Our study was carried out in a private hospital context, it would be interesting to find out the result of the same study in a public hospital, to compare the results with ours, and to see if, depending on the different cultures (Gold, 1982), the determinants of the behavioural intention to adopt an e-health system are the same or it changes. This viewpoint would also allow comparisons to be made that will provide useful evidence for the diffusion of the strategy and its generalisation in the e-health implementation.

Another potential future research avenue is to recruit a larger sample specifically targeting a broader variety of participants with different positions, ages and experiences using a purposive sampling method (Tongco, 2007). Purposive sampling is suggested to ensure there are enough participants representing the various demographic categories (Campbell *et al.*, 2020). The inclusion of a broader variety of job types, experiences and ages will allow the researcher to identify true variations or significant differences related to job type, experience and age as moderating variables. The application of this strategy directly impacts the researcher's ability to categorize at a deeper level and draw conclusions about themes and patterns related to the demographic moderating variables (Sharma & Jyoti, 2017). Using a purposive sampling method ensures that the sample population across locations and facility types is strongly represented (Campbell *et al.*, 2020). This allows the researcher the ability to categorize sub-levels such as location, job types, speciality, task type, and any other definable sub-levels.

Future research can duplicate our study by including moderators in the non-linear connections and comparing the results to the original UTAUT model (which includes moderators) in terms of coefficient of determination (R2) because moderators were not included in our analysis. Based on the aforementioned recommendation, the instrument can also be amended by researchers to include demographic questions about work categories, specialities and other related job types and technical descriptors to identify new structures for moderation. Vanneste *et al.* (2014) stated that organisational contexts can increase or decrease the variation in phenomena and result in relationships fluctuating from stronger to weaker, positive to negative, significant to non-significant. Researchers may adjust the instrument to gather relevant experience-related data and describe it in two ways, such as the length of time within the current entity and the usage and involvement of a range of innovations, such as the e-health system (Côté & Gagné, 2020). Experience, as a moderating variable, may indicate that technological change is more embraced by users with longevity in an enterprise, having a wider understanding of the company and experience using the systems. This is potentially linked to the ability to see and truly understand the effect on the alignment and the enterprise as a whole. UTAUT hypothesizes that "Performance Expectancy", "Effort Expectancy", "Social Influence", and "Facilitating Conditions" are the determinants of "Behavioural Intention"; and that "Gender", "Age", "Experience", and "Voluntariness of Use" have moderating effects on the acceptance of an Information System (Campbell *et al.,* 2020; Venkatesh *et al.,* 2003). Wang *et al.* (2009) also suggested that it is necessary to examine the potential moderating effects of user technology acceptance. The line of future research that we consider interesting, is to possibly integrate all the paradigms of the UTAUT model such as the moderating variables "Age", "Sex", "Experience", and "Context of Use", and then to see if the results of the study will be the same as ours or if the influence of the latter on the dependent variable "Behavioural Intention" will completely change the results.

Another suggestion for future research is to perform the same analysis using the latest UTAUT extension model from Venkatesh *et al.,* 2016. Due to its very recent publication, this model was not used in our submitted research report. The new UTAUT expansion model (Venkatesh *et al.,* 2016) directs researchers while contextually expanding the theoretical structure in the required application. Venkatesh *et al.* (2016) offer a deep discussion to direct the model's potential research extensions, showing how new conceptualisations and phenomena can be integrated within the established framework of a given analysis. This new conceptual extension approach encourages researchers to use the original UTAUT as the central foundational structure and offers the direction in which the concept is proposed to be expanded. Venkatesh *et al.* (2016) developed this model to address the issues around UTAUT cross-contextual application found in the literature. It is strongly advised that future research based on the UTAUT model apply the latest published model by Venkatesh *et al.* (2016).

In Management Information Systems (MIS) and Health Informatics, UTAUT & TAM have been widely used (Ammenwerth, 2019), and numerous improvements and modifications to these models have been proposed over the years (Shachak *et al.,* 2019). For example, this includes incorporating structures from other models and frameworks to fit particular applications such as the adoption of telemedicine, e-health and m-health technologies (Jewer, 2018; Rahman, 2017). Yet, these theories, particularly TAM, have also been widely criticised (Campbell *et al.,* 2020; Shachak *et al.,* 2019). One of TAM and UTAUT's major criticisms is that their contribution to the present knowledge base has hit a plateau (Shachak *et al.,* 2019). While the historical importance of these models to the progress of the adoption of information systems and implementation research is indisputable, thousands of studies have already been used and the findings are relatively consistent. The models explain a large portion of the variance in usage intention and that the two strongest predictors of behavioural intention to adopt a new technology are "Perceived Usefulness" and "Perceived Ease of Use" from TAM or their UTAUT equivalent, "Performance Expectancy" and "Effort Expectancy" (Rahman, 2017; Shih & Fang, 2006; Tosuntaş *et al.,* 2015). Additionally, to TAM and UTAUT, which concentrate on the expectations and intent of people, there are other theoretical methods that future researchers may use in Social Sciences, Information System Management and Health Informatics, which allow e-health acceptance, use and multiple aspects of the socio-technical system to be studied (Shachak *et al.,* 2019). Examples include the P3 Model of

Flack and Morris (2017), the "Information System Success Model" of Delone and Mclean (2004), and the theories of task, technology and organizational fit of Germonpré *et al.* (2016).

The UTAUT model does not explain organizational adoption and does not evaluate the role of organizational strategies in the success or failure of e-health functionality. Future research in the same vein could adopt a similar, integrative vision that could take into account the dimensions of Shih and Fang’s (2006) political and organizational model of Lupton (2017). These dimensions could give a complementary reading to that offered by our model of acceptability (Altamony & Gharaibeh, 2017). Complementary approaches would make it possible to validate the complementarity of the angles of analysis of the adoption phenomenon. It would be interesting if future research efforts could replicate this study, with an organizational and political dimension, with health establishments similar to our case study.

It would also be relevant to carry out a qualitative study using the theoretical framework of the transition from health to e-health to identify the indicators informing that the transition is going smoothly. This study should be conducted once the e-health system is implemented since to trigger a transition process, there must first be a change (Meleis, *et al.*, 2000). In addition, applying this mid-level theory to a specific situation will also help advance health informatics knowledge on the transition phenomenon. A similar study could be carried out when the e-health system is implemented across clinical settings to assess its actual adoption rate and better understand the factors associated with its actual usage (Tosuntaş *et al.*, 2015). Our study examined the behavioural intention of healthcare professionals of adopting an e-health system before implementation. To determine whether pre-implementation factors accurately predicted true behaviours, a post-implementation study on actual system use could be carried out (Wang *et al.*, 2009). Qualitative methods of data collection, such as interviews, observations or meetings with focus groups, could complement a post-implementation survey (Karahanna *et al.*, 1999). According to Begley (1996), the qualitative technique may be used in investigative studies with the goal of leading a more in-depth inquiry to improve an intense identification of the issues. The quantitative method is used in circumstances when something is known about a subject. In order to improve the findings of this thesis, it is recommended that a future report analyse the findings in greater detail. It is important to combine the conclusions of the current study with those from the prospective qualitative research. To eliminate preconceptions and reach perfection is the triangulation's primary goal (Torrance, 2012). The results of a qualitative investigation may be used to compare the findings of a quantitative study, and vice versa (Abdalla *et al.*, 2018). Participants in questionnaire surveys (quantitative research) may be interviewed to learn more about their responses (qualitative study). Cahill (1996) asserts that qualitative research may be utilised as initial research, before to a quantitative investigation, as well as following a quantitative study to assess the study's dependability.

Future examination is required through a qualitative study of Fortis Hospital Mauritius healthcare professionals to explore why some technology adoption factors are a higher priority and more vital than others, which in the current exploration is in contrast with existing literature. Future research should evaluate why, as per the Venkatesh *et al.* (2003) study, perceived "Effort Expectancy" is a more substantial predictor of behavioural intents to embrace technology among healthcare personnel at Fortis Hospital Mauritius than performance expectancy. Answers to this query may come from a future qualitative interview research. While qualitative research creates concepts that aid in understanding social processes, quantitative research offers measured responses to study questions (Abdalla *et al.,* 2018).

It should be highlighted that Venkatesh *et al.* (2003) used a longitudinal analysis perspective to research compulsory adoption technology, in which workers of businesses were regularly assessed in three phases; (1) for their behavioural intention to adopt the technology, (2) the degree of training (3) use of the adopted technology (Ammenwerth, 2019). About our study, the e-health system is mandatory to be used once it gets fully implemented. In order to determine the determining elements that influence the behavioural intention of healthcare professionals to embrace the e-health system, the UTAUT model developed in our study was examined at various points in time. Following research should investigate if these behavioural intentions to adopt technology adoption constructions predict actual usage of the e-health system now that the different types of technology adoption constructs have been established. To assess the causality of any of the relationships presented in the model, in particular the causal impact of the behavioural intention to adopt on actual usage, a longitudinal analysis would be required, which could not be checked in the present study as e-health system was during a pre-implementation phase. Several UTAUT studies such as Schaper and Pervan (2007); Venkatesh and Davis (2000); Venkatesh *et al.* (2003) were longitudinal studies, indicating that the data were gathered at separate points in time to assess behavioural intention and actual usage of the system to see the improvement in the dependent variables (Hamid *et al.,* 2016). As a potential research recommendation, a longitudinal analysis will offer a clearer understanding of the UTAUT's fundamental construct, as well as the effect of measures on behavioural intention and the actual usage of the system (Auerswald & Moshagen, 2019; Venkatesh *et al.,* 2003). Finding out how and whether the behavioural intention is converted into actual use should be the aim of such a study. As determined in the study by Hsieh *et al.* (2017), the link between technology acceptance characteristics that predict intention to adopt in this thesis and the actual behaviour in fresh research should be evaluated. According to their research, participant utilisation of the e-health system was strongly and favourably associated with their behavioural intents to embrace it.

By expanding the UTAUT model to consider additional factors, there are several prospects for additional research given the geographic span of this study. As the current study result was incongruent with some prior studies in that area, future research may investigate the effect of "Facilitating Conditions" on "Behavioural Intention". According to Venkatesh *et al.* (2003), the "Facilitating Conditions" factor will not significantly affect "Behavioural Intention" to embrace technology when the "Effort Expectancy" construct is present (Campbell *et al.,* 2020; Williams *et al.,* 2015). However, this study's findings demonstrate that the availability of technological and organisational resources utilised to facilitate the adoption of the e-health system has a beneficial impact on users' intentions to use the system. It would thus be beneficial for future study to solve that problem. The same study can be conducted again under post-Covid-19 conditions, and the findings can be compared.

6.5 Conclusions

Reforming the health service is not only a medical-related issue but also a development concern (Raymond *et al.,* 2015). Over the last ten years, the pace of acceptance of new technology in the healthcare industry has increased, resulting in a substantial transition (Abbasgholizadeh *et al.*, 2017; Laumer *et al.*, 2010; Rahman, 2017). Electronic Health (e-health) is attracting a lot of interest as a means to enhance procedures, exchange patient information, and improve patient outcomes. Both private and publicly funded health institutions are making substantial investments in the creation of electronic health systems because of their ability to increase the quality and effectiveness of patient care (Raymond *et al.*, 2015). However, for this potential to be realised, it requires strong user involvement which sometimes leads to non-use or under-use of the e-health system (Abbasgholizadeh *et al.*, 2017; Rahman, 2017). The principal objective of this research was to provide answers to the question of what are the determinant factors that affect the behavioural intention of the healthcare professionals to adopt the e-health system as part of the primary care in their daily routine. As stated by Gagnon *et al.* (2016), an in-depth analysis of the critical factors affecting physicians' adoption of an e-health system could lead to better design of outreach strategies that could optimise the impact of implementation projects, particularly about the reduction of the failure rate and better control of project costs.

Our research thesis has contributed to enriching the body of knowledge in the field of technology acceptance and adoption. We first started our study by presenting the impact of technology implementation in the field of healthcare and its impact in Mauritius. As our research is oriented towards technology acceptance, before presenting our selected theoretical framework for this research, namely the "Unified Theory of Acceptance and Use of Technology" (UTAUT) of Venkatesh *et al.* (2003), we have started with the presentation of the eight research models which have been served as a reference in the expansion of the UTAUT model.

Venkatesh *et al.* proposed the "Unified Theory of Acceptance and Use of Technology" (UTAUT) model in 2003 after analysing and synthesising multiple technology acceptance models to enhance the understanding of the features manipulating the adoption of Information and Communication Technology (Abdekhoda *et al.*, 2016; Campbell *et al.,* 2020). UTAUT is perceived by its researchers to be the paradigm that best accounts for the implementation and usage of technology since it puts together, consolidates, and refines previously established theories (Rogers, 1995; Williams *et al.,* 2015). As per Venkatesh *et al.* (2003) the eight studied models, explained between 17 percent to 53 percent of the variance of intention to use information technology, whereas UTAUT explained a variance of 70 percent for intention to use and 50 percent for the usage of the system (Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2012). It is for this reason that Venkatesh *et al.* (2003) present the UTAUT model as the best model for explaining the user's intention to use an information system (Bawack & Kamdjoug, 2018; Oechslein *et al.,* 2014).

UTAUT postulates that the actual usage of a technology is influenced by the behavioural intention to use the system, which is itself influenced by the factors, which are: "Performance Expectancy", "Effort Expectancy", "Social Influence" and "Facilitating Conditions" (Oechslein *et al.,* 2014; Williams *et al.,* 2015). In addition, the model incorporates moderating variables which vary the influence of the determining variables on the intention to use, these are "Gender", "Age", "Experience" and "Voluntariness of Use" (Bawack & Kamdjoug, 2018; Williams *et al.,* 2015). During their empirical research, Venkatesh *et al.* (2003) have used three other determinant variables which are "Self-Efficacy", "Anxiety" and "Attitude Towards Using Technology".

UTAUT model was chosen as the research paradigm for our research work because of its validity, the specificity of its constructs, and especially its intense usage for information technologies adoption and acceptance research. It seemed likely to answer the hypotheses emanating from the research questions which gave rise to the development of our first questionnaire. Our study had a quantitative research approach as it was to analyse the different variables such as "Performance Expectancy", "Effort Expectancy", and the different construct of the UTAUT model which affect the e-health system adoption among the healthcare providers. It was based on measurable data that has been obtained through questionnaires survey from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius as a case study. The questionnaire was adopted from the "Unified Theory on Acceptance and Use of Technology" (UTAUT) model created by Venkatesh *et al.* (2003).

We performed a pilot study in compliance with Malhotra *et al.* (2006) guidelines before distributing the questionnaire to the targeted population. The questionnaire was sent to 25 Fortis Hospital employees, along with a description of the questionnaire and its intent. Following their feedback and final validation by the Director of Human resources and amendments, the final questionnaire was sent to 800 randomly selected healthcare professionals of Fortis Hospitals in Mauritius. It was aired over a period of three months between 01 July 2020 and 02 October 2020. The final sample of respondents is made up of 512 individuals, which represents a response rate of sixty-four percent (64%), which is acceptable under the Churchill Jr (1979) paradigm. The questionnaires were then coded and transcribed into the Statistical Package for Social Sciences (SPSS) Statistics version 26.0 for analysis. The respondent participants were made up of 44% of men and 56% is made up of women. As for the breakdown of positions, 41% of individuals belong to the Nursing officer category, followed by 30% of individuals to the Consultant / Resident Doctor category and 29% to Others including Technicians / Pharmacy officers / Lab Assistants. Finally, the median value for age is 40 years (minimum 19, maximum 62), where 63%, of the respondents, were between 30-51 years old, 20% between 52-68 years old and 17% aged 17-29 years old.

A scale reliability analysis was conducted to show that the collection of the scales reliably and correctly captures the context of the model constructs. The internal stability was measured using the alpha Cronbach's coefficient. The results of the analysis have shown that all the alpha values of the studied instrument demonstrate appropriate construct reliability. The next step was to verify the validity of our data, so we used the Principal Component Analysis (PCA) method. We started our factor analysis by analysing the correlations between our variables, and to do so, the MSA test (Measure of Sampling Adequacy) was used which is also called the coefficient of the Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests (Tosuntaş *et al.,* 2015). Then, the next step consisted of extracting the factors, to determine the number of factors explaining the total variance of our sample on all our variables as recommended by Hair *et al.* (2010), we analysed the table of the Total Explained Variance. The individual items' commonalities were then analysed to demonstrate how well the model is working for each item. After this factor loading of scale items was examined. This is done by analysing the Matrix of Components, as well as the weights of the variables. The greater the weight of the variable, the more representative it is in the factor (Hair *et al.,* 2010). The scale validity steps showed that almost all the scales exhibit an acceptable level of validity. However, the Self-Efficacy construct was eliminated following the factor analysis due to its low level of commonalities and low level of explained variance. Thus, the retained constructs for the confirmatory approach were: "Performance Expectancy"; "Effort Expectancy"; "Social Influence"; "Facilitating Conditions"; "Anxiety"; "Attitude Towards Using Technology" and the dependent variable, "Behavioural Intention". After analysing the correlation matrix between the constructs of our model, we found that there're a strong correlation between the constructs and the convergent and discriminant validity were met. After that, the linear regression analysis was performed to accept or reject our research hypotheses.

As a consequence of the regression analysis, five variables were identified as major determinants of "Behavioural Intention" to adopt the e-health system, namely "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", and "Attitude Towards Using Technology". On the other hand, the factor anxiety had no significant effect on Behavioural Intention to adopt the e-health system. Thus, the H1 hypothesis was accepted, which stated that there is a positive relationship between "Performance Expectancy" and healthcare provider's behavioural intention to adopt the e-health system. The result corroborated with those from previous research such as Venkatesh *et al.* (2003); Tosuntaş *et al.* (2015); Kristiawan and Harisno (2016); Hoque and Sorwar (2017); Oechslein *et al.* (2014); Osifeko *et al.* (2019). The result indicates that the stronger the performance expectancy or perceived usefulness of the e-health system among healthcare providers, the stronger their behavioural intention to adopt it. The H2 hypothesis was also accepted, which stated that there is a positive relationship between

"Effort Expectancy" and healthcare provider's behavioural intention to adopt the e-health system. This result is in accordance with Venkatesh *et al.* (2003); Shih and Fang (2006); Tosuntaş *et al.* (2015); Jawadi, (2014); Osifeko *et al.* (2019). This result indicates that the greater the anticipation of effort or "Perceived Ease of Use" of e-health among healthcare providers, the greater their behavioural intention to embrace it. The H3 hypothesis was also accepted, which stated that there is a positive relationship between "Social Influence" and healthcare provider's behavioural intention to adopt the e-health system. The result is in accordance with respect to the research of Venkatesh *et al.* (2003); Latifi and Alizadeh (2016); Sepeame and Ajala (2013) and corroborate also with those presented in the health informatics such as Jung and Loria (2010); Hoque and Bao (2015) and Chen *et al.* (2014). These results suggest that the more healthcare providers perceive encouragement from their social environment to adopt the system, the stronger their behavioural intention to do it.

According to Venkatesh *et al.* (2003) in the presence of the "Effort Expectancy" construct, the "Facilitating Conditions" construct will have a non-significant influence on "Behavioural Intention", however in our case study, despite the existence of "Effort Expectancy", the findings revealed that there was a positive association between "Facilitating Conditions" and the user's behavioural intention to adopt the e-health system. Thus, the H4 hypothesis was rejected which stated that there is no relationship between "Facilitating Conditions" and healthcare provider's behavioural intention to adopt the e-health system. The result is in accordance with the study of Alsharif *et al.* (2013); Attuquayefio and Addo (2014) state that, the higher the perception of respondents who believe that technical and organisational services are available, the more likely they are to accept the e-health system. The H5 hypothesis was not tested during the regression analysis as the construct self-efficacy was already eliminated from the study during the factor analysis due to its low level of commonalities and low level of explained variance. The H6 hypothesis, which stated that there is no relationship between anxiety and healthcare provider's behavioural intention to adopt the e-health system was accepted. This result is in line with the research of Venkatesh *et al.* (2003). However, during Pearson's correlation coefficient analysis, we found that the variable Anxiety is significantly related to four variables: "Effort Expectancy", "Social Influence", "Facilitating Conditions" and "Behavioural Intention". These correlations are particularly significant and are negative, that is, the variables involved, are in the opposite direction. For example, when "Anxiety" increases, the other variables decrease, in other words, the more the anxiety increases, the less respondents think that the adoption of the e-health system will be easy and vice versa. Venkatesh *et al.* (2003) stated that in the presence of the "Effort Expectancy", the construct attitude towards using technology will have a non-substantial influence on the behavioural intention (Williams *et al.*, 2015). However, our finding is not in line with the statement of Venkatesh *et al.* (2003), as our H7 hypothesis is rejected which stated that there is no relationship between attitude towards using technology and healthcare provider's behavioural intention to adopt the e-health system.

The objective of the research project was to explore individual factors that predict the intention of the healthcare professionals to adopt the e-health system in their clinical activities. This objective was effectively addressed as our thesis has contributed to identifying the factors (technology acceptance variables) that predict adoption of e-health system among health professionals for the Fortis Hospital Mauritius as a case study. Another objective of the study was to contribute to the knowledge base in the area of technology acceptance in healthcare. This objective also was successfully addressed as this is the first exploration to utilise and apply the UTAUT model in the Mauritian context, to assess and examine the factors influencing the intentions of healthcare providers to accept and adopt an e-health system. Our research confirms and partially validates the UTAUT model as an indicator of the intention to adopt an e-health system. The result of our study is in line with the study of Venkatesh *et al.* (2003), who stated that the two most significant factors determining the behavioural intention to adopt a system are "Performance Expectancy" and "Effort Expectancy". The main differences between our study and the one of Venkatesh *et al.* (2003), the author of the UTAUT model, is that "Facilitating Conditions" and "Attitude Towards Using Technology" constructs which were not determinant factors for the behavioural intention in their study, have turn out to be significant and have a positive relationship with behavioural intention to adopt the new system in our study. Another difference is that according to the study of (Venkatesh *et al.*, 2003), "Performance Expectancy" is the strongest predictor of behavioural intention to adopt technology, however in our study, the highest factor affecting the behavioural intention to adopt the e-health system is "Effort Expectancy".

Another objective of the research was to describe some strategies to help organizations and decision-makers working in the health sector to facilitate the transition of their personnel from health to e-health. The results of our evaluative research contain information likely to be of interest to healthcare establishments embarking on a process of computerising their clinical processes. Our results are relevant and interesting for healthcare establishments positioned in pre-adoption or post-adoption in the deployment of an e-health system. As recommended by Crutzen *et al.* (2011), Performance Expectancy, which is equivalent to the construct of perceived usefulness from the TAM model, is a determinant factor in the behavioural intention to adopt an e-health system, it is important to think about an implementation strategy in which the usefulness of the transition to IT must be shared and understood at all levels as. According to Anja *et al.* (2014), it is essential to carry out extensive advertising campaigns to explain the benefits of its adoption and address any misunderstandings or concerns surrounding the e-health system. As far as the Effort Expectancy factor is concerned, Carayon and Xie (2011) stated that providing proper and adequate training on the systems and improved technological exposure will improve the system's familiarity, and clinicians will find the system easy to use. Our research findings show that social influence has a significant impact on the behavioural intention of healthcare providers to adopt the e-health system, so the more healthcare providers perceive an incentive from their social environment to adopt the e-health system, the greater their behavioural intention to do so (Olise *et al.,* 2014). According to Hassani *et al.* (2019), to allow the adoption of an information system, it would be beneficial to ask line managers to open a parenthesis discussion with work colleagues to explain to them the advantages and benefits that will be brought by the adoption of the Information system as according to Dečman (2015), the influence of peers and managers in the workplace is seen as a social influence. Our research results also show that Facilitating Conditions has a significant impact on the behavioural intention of healthcare providers to adopt the e-health system. The significance of this construct is explained that if there is no adequate technical infrastructure or technical support, there can be no pretension to adopt the e-health system (Singh & Shoura, 2006). The success of the implementation of an e-health system strongly depends on the acceptability factors associated with the characteristics of the technology and also on the organizational and functional structure of the healthcare organization. This study could provide food for thought to stakeholders interested in the analysis and implementation of IT in healthcare organizations in general. We may draw the conclusion that it is strongly advised that the new ICT systems in healthcare be simple to use, pertinent to the work architecture, have enough support for technical issues, solid functioning infrastructure should be offered and management involvement is crucial. At the end of our study, we identified five factors that significantly influence the behavioural intention to adopt an e-health system which is: (1) "Performance Expectancy"; (2) "Effort Expectancy"; (3) "Social Influence"; (4) "Facilitating Conditions"; and (5) "Attitude Towards Using Technology".

Like all global crises in human history, the COVID-19 pandemic is having an unprecedented effect on people's health and causing economic disruptions in several countries. However, this new situation is favouring the transition to digital solutions. Innovative approaches to providing high-quality patient care and controlling the spread of the disease have become increasingly important. Medical software applications, for example, could provide useful suggestions on health-related information to doctors and thus can contribute to improving the quality of life. Building rapid data integration and analytical platforms for clinical decision making can help synthesize fragmented data into comprehensive bias-free analysis, providing fast, on-demand insightful solutions which are not possible manually. Developing such clinical decision support systems can help transform offline, static, data-driven guidelines (which are evolving almost daily) into interactive, online up-to-date algorithms for rapid execution. Placing patient demographics and reports into the systems can help generate point-of-care decision-making tools. These software analytics can be used to improve healthcare response in terms of epidemic surveillance, geospatial analysis, cluster outbreak reporting and development of accurate therapeutic algorithms in response to the global pandemic challenge. The medical community is going to undergo significant structural changes that will alter our workflow and communication channels, with e-health emerging as one of the most feasible alternatives for ensuring the safety of healthcare workers and patients. Thus, patients would be able to receive efficient and safe medical care if healthcare organisations invest in e-health early enough. Our research will thus contribute to being relevant and interesting for healthcare establishments positioned in the deployment of an e-health system to better manage the adoption factors of the users. Our research can be used to support clinicians, organizations and decision-makers in choosing strategies for implementing an e-health system with more evidence-based.

Finally, we can say that we were able to achieve our research objectives, by identifying the determinants factors affecting the behavioural intention to adopt an e-health system. The results of this study have enabled us to make contributions in terms of academic research and also to formulate some recommendations for certain stakeholders. The findings of our study include information that will be useful to healthcare organisations that are in the process of computerising their clinical procedures, whether they are in the pre-adoption or post-adoption stages. Indeed, the creation of an e-health record necessitates concerted and organised interventions, with the specificity of acceptability factors at the heart of winning healthcare strategies. The study has brought a better understanding of critical factors that influence the adoption of e-health and would impact developmental strategies to reduce the failure rate of e-health system implementations. To our knowledge, our research is the first of its kind conducted within a private hospital in Mauritius using the UTAUT model. Like all research, ours has some limitations, however, we believe that this is by no means a way to affect the validity of our study, but it rather opens up avenues for future research for other researchers.

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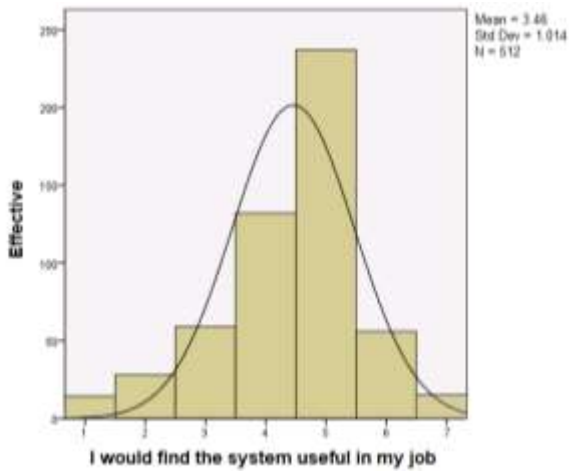
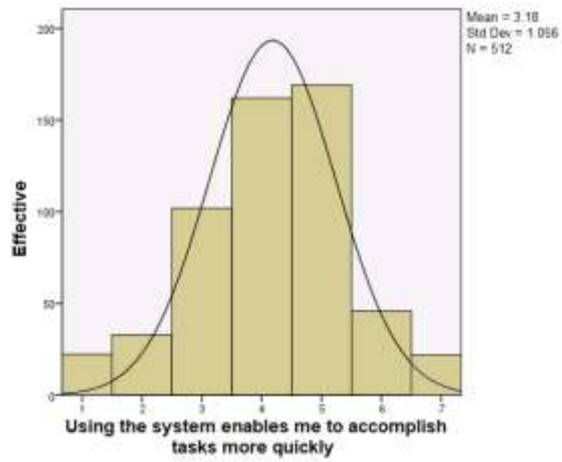
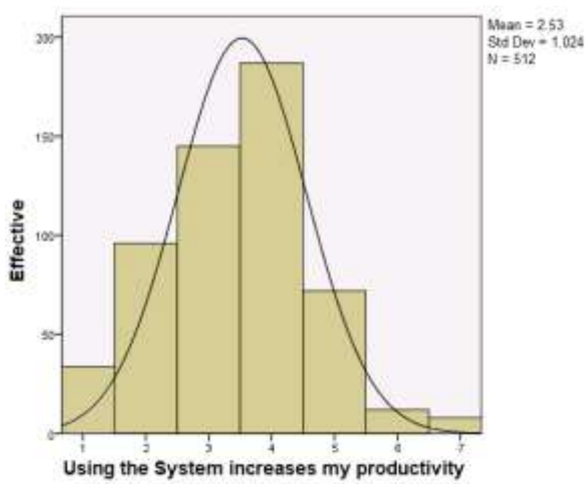
APPENDICES

Appendix A: Distribution of Items

Distribution of Items for construct Performance Expectancy







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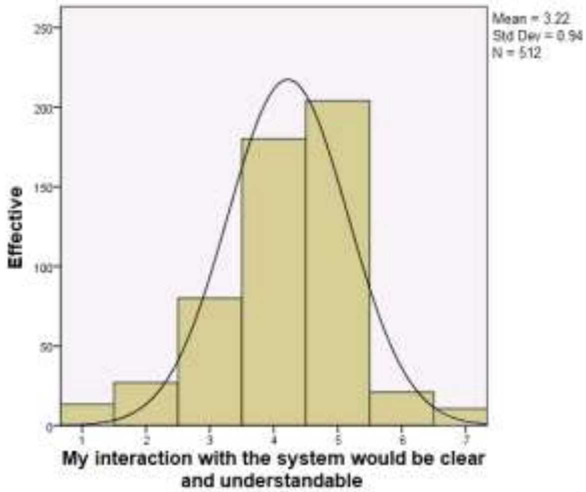
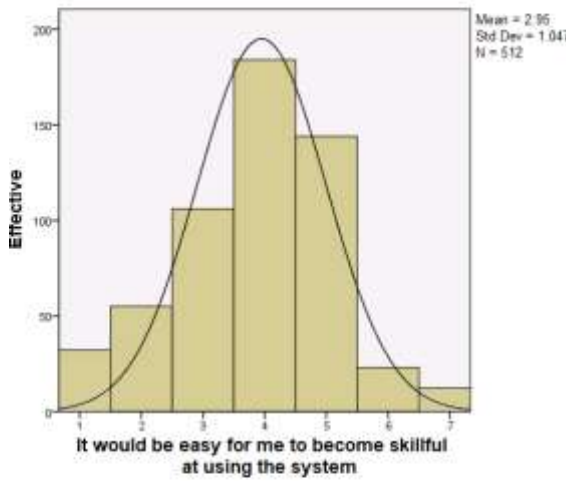
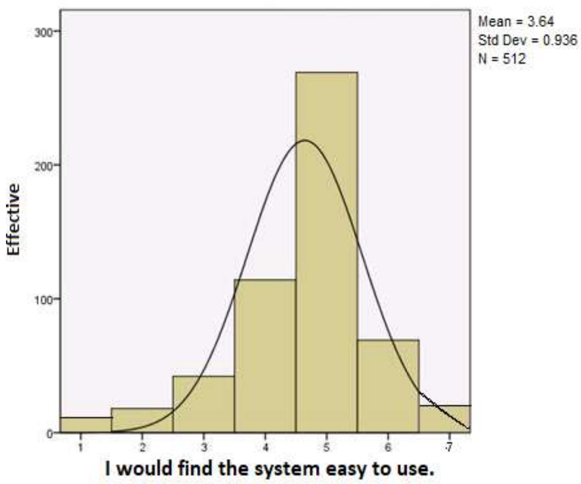
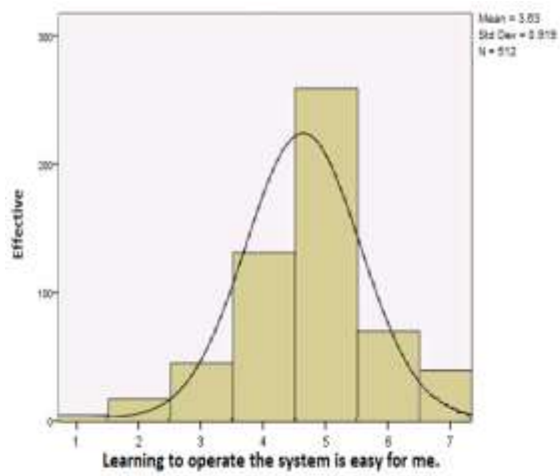
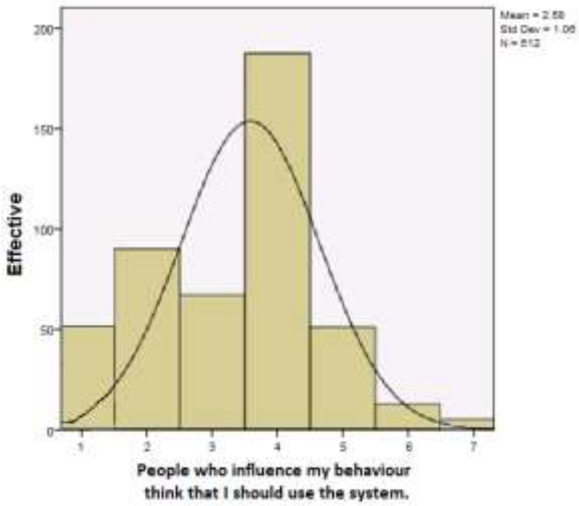


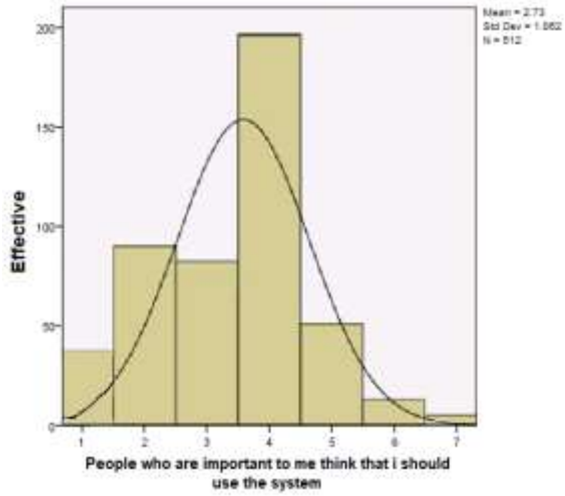


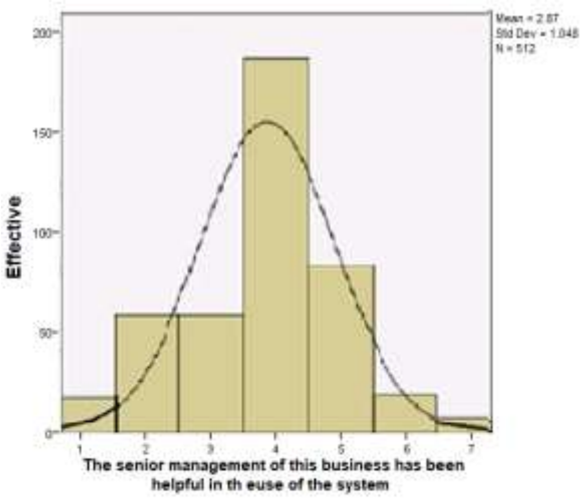


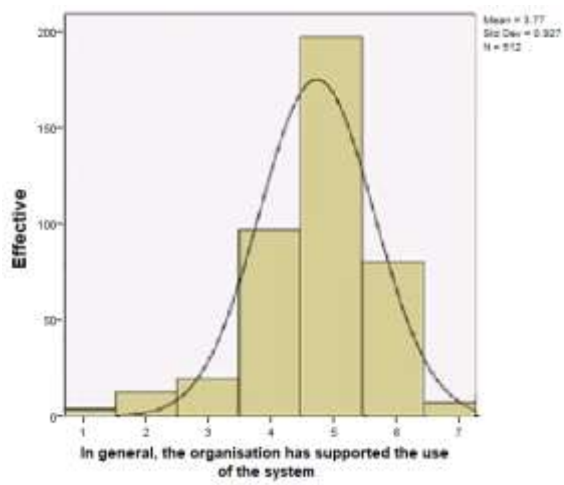


Distribution of Items for construct Social Influence

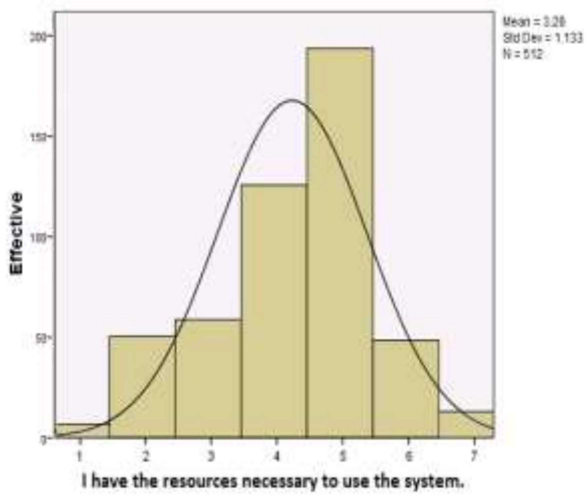


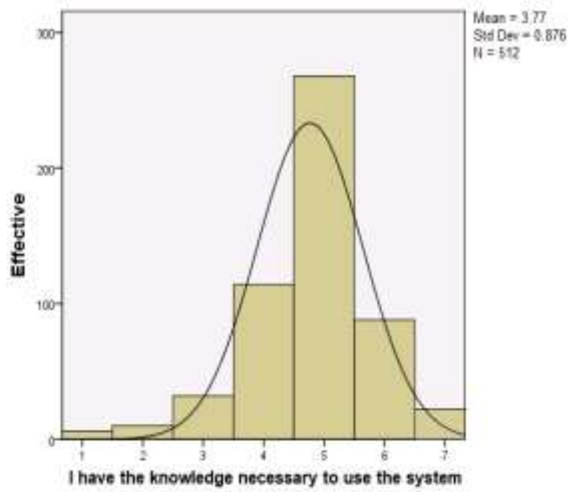


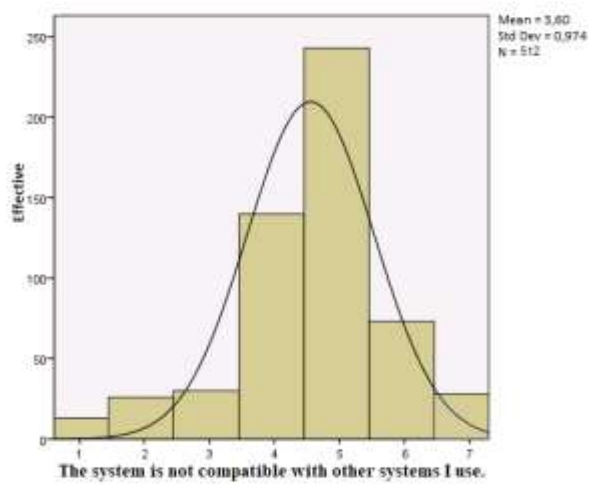




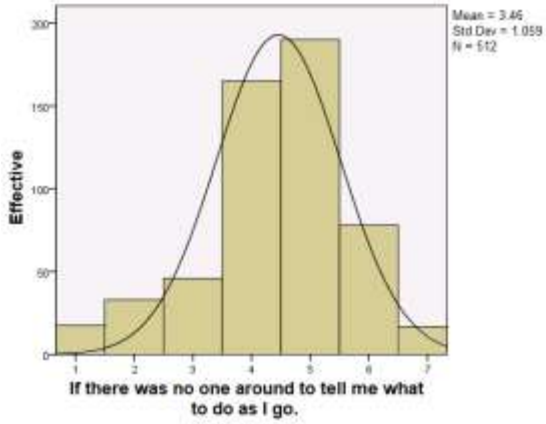
Distribution of Items for construct Facilating Conditions

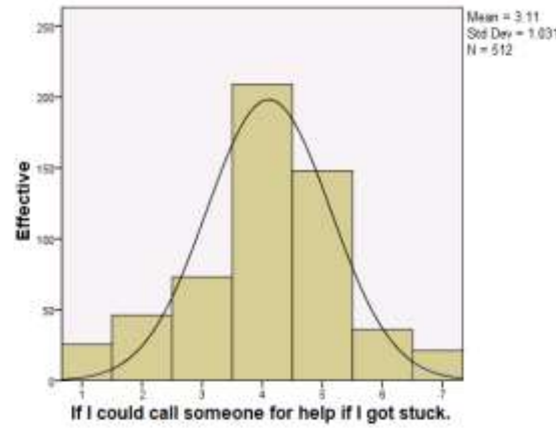


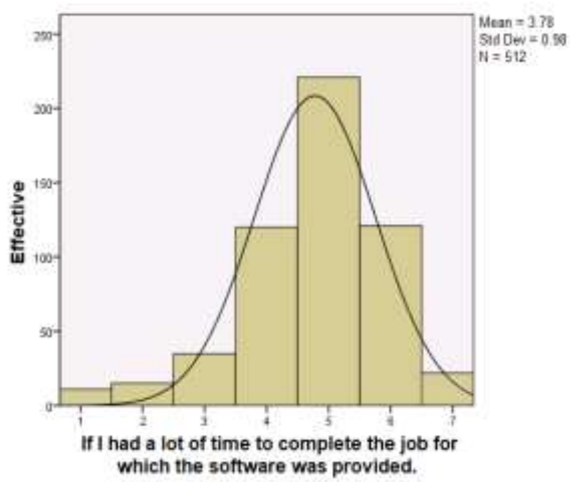


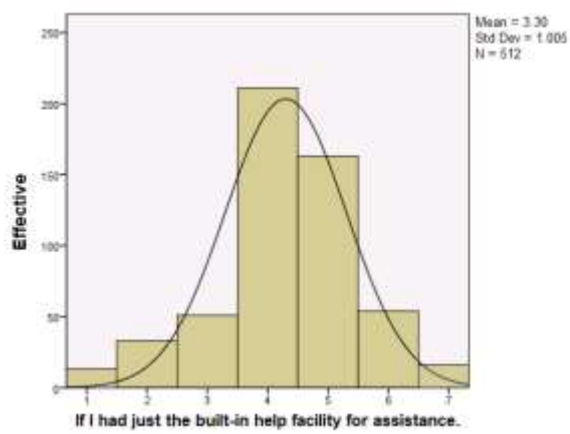


Distribution of Items for construct Self-Efficacy

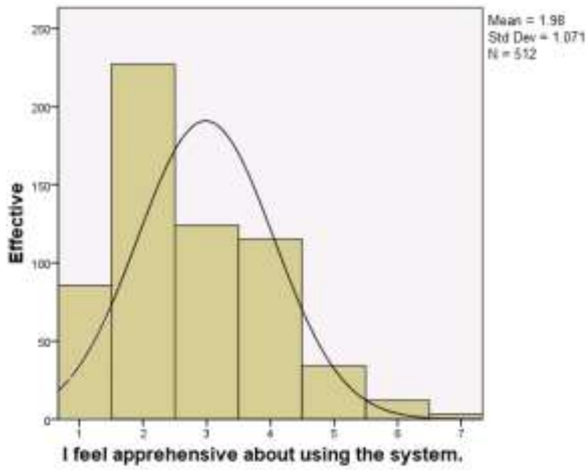


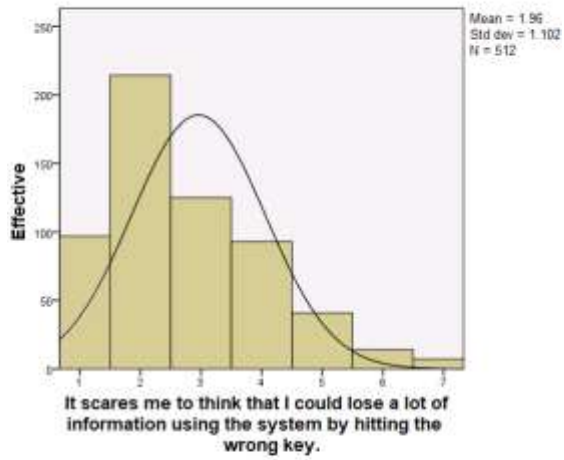


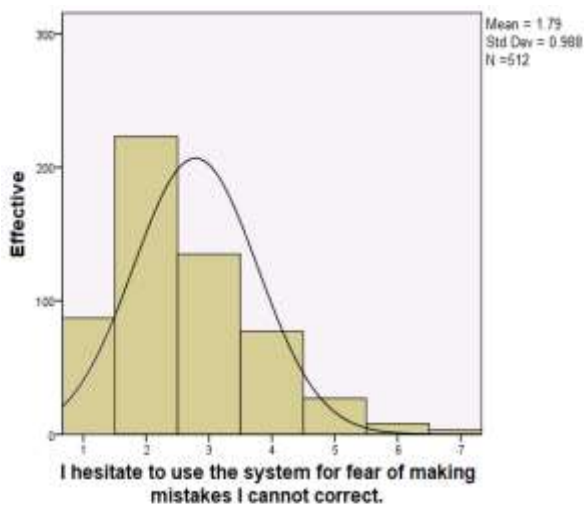


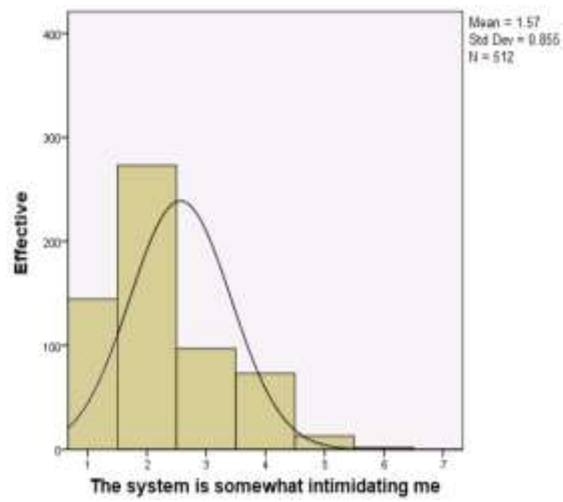


Distribution of Items for construct Anxiety

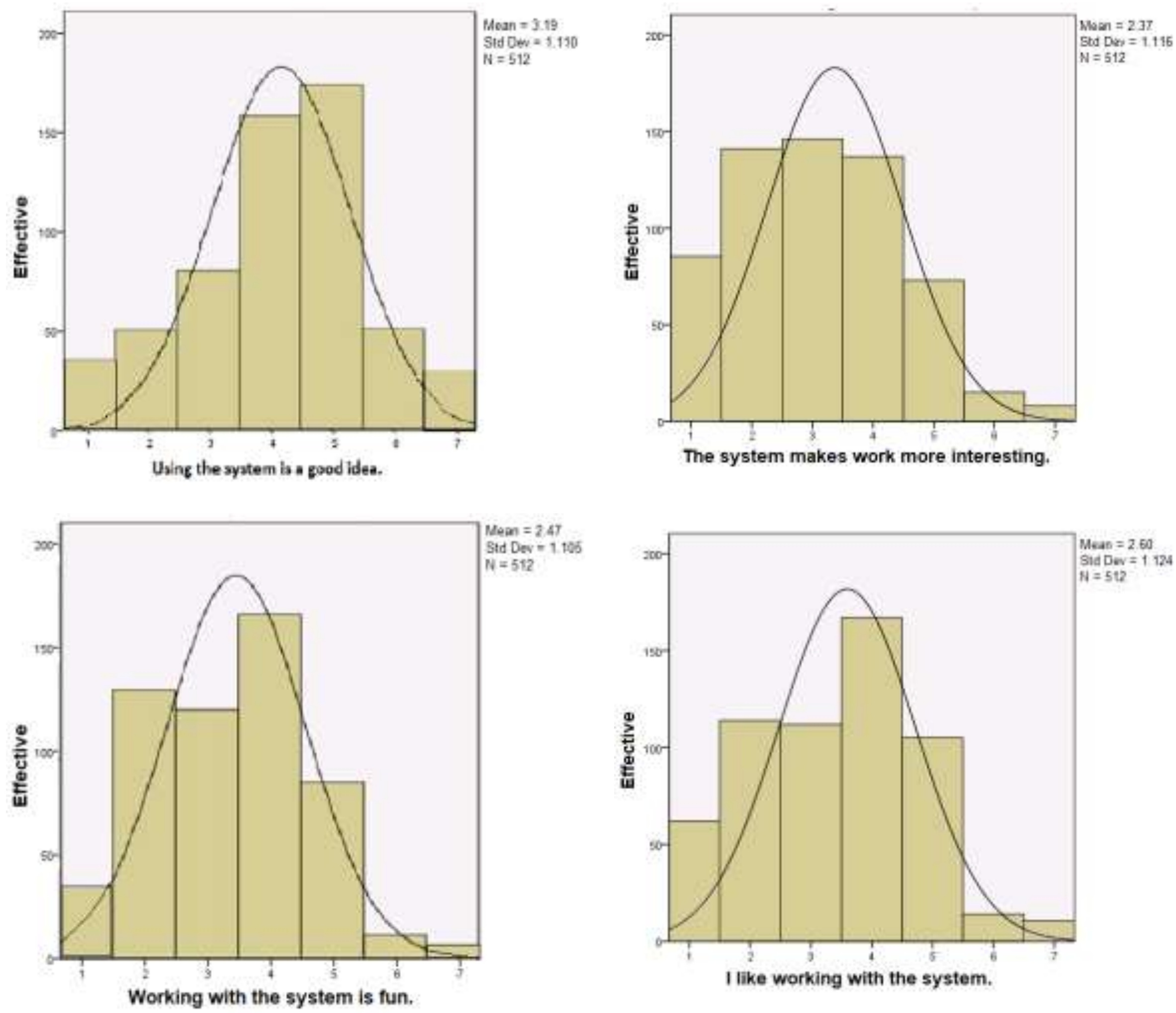




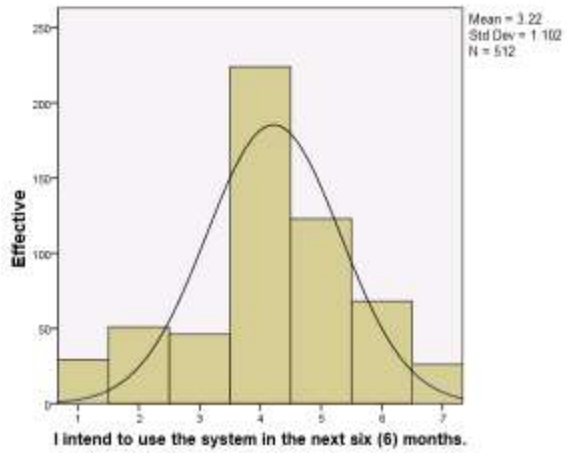


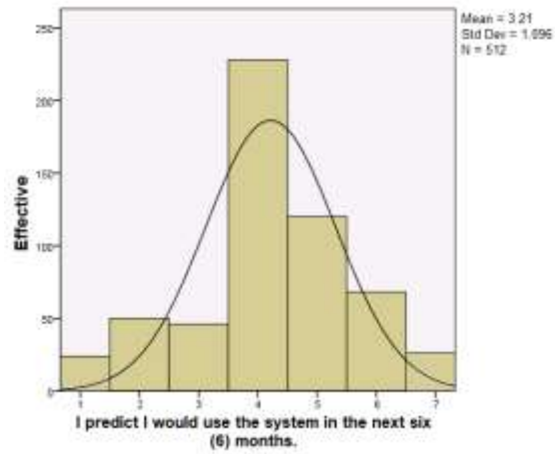


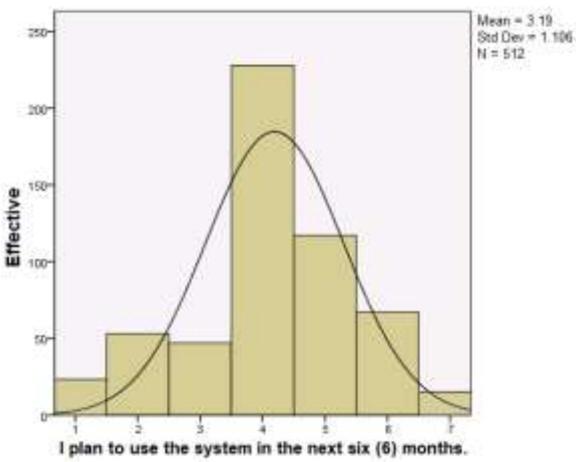
Distribution of Items for construct Attitude towards using technology



Distribution of Items for construct Behavioural Intention







Appendix B: Results of Regression Analysis

The tables below show the results of the Linear Regression for the relationship between:

Performance Expectancy → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.485[a]	0.235	0.234	0.87530784

a. Predictors: (constant), Performance Expectancy

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	120.256	1	120.256	156.959	0.000[a]
	Residual	390,744	510	0.766		
	Total	511.000	511			

a. Predictors: (constant), Performance Expectancy

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.356E-16	0.039		0.000	1.000
	Performance Expectancy	0.485	0.039	0.485	12.527	0.000

a. Dependent Variable: Behavioural Intention

Effort Expectancy → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.492[a]	0.242	0.241	0.871375001

a. Predictors: (constant), Effort Expectancy

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.760	1	123.760	162.993	0.000[a]
	Residual	387.240	510	0.759		
	Total	511.000	511			

a. Predictors: (constant), Effort Expectancy

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.381E-16	0.039		0.000	1.000
	Effort Expectancy	0.492	0.039	0.492	12.767	0.000

a. Dependent Variable: Behavioural Intention

Social Influence → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.358[a]	0.128	0.127	0.93446931

a. Predictors: (constant), Social Influence

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65.651	1	65.651	75.182	0.000[a]
	Residual	445.349	510	0.873		
	Total	511.000	511			

a. Predictors: (constant), Social Influence

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.232E-16	0.041		0.000	1.000
	Social Influence	0.358	0.041	0.358	8.671	0.000

a. Dependent Variable: Behavioural Intention

Facilitating Conditions → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.396[a]	0.157	0.155	0.91916751

a. Predictors: (constant), Facilitating Conditions

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.177	1	80.177	94.828	0.000[a]
	Residual	430.883	510	0.845		
	Total	511.000	511			

a. Predictors: (constant), Facilitating Conditions

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.244E-16	0.041		0.000	1.000
	Facilitating Conditions	0.396	0.041	0.396	9.737	0.000

a. Dependent Variable: Behavioural Intention

Anxiety → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.135[a]	0.018	0.016	0.99181412

a. Predictors: (constant), Anxiety

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.3150	1	9.315	9.470	0.002[a]
	Residual	501.685	510	0.984		
	Total	511.000	511			

a. Predictors: (constant), Anxiety

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.025E-16	0.044		0.000	1.000
	Anxiety	-0.135	0.044	-0.135	-3.077	0.002

Dependent Variable: Behavioural Intention

Attitude towards using technology → Behavioural Intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.470[a]	0.221	0.219	0.88357722

a. Predictors: (constant), Attitude towards using technology

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	112.839	1	112.839	144.533	0.000[a]
	Residual	398.161	510	0.781		
	Total	511.000	511			

a. Predictors: (constant), Attitude towards using technology

b. Dependent Variable: Behavioural Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		A	Std. Error	Beta		
1	(Constant)	-1.170E-16	0.039		0.000	1.000
	Attitude towards using technology	0.470	0.039	0.470	12.021	0.000

Dependent Variable: Behavioural Intention

Appendix C: UREC Approved – Research Ethics Application Form (REAF)

UNICAF UNIVERSITY

REAF_DS - Version 3.0AP

UNICAF UNIVERSITY RESEARCH ETHICS APPLICATION FORM DOCTORAL STUDIES	UREC USE ONLY: Application No: Date Received:

Student's Name: Sameer Korumtallee

Student's E-mail Address: sameerk@consultant.com

Student's ID #: R1704D2607423

Supervisor's Name: Dr Vikram Niranjan

University Campus: Unicaf University Malawi (UUM)

Program of Study: UUM: DBA - Doctorate of Business Administration

Research Project Title: Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius

1. Please state the timelines involved in the proposed research project:

Estimated Start Date: 01-Mar-2019 Estimated End Date: 31-Mar-2021

2. External Research Funding (if applicable):

a. Do you have any external funding for your research?

☐ YES ☑ NO

If YES, please answer questions **2b** and **2c**.

b. Please list any external (third party) sources of funding you plan to utilise for your project. You need to include full details on the source of funds (e.g. state, private or individual sponsor), any prior / existing or future relationships between the funding body / sponsor and any of the principal investigator(s) or co-investigator(s) or student researcher(s), status and timeline of the application and any conditions attached.

Not Applicable

c. If there are any perceived ethical issues or potential conflicts of interest arising from applying or and receiving external funding for the proposed research then these need to be fully disclosed below and also further elaborated on, in the relevant sections on ethical considerations later on in this form.

Not Applicable

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3. The research project

a. Project Summary:

In this section please fully describe the purpose and underlying rationale for the proposed research project. Ensure that you pose the research questions to be examined, state the hypotheses, and discuss the expected results of your research and their potential.

It is important in your description to use plain language so it can be understood by all members of the UREC, especially those who are not necessarily experts in the particular discipline. To that effect please ensure that you fully explain / define any technical terms or discipline-specific terminology (maximum 300 words +/- 10%).

The overall objective of the research project is to explore individual factors that predict the intention of healthcare professionals to use the e-health system in their clinical activities. To do so, their perceptions will be gathered as to elaborate the impact of using the e-health system in their day-to-day exercise, to evaluate individuals and groups who are favourable or unfavourable towards its usage and to identify the factors that may facilitate or hinder the usage of the e-health system.

This study has a quantitative research approach as it has to analyse the different variables (such as usefulness, ease of use, self-efficacy, etc) affecting the e-health adoption among the healthcare providers. Data will be obtained through questionnaires survey from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius. The questionnaire has been adopted from Unified Theory on Acceptance and Use of Technology (UTAUT) created by Venkatesh et al. (2003), it integrates eight theories of technology adoption and provides a comprehensive view of the factors affecting users' adoption behaviour. The research questions are as follows:

Q1. What is the relationship between healthcare provider's characteristics (i.e. age, gender, years of experience, education, etc.) and e-health system adoption?

Q2. What is the relationship between healthcare provider's contextual factors (i.e. training, management support, workload, position, etc.) and e-health system adoption?

Q3. What is the relationship between healthcare provider's perception factors (i.e. perceived usefulness, ease of use, ease of learning, satisfaction, etc.) and e-health system adoption?

b. Significance of the Proposed Research Study and Potential Benefits:

Outline the potential significance and/or benefits of the research (maximum 200 words).

The purpose of this research is to identify and analyse the factors that promote or limit the adoption of the E-health system by physicians and health care practitioners. This study will help improve the choice of change management strategies to maximize the chances of success when implementing a new information system.

In this regard, a better understanding of the critical factors influencing physicians' adoption of E-health systems may lead to better design of implementation strategies for health care organisations.

In a difficult context of financial constraints and limited resources, a better understanding of the critical factors in the implementation of the E-health could optimize the impact of implementation projects, particularly with the reduction of the failure rate and a better control of the costs associated with the projects. This could also translate into more extensive use of the E-health system by professionals and thus ensure better performance.

4. **Project execution:**

a. The following study is an:

- [x] experimental study (primary research)
- [ ] desktop study (secondary research)
- [ ] desktop study using existing databases involving information of human/animal subjects
- [ ] Other

If you have chosen 'Other' please Explain:

b. Methods. The following study will involve the use of:

Method	Materials / Tools
[ ] Qualitative	[ ] Face to Face Interviews [ ] Phone Interviews [ ] Face to Face Focus Groups [ ] Online Focus Groups [ ] Other *
[x] Quantitative	[ ] Face to Face Questionnaires [x] Online Questionnaires [ ] Experiments [ ] Tests [ ] Other *

*If you have chosen 'Other' please Explain:

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5. **Participants:**

a. Does the Project involve the recruitment and participation of additional persons other than the researcher(s) themselves?

☑ YES **If YES, please complete all following sections.**

☐ NO **If NO, please directly proceed to Question 7.**

b. Relevant Details of the Participants of the Proposed Research

Please state the number of participants you plan to recruit, and describe important characteristics such as: demographics (e.g. age, gender, location, affiliation, level of fitness, intellectual ability etc). It is also important that you specify any inclusion and exclusion criteria that will be applied (e.g. eligibility criteria for participants).

Number of participants: 250

Age range From 18 To 65

Gender
☑ Female
☑ Male

Eligibility Criteria:

- Inclusion criteria: Can read & talk in English
  Employee of Fortis Hospitals
- Exclusion criteria: Refusal to give inform consent
  Non-medical staff

Disabilities: Not Applicable

Other relevant information (maximum 100 words):

c. **Participation & Research setting:**

Clearly describe which group of participants is completing/participating in the material(s)/ tool(s) described in 5b above (maximum 200 words).

The current number of healthcare employees at Fortis Mauritius Hospitals is around 1575. With a confidence level of 95% and an error margin of 7%, the sample size is estimated to be 175 participants. Based on a 70% desired response rate, the total number of participants to be surveyed is 250. All the participants will participate through an online questionnaire. Given that the population of our research comprises of different categories of users of the e-health system at Fortis Hospitals, the stratified sampling method will be used to ensure that all the different categories of the users of the system such as nursing officers, doctors, technicians, pharmacy officers, record officers, etc. are included in the study.

d. **Recruitment Process for Human Research Participants:**

Please clearly describe how the potential participants will be identified, approached and recruited (maximum 200 words).

Participants will be recruited primarily through email communication and recruitment posters will be placed on notice boards in the two Fortis Hospitals in Mauritius, the email and posters will be in accordance with Fortis Hospital's posting policy.

e. **Research Participants Informed Consent.**

Select below which categories of participants will participate in the study. Complete the relevant Informed Consent form and submit it along with the REAF form.

Yes	No	Categories of participants	Form to be completed
☑	☐	Typically Developing population(s) above the maturity age *	Informed Consent Form
☐	☑	Typically Developing population(s) under the maturity age *	Guardian Informed Consent Form

* Maturity age is defined by national regulations in laws of the country in which the research is being conducted.

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f. **Relationship between the principal investigator and participants.**

Is there any relationship between the principal investigator (student), co-investigators(s), (supervisor) and participant(s)? For example, if you are conducting research in a school environment on students in your classroom (e.g. instructor-student).

☑ YES ☐ NO

If YES, please specify (maximum 100 words).

I am currently an employee of the Fortis Hospital in Mauritius, the selected participants will be from the same organisation. Thus there will be a colleague - colleague relationship.

6. **Potential Risks of the Proposed Research Study.**

a. **Are there any potential risks, psychological harm and/or ethical issues associated with the proposed research study, other than risks pertaining to everyday life events (such as the risk of an accident when travelling to a remote location for data collection)?**

☐ YES ☑ NO

If YES, please specify (maximum 150 words).

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b. Please choose the appropriate option

		Yes	No
i.	Will you obtain written informed consent form from all participants?	✓	
ii.	Does the research involve as participants, people whose ability to give free and informed consent is in question?		✓
iii.	Does this research involve participants who are children under maturity age? If you answered YES to question iii, please complete **all following questions.** If you answered NO to question iii, please **do not answer Questions iv, v, vi and proceed to Questions vii, viii, ix and x.**		✓
iv.	Will the research tools be implemented in a professional educational setting in the presence of other adults (i.e. classroom in the presence of a teacher)?		✓
v.	Will informed consent be obtained from the legal guardians (i.e. parents) of children?		✓
vi.	Will verbal assent be obtained from children?		✓
vii.	Will all data be treated as confidential? If NO, please explain why participants' anonymity or confidentiality is not appropriate for this proposed research project, providing details of how all participants will be informed of the fact that any data which they will provide will not be anonymous or confidential.	✓	
v.	Will all participants/ data collected be anonymous? If NO, please describe the procedures to be used to ensure anonymity of participants and/or confidentiality of the collected data both during the conduct of the research and in the subsequent release of its findings.	✓	

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		Yes	No
ix.	Have you ensured that personal data and research data collected from participants will be securely stored for five years?	✓	☐
x.	Does this research involve the deception of participants? If YES, please describe the nature and extent of the deception involved. Explain how and when the deception will be revealed, and who will administer this debrief to the participants:	☐	✓

c. Are there any other ethical issues associated with the proposed research study that are not already adequately covered in the preceding sections?

☐ Yes ✓ No

If YES, please specify (maximum 150 words).

d. Please indicate the Risk Rating.

☐ High ✓ Low

7. <u>Further Approvals</u>

Are there any other approvals required (in addition to ethics clearance from UREC) in order to carry out the proposed research study?

☐ YES ✓ NO

If YES, please specify (maximum 100 words).

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8. **Application Checklist**

Please mark √ if the study involves any of the following:

- ☐ Children and young people under 18 years of age, vulnerable population such as children with special educational needs (SEN), racial or ethnic minorities, socioeconomically disadvantaged, pregnant women, elderly, malnourished people, and ill people.
- ☐ Research that foresees risks and disadvantages that would affect any participant of the study such as anxiety, stress, pain or physical discomfort, harm risk (which is more than is expected from everyday life) or any other act that participants might believe is detrimental to their wellbeing and / or has the potential to / will infringe on their human rights / fundamental rights.
- ☐ Risk to the well-being and personal safety of the researcher.
- ☐ Administration of any substance (food / drink / chemicals / pharmaceuticals / supplements / chemical agent or vaccines or other substances (including vitamins or food substances) to human participants.
- ☐ Results that may have an adverse impact on the natural or built environment.

9. **Further documents**

Please check that the following documents are attached to your application:

		ATTACHED	NOT APPLICABLE
1	Recruitment advertisement (if any)	☑	☐
2	Informed Consent Form / Guardian Informed Consent Form	☑	☐
3	Research Tool(s)	☑	☐
4	Gatekeeper Letter	☑	☐
5	Any other approvals required in order to carry out the proposed research study, e.g., institutional permission (e.g. school principal or company director) or approval from a local ethics or professional regulatory body.	☐	☑

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10. Final Declaration by Applicants:

(a) I declare that this application is submitted on the basis that the information it contains is confidential and will only be used by Unicaf University for the explicit purpose of ethical review and monitoring of the conduct of the research proposed project as described in the preceding pages.

(b) I understand that this information will not be used for any other purpose without my prior consent, excluding use intended to satisfy reporting requirements to relevant regulatory bodies.

(c) The information in this form, together with any accompanying information, is complete and correct to the best of my knowledge and belief and I take full responsibility for it.

(d) I undertake to abide by the highest possible international ethical standards governing the Code of Practice for Research Involving Human Participants, as published by the UN WHO Research Ethics Review Committee (ERC) on http://www.who.int/ethics/research/en/ and to which Unicaf University aspires to.

(e) In addition to respect any and all relevant professional bodies' codes of conduct and/or ethical guidelines, where applicable, while in pursuit of this research project.

☑ **I agree with all points listed under Question 10**

Student's Name: Sameer Korumtallee

Supervisor's Name: Dr Vikram Niranjan

Date of Application: 26-Apr-2020

Important Note:
Please now save your completed form (we suggest you also print a copy for your records) and then submit it to your UU Dissertation/project supervisor (tutor). **In the case of student projects, the responsibility lies with the Faculty Dissertation/Project Supervisor.** If this is a student application, then it should be submitted via the relevant link in the VLE. Please submit only electronically filled in copies; **do not** hand fill and submit scanned paper copies of this application.

Appendix D: UREC Approved - Informed Consent Form

UNICAF UNIVERSITY

UU_IC - Version 2.0

Informed Consent Form

Part 1: Debriefing of Participants

Student's Name: Sameer Korumtallee

Student's E-mail Address: sameerk@consultant.com

Student ID #: R1704D2607423

Supervisor's Name: Dr Vikram Niranjan

University Campus: Unicaf University Malawi (UUM)

Program of Study: UUM: DBA - Doctorate of Business Administration

Research Project Title: Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius

Date: 26-Avr-2020

Provide a short description (purpose, aim and significance) of the research project, and explain why and how you have chosen this person to participate in this research (maximum 150 words).

The purpose of this research is to identify and analyse the factors that promote or limit the adoption of the E-health system by physicians and health care practitioners. The results of this research will shed light on some strategies to help the organisations and decision makers working in the health sector to facilitate the transition of their personnel from health to e-health and to promote its usage.
Research participants are those currently using the Hospital Information System. They are asked to complete a closed-ended questionnaire concerning their personal experiences about the usage of the e-health system, with emphasis on factors such as usefulness of the system, ease of use and ease of learning.

The above named Student is committed in ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded and will not be accessible to anyone outside this research. Data described and included in dissemination activities will only refer to coded information ensuring beyond the bounds of possibility participant identification.

I, Sameer Korumtallee **, ensure that all information stated above is true and that all conditions have been met.**

Student's Signature: ____________

UU_IC - Version 2.0

Informed Consent Form

Part 2: Certificate of Consent

This section is mandatory and should to be signed by the participant(s)

Student's Name: Sameer Korumtallee

Student's E-mail Address: sameerk@consultant.com

Student ID #: R1704D2607423

Supervisor's Name: Dr Vikram Niranjan

University Campus: Unicaf University Malawi (UUM)

Program of Study: UUM: DBA - Doctorate of Business Administration

Research Project Title: Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of my participation to this study. I understand that my data will remain anonymous and confidential, unless stated otherwise. I consent voluntarily to be a participant in this study.

Participant's Print name:

Participant's Signature: ______________________

Date:

If the Participant is illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had an opportunity to ask questions. I confirm that the aforementioned individual has given consent freely.

Witness's Print name:

Witness's Signature: ______________________

Date:

Appendix E: UREC Approved – Gatekeeper Letter

UNICAF UNIVERSITY

UU_GL - Version 2.0AP

Gatekeeper letter

Address: Wellkin Fortis Hospital, Moka Mauritius

Date: 26-Avr-2020

Subject: Request for Permission for Research

Dear Sir,

I am a doctoral student at Unicaf University, Malawi. As part of my degree I am carrying out a study on factors influencing the adoption of E-health system by healthcare providers. I am writing to enquire whether you would be willing to participate in this research.

Subject to approval by Unicaf Research Ethics Committee (UREC) this study will be using a quantitative research approach. Data will be collected through closed-ended questionnaire. Once data will be collected it will be analyzed to have: (1) a descriptive statistics analysis; (2) an analysis of variance; and (3) a confirmatory analysis.

The overall objective of the research project is to explore individual factors that predict the intention of the healthcare professionals to use the e-health system in their clinical activities. The project title is "Factors influencing the adoption of E-health system - A case study of Fortis Hospitals in Mauritius" and will be supervised by Dr. Vikram Niranjan.

In connection with this, I am asking your permission to allow me access in your vicinity and to interrogate your staffs with a questionnaire. Rest assured, data that will be gathered will remain confidential and will be used for academic purposes only.

Thank you in advance for your time and for your consideration for this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Sameer Korumtallee

Student's Name: Sameer Korumtallee
Student's E-mail: sameerk@consultant.com
Student's Address and Telephone: (230) 5919 4014
Supervisor's Title and Name: Dr Vikram Niranjan
Supervisor's Position: Supervisor
Supervisor's E-mail: v.niranjan@unicaf.org

Appendix F: UREC Approved – Debriefing Form

Debriefing Form

Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius

Dear Participants,

Thank you for participating in my research study based on the factors influencing the adoption of E-health system – a case study of Fortis Hospitals Mauritius. The information you gave will make a valuable contribution to analyse the factors above mentioned topic.

The overall objective of the research project is to explore individual factors that predict the intention of the healthcare professionals to use the e-health system in their clinical activities. To do so, your perceptions has been gathered (1) to elaborate the advantages and disadvantages of using the e-health system in your day-to-day exercise, (2) to evaluate individuals and groups who are favourable or unfavourable towards its usage and (3) to identify the factors that may facilitate or hinder the usage of the e-health system.

Thanks to your participation, data has been collected through questionnaires from a randomly selected population of medical professionals and healthcare providers of Fortis Hospitals in Mauritius. The results of this research will shed light on some strategies to help organizations and decision makers working in the health sector to facilitate the transition of their personnel from health to e-health and to promote its usage.

Your participation in this study is voluntary, you do have the privilege to pull back your assent for the exploration whenever you want. You will not be penalized or strike back because of your withdrawal. Rest assured, data that has been collected is strictly confidential and will be used for academic purposes only.

Thank you for your participation in this study. If you have further questions about the study, please feel free contact the researcher. In addition, if you have any concerns about any aspect of the study, you may also contact the research supervisor as per detail provided below.

Name of researcher	**Name of Supervisor**
Sameer Korumtallee	Dr Vikram Niranjan
Unicaf University, Malawi	Unicaf University, Malawi
Tel: 5919 4014	
Email: sameerk@consultant.com	Email: v.niranjan@unicaf.org

Appendix G: UREC Approved – Advert for Participants

PARTICIPANTS NEEDED FOR RESEARCH STUDY

My name is Sameer Korumtallee. The aim of this message is to see if you might be interested in participating in a research study. The research is being done as part of my doctoral research project. The focus of the research is to analyse the factors influencing the adoption of the E-health system.

If you agree to participate for the research you will be asked to sign a consent form and reply to a questionnaire that will take no more than 15 minutes of your time.

Your participation is completely voluntary and if you choose not to participate it will not impact our relationship.

If you are interested in more information about the study or would like to volunteer please reply by email to sameerk@consultant.com or phone (230) 5919 4014.

The deadline for confirming your participation is on (Date to be confirmed).

Thanks, and Regards
Sameer Korumtallee

Appendix H: UREC Approved – Questionnaire

Survey Questionnaire

Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius

Important Notes:

1. This questionnaire is anonymous.
2. The term system used throughout the questionnaire refers to the E-health system implemented at Fortis Mauritius Hospitals.
3. The average time to complete this questionnaire is 15 minutes.
4. Please answer all questions
5. All information gathered is solely for research purposes and will be treated statistically, without dissemination of your specific data or answers.

For further information about this study, please contact Sameer Korumtallee (Doctoral Candidate) at ext. 1067.

Your hospital	☐ Wellkin Fortis		☐ Darné Fortis		
Your Position	☐ Consultant		☐ Resident Doctor	☐ Nursing officer	
	☐ Technician		☐ Pharmacy officer	☐ Others	
Education Level	☐ Diploma or Below		☐ Bachelor	☐ Master or above	
Employment Status	☐ Full-time		☐ Part-time		
Gender	☐ Male		☐ Female		
Age	☐ ≤ 25	☐ ≤ 35	☐ ≤ 45	☐ ≤ 55	☐ ≤ 65
Years of Service	☐ 0 - 5	☐ 6 - 10	☐ 11 - 15	☐ 16 – 20	☐ ≥ 21

Please, express your agreement level with the statements below:

Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Disagree
1	2	3	4	5	6	7

	Performance Expectancy	1	2	3	4	5	6	7
PE1	I would find the system useful in my job.							
PE2	Using the system enables me to accomplish tasks more quickly							
PE3	Using the system increases my productivity.							
PE4	If I use the system, I will increase my chances of getting a raise.							

	Effort Expectancy	1	2	3	4	5	6	7
EE1	My interaction with the system would be clear and understandable.							
EE2	It would be easy for me to become skillful at using the system.							
EE3	I would find the system easy to use.							
EE4	Learning to operate the system is easy for me.							

	Attitude toward using technology	1	2	3	4	5	6	7
AT1	Using the system is a good idea.							
AT2	The system makes work more interesting.							
AT3	Working with the system is fun.							
AT4	I like working with the system.							

	Social influence	1	2	3	4	5	6	7
SI1	People who influence my behaviour think that I should use the system.							
SI2	People who are important to me think that I should use the system.							
SI3	The senior management of this business has been helpful in the use of the system.							
SI4	In general, the organization has supported the use of the system.							

	Facilitating conditions	1	2	3	4	5	6	7
FC1	I have the resources necessary to use the system.							
FC2	I have the knowledge necessary to use the system.							
FC3	The system is not compatible with other systems I use.							
FC4	A specific person (or group) is available for assistance with system difficulties.							

	Self-efficacy I could complete a job or task using the system.	1	2	3	4	5	6	7
SE1	If there was no one around to tell me what to do as I go.							
SE2	If I could call someone for help if I got stuck.							
SE3	If I had a lot of time to complete the job for which the software was provided.							
SE4	If I had just the built-in help facility for assistance.							

	Anxiety	1	2	3	4	5	6	7
AN1	I feel apprehensive about using the system.							
AN2	It scares me to think that I could lose a lot of information using the system by hitting the wrong key.							
AN3	I hesitate to use the system for fear of making mistakes I cannot correct.							
AN4	The system is somewhat intimidating to me.							

	Behavioural intention to use the system	1	2	3	4	5	6	7
BI1	I intend to use the system in the next six (6) months.							
BI2	I predict I would use the system in the next six (6) months.							
BI3	I plan to use the system in the next six (6) months.							

Appendix I: Email Sent to Gatekeeper

----- Original Message -----
From: Sameer Korumtallee [mailto:sameerk@consultant.com]
Sent: Tuesday, May 19, 2020 5:09 PM
To: Sukmeet Sandoo
CC: Sameer Korumtallee
Subject: Request for Permission to Conduct Research

Dear Sir,

We spoke.

I am a doctoral student at Unicaf University, Malawi. As part of my degree I am carrying out a study on factors influencing the adoption of E-health system by healthcare providers. I am writing to enquire whether you would be willing to participate in this research.

Subject to approval by Unicaf Research Ethics Committee (UREC) this study will be using a quantitative research approach. Data will be collected through closed-ended questionnaire. Once data will be collected it will be analysed to have: (1) a descriptive statistics analysis; (2) an analysis of variance; and (3) a confirmatory analysis.

The overall objective of the research project is to explore individual factors that predict the intention of the healthcare professionals to use the e-health system in their clinical activities. The project title is "Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius" and will be supervised by Dr. Vikram Niranjan.

In connection with this, I am asking your permission to allow me access in your vicinity and to interrogate your staffs with a questionnaire. Rest assured, data that will be gathered will remain confidential and will be used for academic purposes only.

Thank you in advance for your time and for your consideration for this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Sameer Korumtallee

Name: Sameer Korumtallee	**Name:** Dr. Vikram Niranjan
Position: Doctoral Student	**Position:** Supervisor
Address: Riv du Rempart, Mauritius	**Address:** Unicaf University, Malawi
Phone: (230) 5919 4014	**E-mail:** v.niranjan@unicaf.org
E-mail: sameerk@consultant.com	

Appendix J: Approval from Gatekeeper to Conduct Research

Sent: Tuesday, May 20, 2020 at 9:12 AM
From: "Sukmeet Sandoo" <s.sandoo@wellkin.com>
To: "Sameer Korumtallee" <sameerk@consultant.com>
Subject: RE: Request for Permission to Conduct Research

Hello Sameer

Nice to hear from you. I have taken note of your request.

You have my go ahead to conduct your research in our hospitals.

Regards

Sukmeet Sandoo

Chief Operation Officer

Wellkin Hospital, Royal Road, Moka, Mauritius

Tel: (230) 605 1000

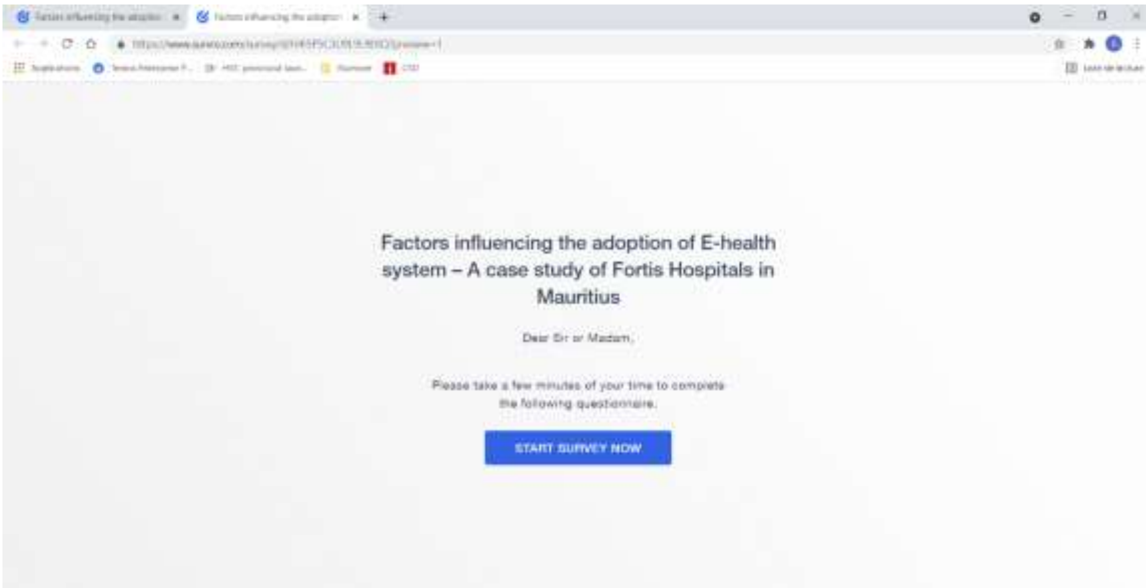
Email: s.sandoo@wellkin.com

www.wellkinhospital.com

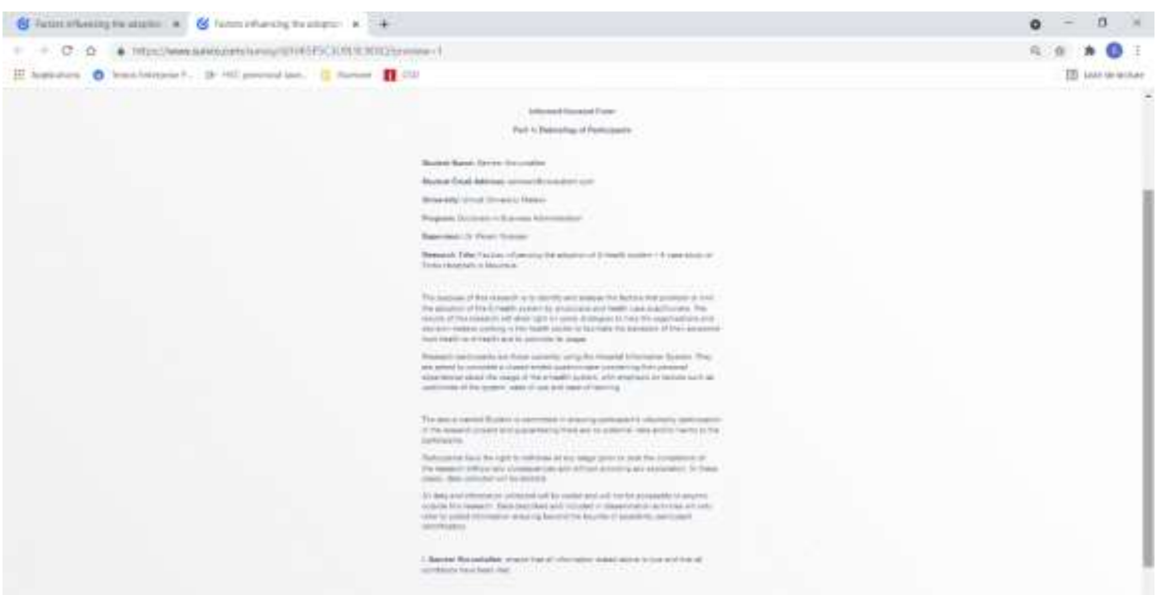
Appendix K: Main Questionnaire used for the study

Final The Survey link : https://www.survio.com/survey/d/H4I5P5C3U9L9L9E8Q

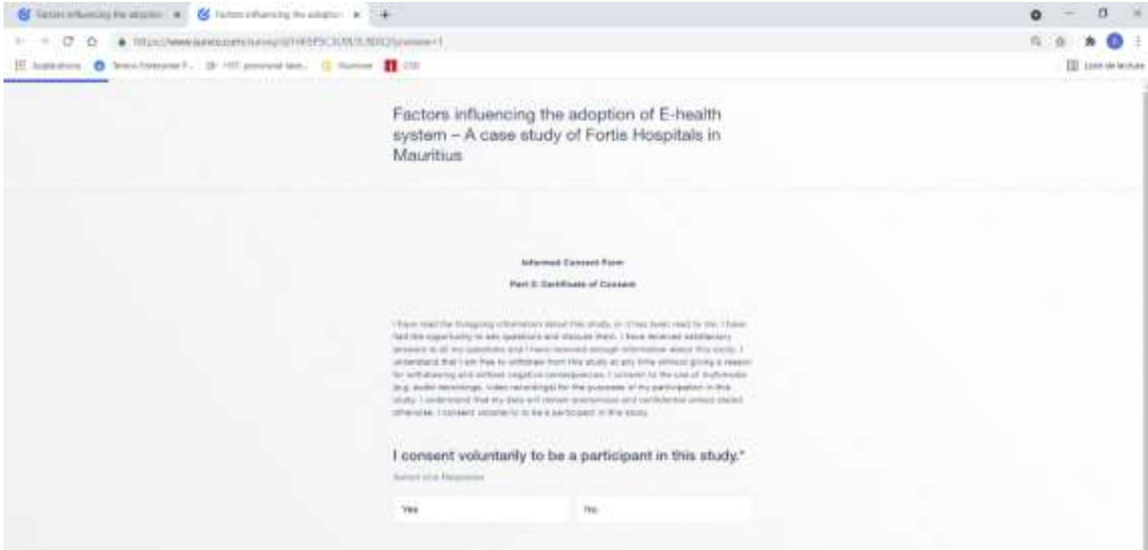
Welcome Page :



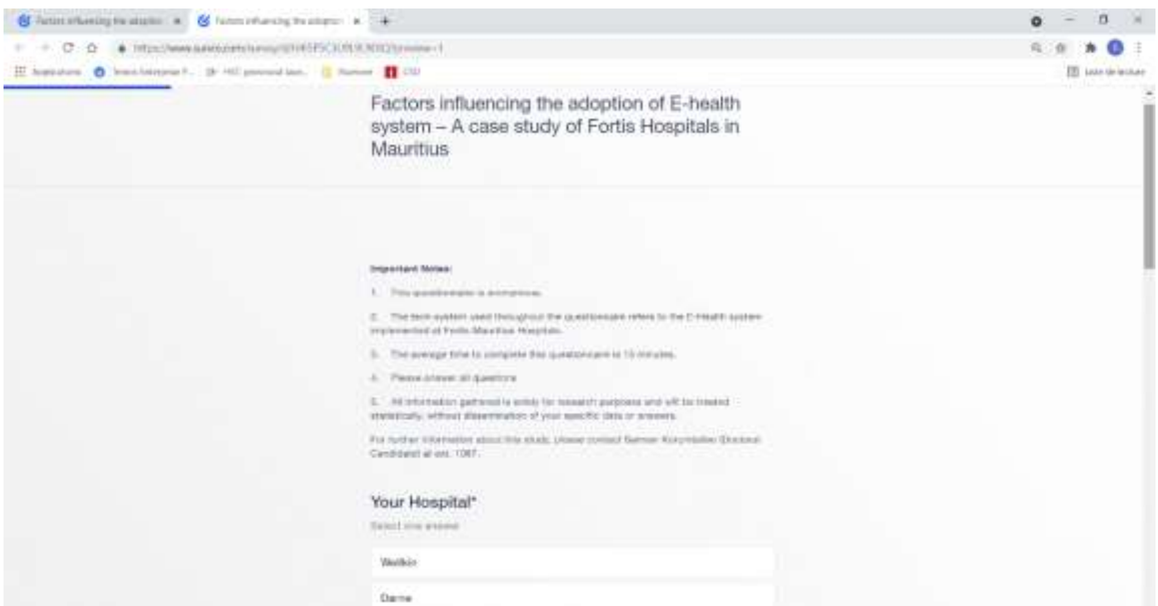
Informed Consent Form



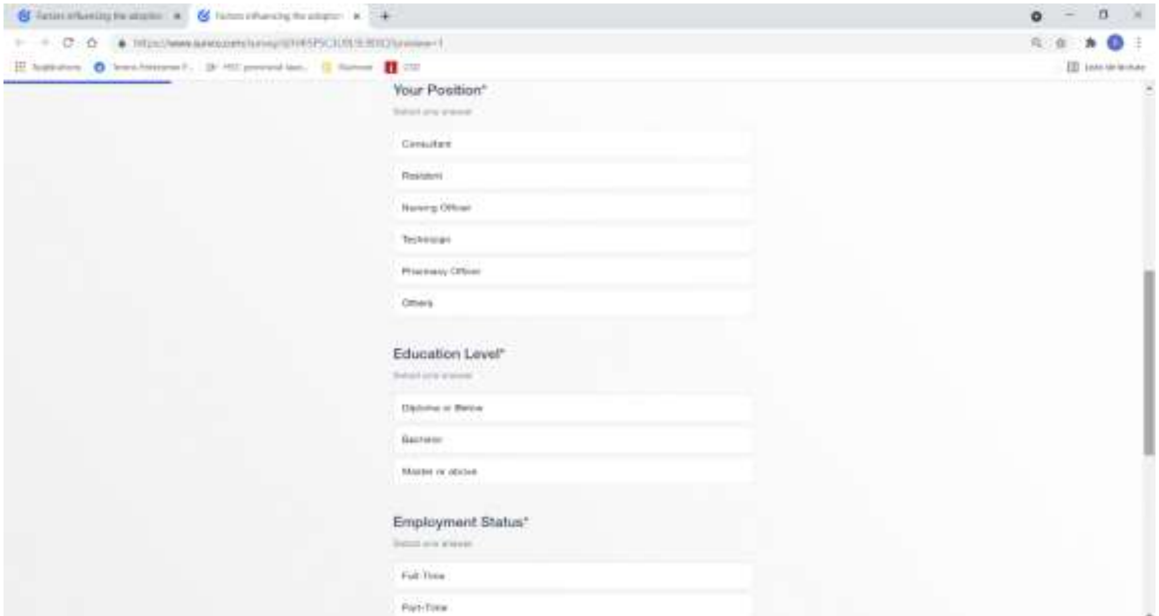
Certificate of Consent



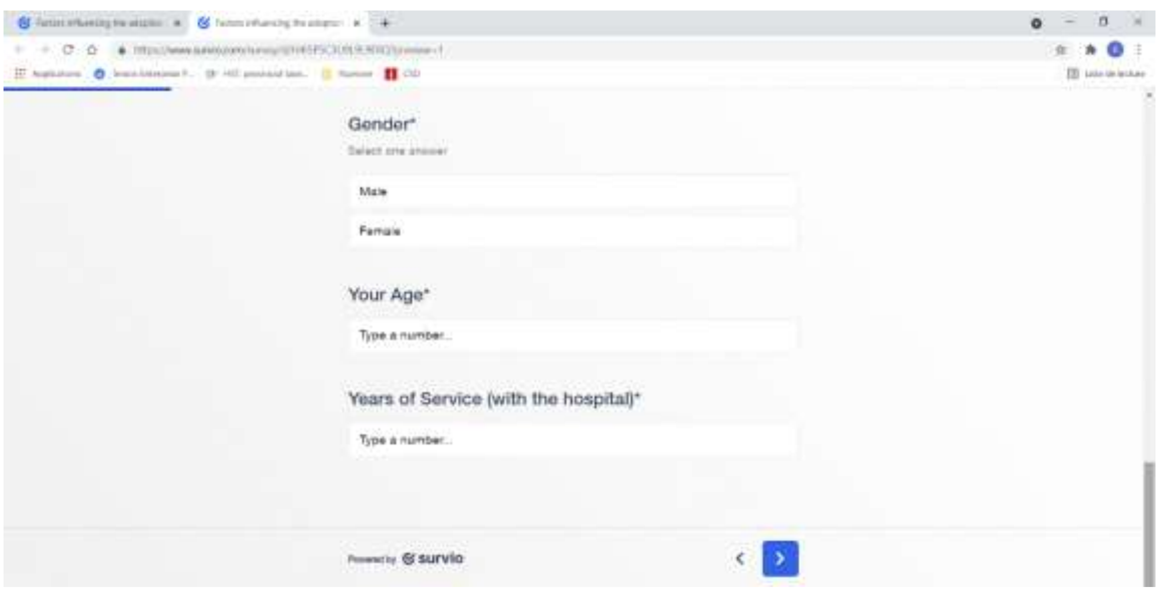
Demographic Characteristics Page



Demographic Characteristics Page (cont)



Demographic Characteristics Page (cont)



Question Page

Performance Expectancy

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

I would find the system useful in my job.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Using the system enables me to accomplish tasks more quickly*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Using the system increases my productivity.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Question Page

Effort Expectancy

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

My interaction with the system would be clear and understandable.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

It would be easy for me to become skillful at using the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

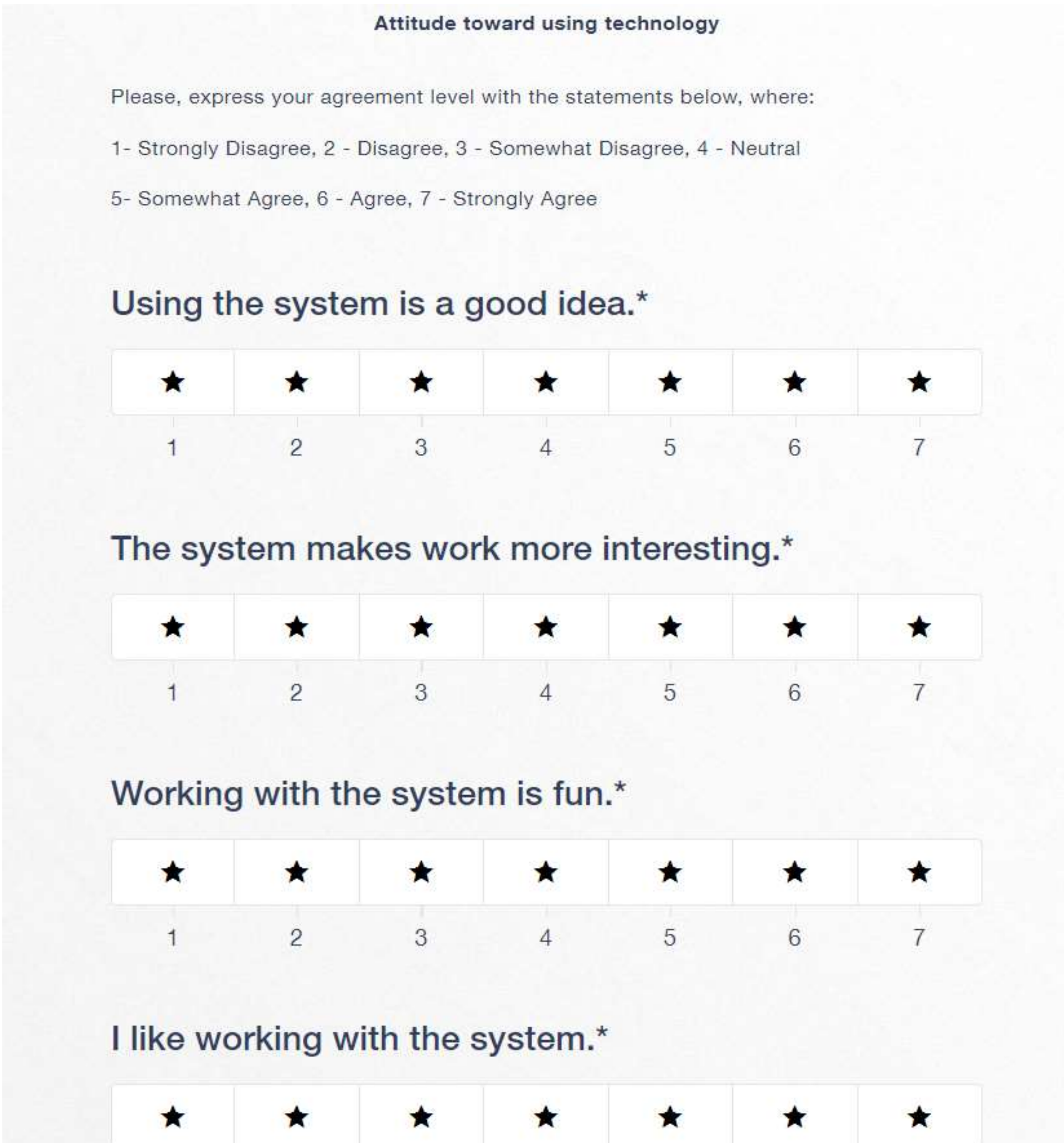
I would find the system easy to use.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Learning to operate the system is easy for me.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Question Page



Attitude toward using technology

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

Using the system is a good idea.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

The system makes work more interesting.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Working with the system is fun.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I like working with the system.*

★	★	★	★	★	★	★

Question Page

Social influence

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

People who influence my behaviour think that I should use the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

People who are important to me think that I should use the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

The senior management of this business has been helpful in the use of the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

In general, the organization has supported the use of the system.*

★	★	★	★	★	★	★

Question Page

Facilitating Conditions

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

I have the resources necessary to use the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I have the knowledge necessary to use the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

The system is not compatible with other systems I use.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Question Page

Self-efficacy

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

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

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I could complete a job or task using the system. If I could call someone for help if I got stuck.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I could complete a job or task using the system. If I had a lot of time to complete the job for which the software was provided.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I could complete a job or task using the system. If I had just the built-in help facility for assistance.*

Question Page

Anxiety

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

I feel apprehensive about using the system.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

It scares me to think that I could lose a lot of information using the system by hitting the wrong key.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

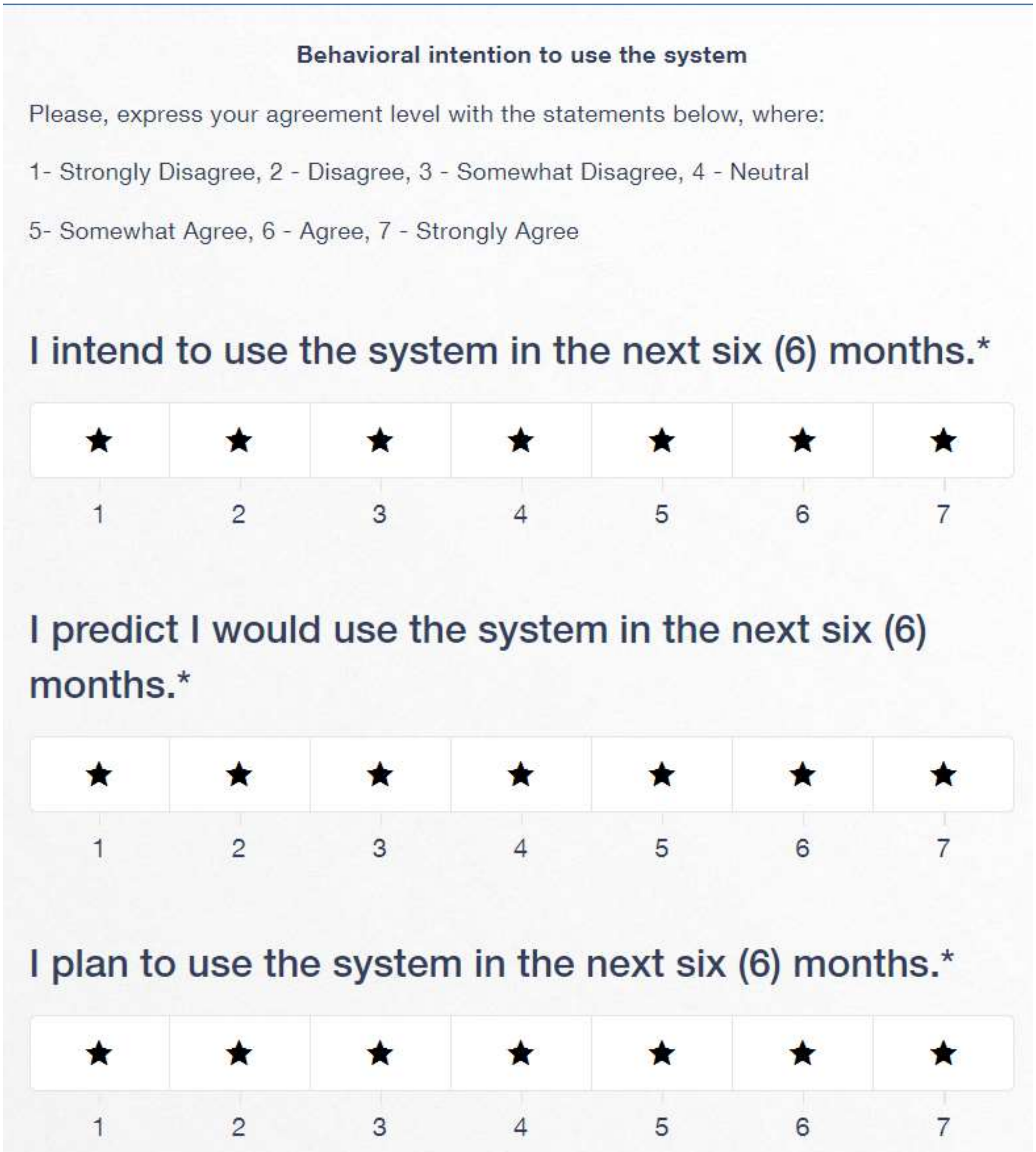
I hesitate to use the system for fear of making mistakes I cannot correct.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

The system is somewhat intimidating to me.*

★	★	★	★	★	★	★

Question Page



Behavioral intention to use the system

Please, express your agreement level with the statements below, where:

1- Strongly Disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Neutral

5- Somewhat Agree, 6 - Agree, 7 - Strongly Agree

I intend to use the system in the next six (6) months.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

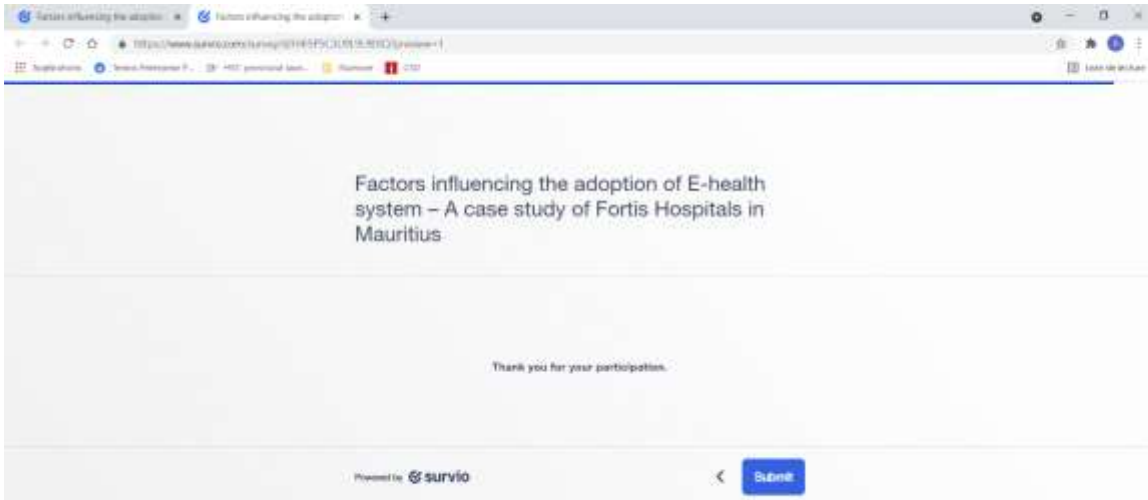
I predict I would use the system in the next six (6) months.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

I plan to use the system in the next six (6) months.*

★	★	★	★	★	★	★
1	2	3	4	5	6	7

Submit Page


Factors influencing the adoption of E-health system – A case study of Fortis Hospitals in Mauritius
Thank you for your participation.
survio
Submit

Appendix L: Mail sent for e-signature for the consent form