UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

User Acceptance of Teleradiology in Kenya: A Case Study of Two Teleradiology Centers in Nairobi County.

BY

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DECLARATION

I declare that this is my original work and has not been presented for a degree in any other University.

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This research project has been submitted for examination with my approval as the University Supervisor

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God bless you all!

ABSTRACT

The general shortage of radiologists in the world and more also in developing countries such as Kenya has made teleradiology to be explored as a potential solution to improving access to radiology services. Teleradiology is a subset of telemedicine that allows medical images to be transmitted and accessed remotely over IT networks for clinical interpretation and diagnosis. Despite the wide adoption of this technology, there are still challenges encountered during implementation such as user resistance.

This study purposed to develop a new technology acceptance model based on the baseline UTAUT model to investigate the determinants of acceptance of teleradiology systems in Kenya. The extended model would be validated using empirical data collected. A cross-sectional exploratory study was used at two teleradiology centers in Nairobi county and questionnaires were used as the main data collection instrument. SPSS software was used to analyze the data collected. Descriptive and Inferential statistics were used to draw the key findings and conclusion of the study.

The total number of valid questionnaires returned was 50 against a target of 60 which represented a response rate of 83% from the two teleradiology centers. Data analysis results showed that all the independent variables jointly accounted for 24.4% of variation in teleradiology acceptance(dependent variable). A significance value (P-value) of 0.002(<0.05) implied that the conceptual model was statistically significant at the 5% significance level. Effort Expectancy was the most significant predictor of teleradiology acceptance in this study.

Theoretically, the findings from this case study can still be leveraged on to explain acceptance of other types of Health Information Systems in other similar settings. Practically, findings from this study have practical significance and contribution to management and system implementation groups on the approaches to use in implementation of HIS.

Key Words: Teleradiology, Acceptance, Information Technology(IT), Unified Theory of Acceptance and Use of Technology (UTAUT) model, Health information System(HIS).

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LIST OF ABBREVIATIONS

BI: Behavioural Intention

CR: Computed Radiography

CT: Computed Tomography

DICOM: Digital Imaging and Communications in Medicine

EE: Effort Expectancy

EMR: Electronic Medical Records

FC: Facilitating Conditions

HIS: Hospital Information System

HIT: Health Information Technology

IDT: Innovation of Diffusion Theory

IS: Information System

IT: Information Technology

MM: Motivational Model

MPCU: Model of PC Utilization

MRI: Magnetic Resonance Imaging

PACS: Picture Archiving and Communication System

PE: Performance Expectancy

SCT: Social Cognitive Theory

SI: Social Influence

TAM: Technology Acceptance Model

TPB: Theory of Planned Behaviour

TRA: Theory of Reasoned Action

UTAUT: Unified Theory of Acceptance and Use of Technology

CHAPTER 1: INTRODUCTION

1.1 Background

1.1.1 Introduction to Teleradiology.

The advancement of IT has brought about the maturity of telemedicine which has improved access to healthcare services (Monteiro et al., 2016). This is in line with the third UN SDG goal which ensures promotion of well-being for all and healthy lives at all ages. Quality essential healthcare access and universal health coverage is one of the specific targets of this goal (SDG 3.8). Telemedicine covers technologies that permit medical professionals to offer their health services to patients or clients who are physically or geographically distant or are not able to travel to the health facilities.

Telemedicine solutions can be used by specialized centers to assist remote physicians to perform certain diagnoses. One of the medicine specializations that has been impacted largely by telemedicine advancements is radiology. Recent research shows that there is a general shortage of radiologists globally despite the increasing demand for radiology services (Mwogi et al., 2018). This necessitated teleradiology to be explored as a potential solution to help improve access to radiology services by patients in both urban and rural areas. Teleradiology is a telemedicine subset where IT has been widely utilized to advance access to radiology services.

Teleradiology, according to the European Society of Radiology, is the digital transmission of radiographic images and patient biodata between geographically dispersed locations for primary interpretation, expert consultation, and clinical evaluation. The patient's biodata can be transferred digitally inside and across institutions, and in certain cases, across national borders. Users of teleradiology are the commonly referred to as tele-radiologists. The European Society of Radiology also defines a tele-radiologist as the physicians providing the reading services from a different location from where the patient’s study was taken (ESR, 2014).

Depending on the relationship between the teleradiologist and the organization acquiring the image, teleradiology can be categorized as either intramural or extramural (Hanna et al., 2020). Intramural or intra-organizational teleradiology is where the teleradiologist interpreting the images is affiliated with the organization that acquires the images as a member of staff. Extramural or extra-organizational teleradiology is where the teleradiologist interpreting the images works for another corporation not affiliated to the organization acquiring the image.

1.1.2 Global Growth and Adoption of Teleradiology.

Teleradiology may have originated in the United States, but it has since grown rapidly around the world (Krupinski, 2014). It started in the mid-1990s and grew over the decades catalyzed by technology advancements and global market forces (Hanna et al., 2020). By 2014, teleradiology was a well-established telemedicine practice being utilized in over 70% of radiology practices in the United States of America and around the world (Krupinski, 2014). According to a 2016 poll by the European Society of Radiology, 74% of teleradiologists practice intramural teleradiology and 71% practice extramural teleradiology (Hanna et al., 2020).

According to a recent study done by the members of the American College of Radiology, 84% teleradiologists used teleradiology for internal examinations and 46% of teleradiologists used teleradiology for external examinations (Hanna et al., 2020). This evidence implies that teleradiology has been well adopted globally. Teleradiology is still growing with the teleradiology global market expected to rise from USD 7.9 billion in 2020 to USD 22.8 billion by 2025, according to teleradiology market reports (marketsandmarkets.com, 2020). These figures may even go higher because of the Covid-19 pandemic that has propelled adoption of many telemedicine practices in a bid to avoid the spread of the deadly virus from the patient to the medical practitioners.

1.1.3 Teleradiology Adoptions in Kenya

Since the inaugural effort in 2001, there has been a substantial rise in the use of eHealth interventions in Kenya (Kenya National eHealth Policy 2016-2030, 2016). This tendency may be ascribed to the government's acknowledgment of ICT as a vital facilitator of social, economic, and political growth. This has also been motivated by the seeming benefits of technology such as improved quality of healthcare, cost reduction, better working environment for staff and patient satisfaction. E-health applications include those that improve illness prevention, provide quick patient diagnosis, and improve patient care. Electronic Medical Records Systems, Health Knowledge Management Systems, M-Health, and generic Healthcare Information Systems are examples applications (Boore, 2018).

Kenya's healthcare system is undergoing a paradigm change in which services are being delegated to counties. This necessitates new ways of managing the industry in order to improve service delivery. This is being accomplished through using techniques that use ICT in the delivery of healthcare services (Boore, 2018). One of the e-health interventions that the government has invested in teleradiology. This has been propelled by the rising demand for radiological services caused by the global and local scarcity of radiologists, with the shortfall being exacerbated in poorer nations like Kenya (Mwogi et al., 2018). To address the shortage of radiologists in Kenya, the government of Kenya has invested heavily on having a national teleradiology center at the main referral hospital.

In 2015, the Kenyan Government invested heavily in equipping at least all county and national referral hospitals with advanced medical imaging equipment such as X-ray, CT Scan and MRI Scan machines (Mwogi et al., 2018). This laid the backbone infrastructure for the adoption of teleradiology in Kenya. In March 2020, the Kenyatta National Hospital then launched a diagnostic and reporting center which incorporates a medical teleconferencing facility and artificial intelligent teleradiology center. Through this, the medical practitioners would connect live to Wuhan China for timely demonstrations in treatment of COVID-19 and leverage on teleradiology to capture & interpret COVID-19 CT scans remotely from the 47 counties of Kenya.

In November 2016, the International Organization for Migration, the UN Migration Agency, also established a regional Teleradiology hub in Nairobi to advance the health assessment of migrants and refugees. The center uses innovative technologies such as Picture Archiving and Communication Systems (PACS), web based CXR reporting applications, and live chat for real-time support. More private organizations and companies have come up with privately owned teleradiology centers that provide digital imaging and interpretation services to clients such as insurance companies and even hospitals in the country.

In general, Teleradiology has simplified diagnostic imaging and reporting; nonetheless, teleradiology implementation and adoption, like many other healthcare IT initiatives, requires change management to alleviate user resistance and enhance acceptability (Karuri, 2015). If people reject IT systems, even the greatest and most costly ones will fail. Human factors have been recognized as a significant element impacting the effective adoption of information systems, according to a previous literature study, more than 40% of IT advances in various sectors, including the health sector, have failed or been abandoned (Karuri, 2015).

Teleradiology systems, like any other healthcare IT systems, require significant investment of financial resources to establish. Teleradiology global market is expected to reach rise from USD 7.9 billion in 2020 to USD 22.8 billion by 2025 (marketsandmarkets.com, 2020). Given the human aspects and the rising financial resources being dedicated to teleradiology adoption, a technology acceptance study becomes even more critical to assure a successful implementation of such systems so that maximum benefits are realized.

1.2 Problem Statement

There is a general shortage of radiologists in the world and even more in developing countries despite the increasing demand for radiology services(Mwogi et al., 2018). Mwogi found out that in Kenya, the number of qualified radiologists is only 13-38% of those needed to serve the entire country's population. Mwogi continues to say that even the few radiologists that are there tend to be concentrated in the urban areas compared to rural areas. To address this deficiency of radiologists, teleradiology was explored as a potential solution to improve access to radiology services.

There are numerous benefits brought about by teleradiology but despite the benefits, there are still challenges in implementation and adoption of such technology such as the need to re-organize the workflow, the high costs associated with setup and resistance by end users to accept the technology. The last challenge on user acceptance forms the basis for this research. Human factors have been recognized as a significant element impacting the effective adoption of information systems, according to a previous literature study, more than 40% of IT advances in various sectors, including the health sector, have failed, or been abandoned (Karuri, 2015).

Even though there are many models and theories developed and tested to understand the issues in acceptance and adoption of healthcare technologies such as Electronic Medical Records (EMR), there is still a need to extend such research to other types of healthcare technologies such as teleradiology (Karuri, 2015). The fact that there is also existing technology acceptance research on teleradiology and PACS systems in developed countries, they do not consider the different factors in the context of developing countries. These knowledge gaps present a research opportunity to evaluate the level of acceptance and use of teleradiology systems in developing countries like Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this research is to extend the knowledge and understanding of healthcare technology acceptance by developing a model to investigate the factors that influence teleradiology acceptance in Kenya.

1.3.2 Specific Objectives

The specific objectives of this research are to:

i. Develop a technology acceptance model based on the baseline UTAUT to investigate on the factors that influence teleradiology acceptance in Kenya.
ii. Validate the model using empirical data collected from two teleradiology centers in Nairobi County.

1.3.3 Research Questions

The following research questions have been formulated to guide the process of addressing above objectives:

i. What are the critical factors that determine teleradiology acceptance success in Kenya?
ii. How can existing technology acceptance models be leveraged upon to study contribution of the identified factors to acceptance of teleradiology systems in Kenya?
iii. Which of the identified factors are most influential in contributing to the acceptance of teleradiology systems in Kenya?

1.4 Scope of the Study

This study sought to extend the UTAUT model and validate it using data collected from two teleradiology centers only. This was in view of the time allocated to undertake the research study and also the proximity and ease of data collection for these specific sites. The study's data will be limited to these two centers based on the criteria of implementing teleradiology.

1.5 Assumptions of the Study

One of the assumptions of the study was that there would be specific type of teleradiology system being investigated since most organizations use different teleradiology software. The basic requirement would be that at least each of the two centers have implemented a teleradiology system that is based on the Picture Archiving and Communication System, whether locally hosted ot hosted on the cloud. Another assumption of the study is that users of teleradiology systems would not be restricted only to radiologist even if they are primary users. This study would also consider anyone else who interacts with these systems and collect data from them as well.

1.6 Justification of The Study

User resistance to technology is a huge blockade that can cause even the best and most resource intensive information technologies to fail (Goodarzi et al., 2016). Theoretically, this research will help to extend the baseline UTAUT model (Venkatesh et al., 2003) to study acceptance and use of a new technology artifact in a new organizational setting. Practically, undertaking this research will explain how users adopt and use teleradiology in the healthcare sector and will play an important role in ensuring effective implementation of such systems. By understanding the factors that determine the level of user acceptance and use of teleradiology systems, healthcare management will be able to plan for the different implementation approaches to use and more effective use of such systems to ensure successful adoption and thereby maximize on the benefits of such systems.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on topics that are pertinent to this research project. A conceptual model is also presented to guide the research project.

2.2 Teleradiology Concept

Telemedicine covers technologies that permit medical professionals to offer their health services to patients or clients who are physically or geographically distant, or are not able to travel to teleradiology centers (Monteiro et al., 2016). This becomes a crucial practice that can have a lifesaving effect since medical professionals can offer their services anytime and anywhere especially in places where the population is scattered. Telemedicine solutions can also be used by specialized centers to assist remote physicians to perform certain diagnoses. Advancement of IT has brought about maturity of telemedicine which has improved access to healthcare services (Monteiro et al., 2016).

Teleradiology is a telemedicine subset where information technologies have been widely applied to advance access to radiology or imaging services. The exchange of the radiological image and patient biodata digitally in different geographical location with an aim of primary interpretation, expert consultation and clinical review according to the European Society of Radiology is what is referred to as Teleradiology (ESR, 2014). There are two primary service models in which teleradiology is categorized according to Routsalainen (2010). A first model is an approach based on message paradigm; this is an approach considered to be common paradigm message (off-line mode). More developed service model is the second type of model. In this model, there is interactive use of Picture Archiving Systems (PACS) in teleradiology systems which is the focus of this study.

2.3 Teleradiology Architecture and Infrastructure

The purpose of a teleradiology architecture is to allow images to be efficiently and securely transmitted from various facilities (transmitting sites) to a central server (receiving site) accessible to the tele-radiologists, allow for notification of relevant radiologists assigned to interpret the image, save the radiology report and finally to allow for notification and viewing of generated report by facilities (Mwogi et al., 2018).

2.3.1 Stakeholder and Policy Considerations

Implementation of a teleradiology architecture needs to be done in close collaboration with the key stakeholders (Mwogi et al., 2018). Policies such as image access rights should be carefully considered to safeguard confidentiality of patient biodata. Mechanisms must also put in place to manage the storage within the central server like having a policy guideline to manage duplicate studies, to specify when to delete old studies and a guideline to optimize the responses to the different modalities.

2.3.2 Picture Archiving and Communication System (PACS)

A Picture Archiving and Communication System (PACS) is an advanced medical image management information system which not only forms a centralized database for all the images and biodata, but also through various modalities, acquires and transmits radiology based images such as X-rays, CT, MRI, and other nuclear medicine-related images to physicians over computer networks, thus replacing the traditional film-based images (Alhajeri et al., 2017). Some of the benefits of PACS include enhancing the operational efficiency and productivity of the medical image service, allowing the accessibility of radiological images from anywhere and anytime, reducing the waiting time and turnaround time for image and reports retrieval , facilitating remote consultations and diagnoses and so on which ultimately leads increased satisfaction of radiology staff and also patients (Aldosari, 2012). Despite all these benefits, there are still challenges in implementation and adoption of PACS technology such as the need to re-organize the workflow, the high costs associated with setup and resistance by end users to accept the technology(Goodarzi et al., 2016). The typical features of a basic local PACS network architecture are illustrated in Figure 2.1 below.

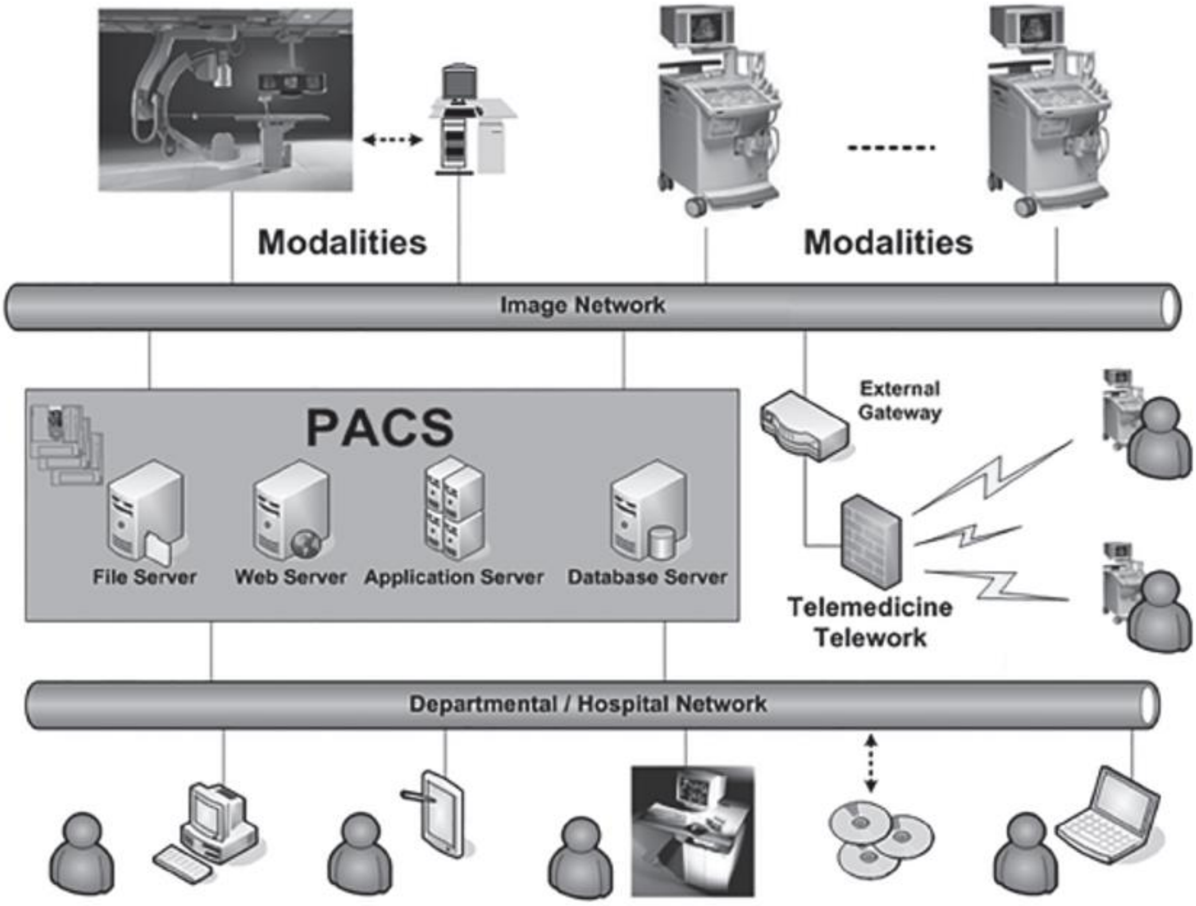

Figure 2. 1: A general PACS architecture. From (Monteiro et al., 2016)

2.3.3 Cloud-Based Picture Archiving and Communication System

Currently, due to the high storage and processing power needed in healthcare IT, there is need for highly scalable infrastructures that can be provided by cloud technology (Monteiro et al., 2016). PACS can now be outsourced to a cloud infrastructure which brings about great impact on teleradiology centers in terms of cost reduction. However, Montero says that despite the advantages of a cloud based PACS architecture, there are still issues related to data confidentiality, data privacy, data availability and data ownership to be considered before migrating a local PACS to the cloud.

2.3.4 Teleradiology Architecture Implementation

There are various ways to implement a teleradiology architecture. A study was carried out by Mwogi et al., (2018) to describe implementation of a scalable low-cost multi-hospital teleradiology architecture. This was a demonstration of a scalable and sustainable health information technology-based approach to improve efficiency and effectiveness of radiology services in settings with limited numbers of radiologists. From the study by Mwogi, the following is a general conclusion on how to implement a teleradiology architecture.

Images are acquired using the DICOM standard from the various modalities including DR, CR, CT, MRI and others. Acquired images are then securely transmitted via TCP/IP network to a central DICOM server, either locally or on the cloud. The central server can run an opensource PACS software such as ClearCanvas DICOM server or DCM4CHEE DICOM server or even a vendor specific and commercial PACS software such as LogiPACS. This software helps the central server to be able to receive the radiological images from the different radiology equipment in the transmitting sites.

The server can be configured in a way that there is separate partition for images originating from each transmitting site. At each of the facility, the radiology equipment or modality is configured to communicate with the central server so that after acquisition of an image, a storage command is triggered immediately to the central server. The image is thus automatically uploaded to the server. The central server then processes each image before storage. Some of the processing can be lossless compression of uncompressed images and checking for bio-data compliance. The images are then made available to the authorized tele-radiologists for reading and interpretation.

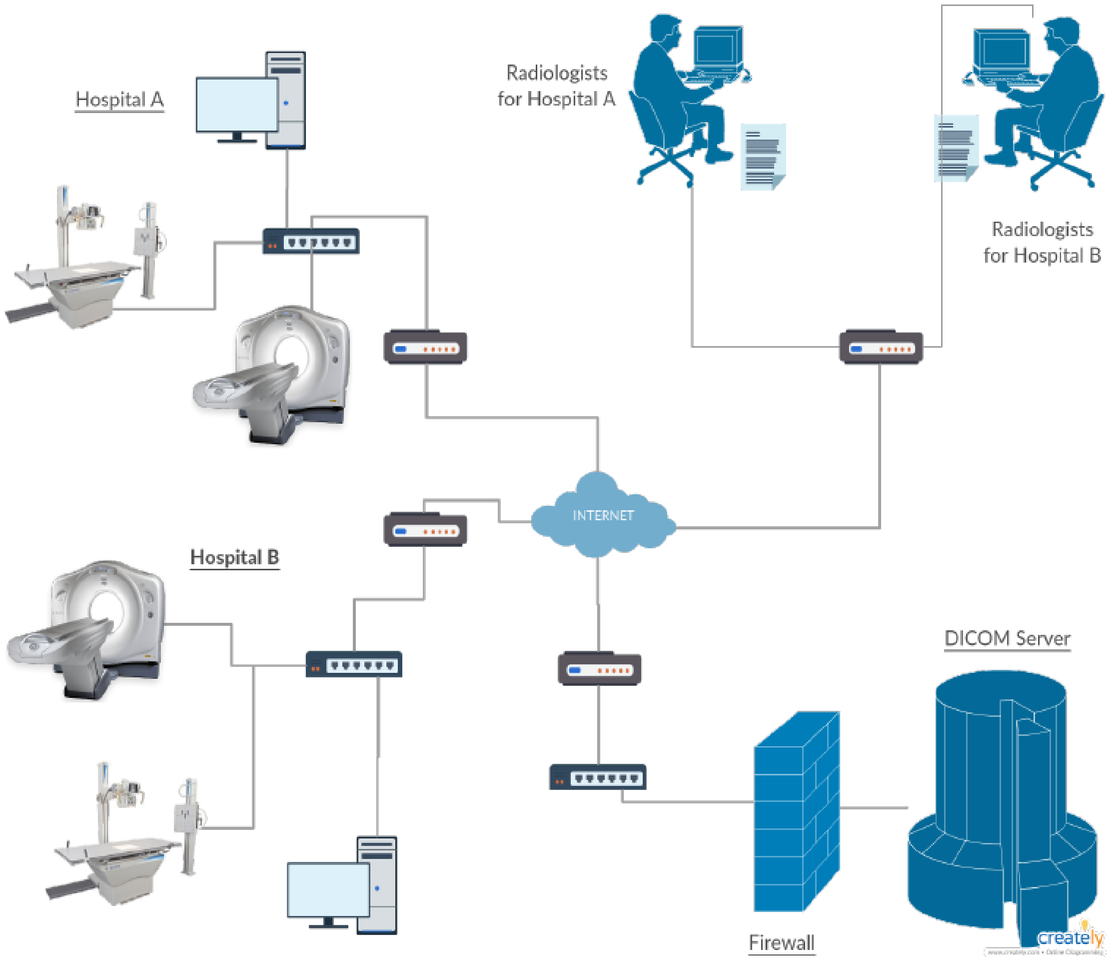

Figure 2. 2: General Teleradiology Architecture. From (Mwogi et al., 2018)

2.4 Theoretical Framework

Research on acceptance of information systems has intensified and researchers are putting more effort in search of the optimal set of variables to predict acceptance (behavioural intention, attitude and use (Pynoo, 2012). This has resulted to the development of various acceptance models originating from different theoretical disciplines such as psychology, and sociology. These models have subsequently been refined and adapted over the past years in a bid to improve their effectiveness in predicting behaviour intention and technology use.

2.4.1 Information Systems Acceptance Theories

Below are some of the prominent theories in use today to predict intention and use of information systems. These theories form the foundational basis for the formulation of the main theory used for this study (UTAUT)

2.4.1.1 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) is a well-established theory for predicting and explaining human behaviour. TRA theorizes that the behavioural intention to perform a behaviour is influenced by a personal factor and a social factor (Fishbein M and Ajzen I, 1975). The personal factor is represented by attitude (ATT), and the assumption is that the attitude comes from beliefs and evaluations and determines an individual's positive or negative feeling toward performing the target behaviour. The social factor is represented by subjective norm (SN). Fishbein and Ajzen (1975) refer to the beliefs that constitute subjective norm as normative beliefs.

Being a generic behaviour theory, it has served as the foundation for explaining and predicting human behaviour in any context. However, researchers identified a limitation in this theory when applied in a contextual setting (Davis, 1989). The biggest contribution by this theory is the Behavioural Intention (BI) construct which is used for predicting actual technology use behaviour. BI is also used in the theories that were developed later based on TRA, namely TPB, TAM and UTAUT. In the test by Venkatesh et al (2003) this theory was only able explain between 19% and 20% of the variance in intention to use technology.

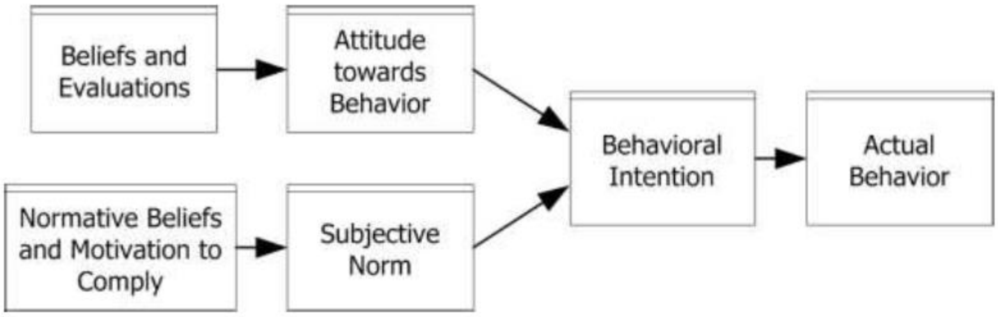

Figure 2. 3 Theory of Reasoned Action (Fishbein M and Ajzen I, 1975)

2.4.1.2 Technology Acceptance Model (TAM)

TAM was designed by Davis in 1989 to predict IT acceptance and usage, and it used the Theory of Reasoned Action (TRA) as its theoretical base. It is the most prominent theory used to explain user acceptance of information systems. It states that a user's attitude towards a technology depends on the *perceived usefulness* of that technology and its *perceived ease of use*. There are several variations of TAM and in many cases, attitude is omitted. The basic TAM consists of two constructs of "*perceived usefulness* (PU)" defined as the degree to which a person believes that using a particular system would enhance his/her job performance, and "*perceived ease of use* (PEOU)" which is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

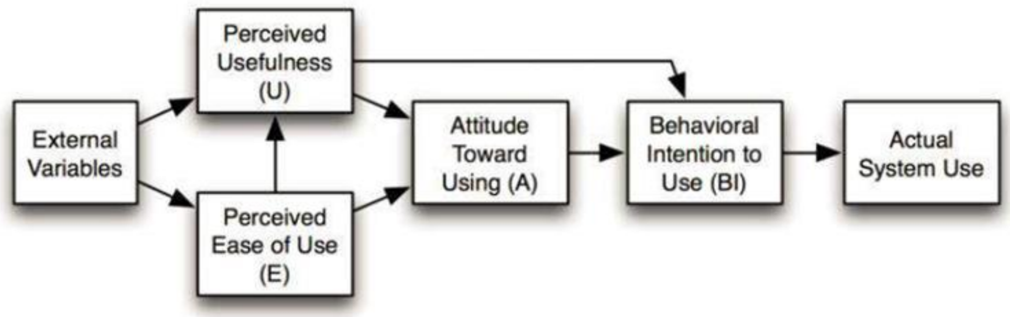

Figure 2. 4: Original Technology Acceptance Model (Davis, 1989)

2.4.1.3 Technology Acceptance Model 2 (TAM2)

TAM2 was developed by integrating antecedents to perceived usefulness, including social influence variables (subjective norm and image) that were not there in the original TAM. It also integrated cognitive instrumental processes variables (job relevance, output quality, and result demonstrability.

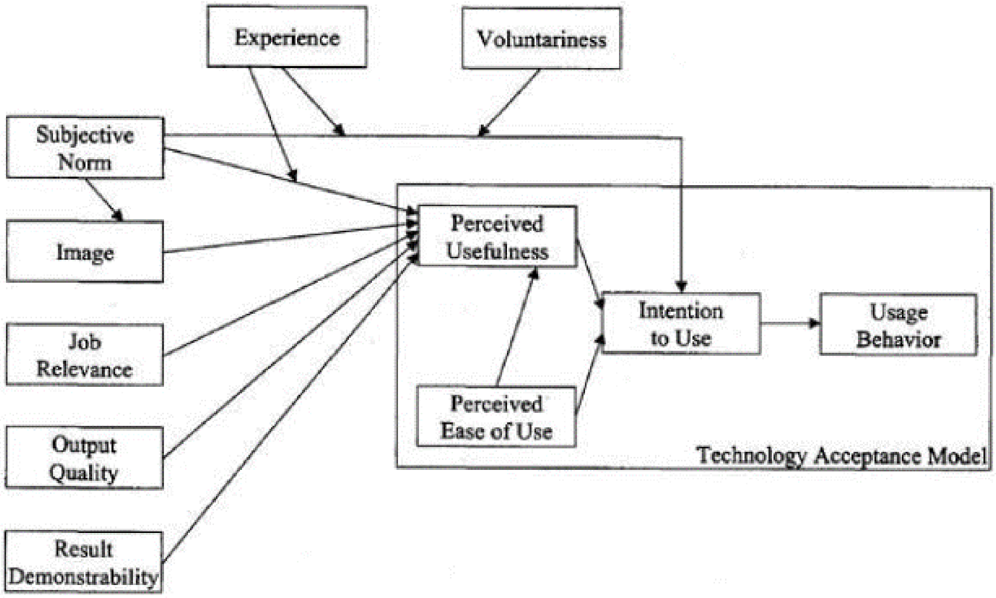

Figure 2. 5: Technology Acceptance Model 2 (Venkatesh & Davis, 2000)

2.4.1.4 Technology Acceptance Model 3 (TAM3)

TAM3 adds *individual differences* and *system characteristics* as antecedents to perceived usefulness and perceived ease of use, next to constructs relating to subjective norms and facilitating conditions (Venkatesh & Bala, 2008). The main difference between UTAUT and TAM3 is that social influence and facilitating conditions are modeled as direct predictors of acceptance in UTAUT, whereas in TAM3 they are modeled as antecedents to perceived usefulness and perceived ease of use.

2.4.2 The Unified Theory of Acceptance Model (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by incorporating factors from eight technology acceptance models including above models (Venkatesh et al., 2003). The UTAUT model was validated by comparing its effectiveness against that of the eight theoretical models for four different IT systems in four different industries, including two voluntary and two mandatory systems. None of these industries however was in the health sector. The model's effectiveness was also examined at three different time periods, namely: after training, one month after implementation, and three months after implementation.

Venkatesh et al (2003) found that none of the tested models could explain more than 50% of the variance in user intentions to use a new technology whereas the combined model was able to explain

69% of intention to use IT (technology acceptance). The model was further cross-validated by applying it to evaluate systems in two additional organizations and demonstrated good predictive ability. When considering the direct effects only, UTAUT was able to explain much less of the variance at 27% of intention to use and 37% of use behaviour only. Due to its proven success in predicting user acceptance, this study will leverage on UTAUT as the foundational model to study teleradiology in Kenya. The four constructs of UTAUT are: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions (Venkatesh et al, 2003).

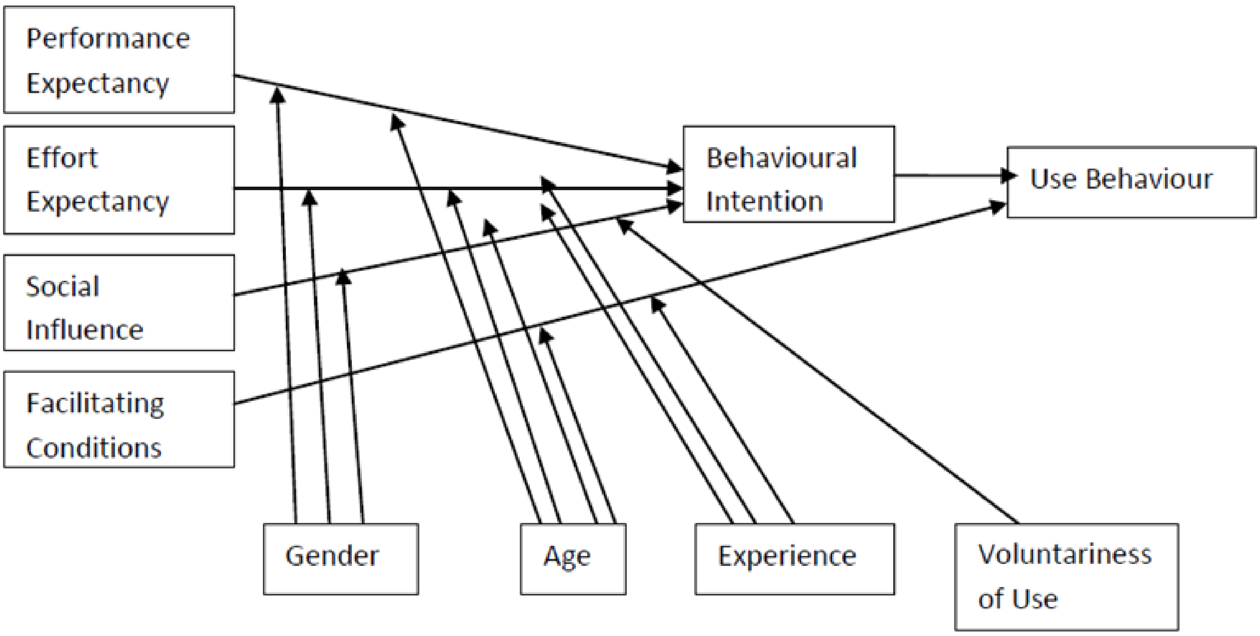

Figure 2. 6: The UTAUT Model (Venkatesh et al. 2003).

2.5 Empirical Research

Literature review reveals that compared with other industries and sectors, user acceptance studies in the health sector are still quite limited, and more so when considering application in developing countries context(Karuri, 2015). Below is a summary of related technology acceptance research in the healthcare sector with the key findings that are relevant to the current research.

Table 2. 1 Empirical Review of Related Acceptance Studies and Their Key Findings

	Research Study	Brief Description	Theory Used	Key Finding and Relevance to Current Study
1	(Karuri, 2015)	Investigated the acceptance and use of DHIS2, among healthcare professional in the Kenyan public healthcare	Modified UTAUT	The study revealed that social influence was the most influential predictor of behavioral intention, while facilitating condition and computer anxiety play a substantial role in predicting DHIS2 acceptance.
2	(Chebole, 2015)	Sought to explore factors that influence the adoption of EMR systems in Kenya by focusing on public health care facilities in Nairobi County	TAM	It was established that Capacity, User Perception and Workload had an influence in the adoption of EMR whereas there was a weak positive insignificant relationship between infrastructure and adoption of EMR
3	(Goodarzi et al., 2016)	Assessed and compared user acceptance of PACS systems in the emergency departments of three different hospitals in Iran and investigated the effect of socio-demographic factors on the acceptance.	Modified TAM	The study found out that PACS is highly accepted in all three hospitals especially among the specialists. Perceived usefulness, perceived ease of use and change were the factors influencing PACS acceptance.
4	(Pynoo et al., 2012)	Investigated the factors that contribute to the acceptance of PACS in Belgium and whether these factors change as the physicians gain experience in use of PACS.	UTAUT	The study revealed that the main motivation for physicians to start using PACS was effort expectancy, whereas performance expectancy only becomes important after the physicians started using PACS.

Note: The related and significant constructs as concluded from these studies are underlined.

2.6 Conceptual Framework

This section outlines the pertinent factors influencing acceptance of teleradiology in Kenya. They form the variables that were used to design the study's conceptual model and hypotheses. Variables adapted from the original UTAUT model were *performance expectancy*, *effort expectancy* and *facilitating conditions*. In addition to drawing out suitable variables from the baseline UTAUT model, the current study strengthened the proposed model by bringing in two variables (*technology experience* and *training adequacy*) from technology acceptance literature. These variables were used as direct determinants of teleradiology acceptance in the current research. *Gender* and *Age* were also incorporated in the study as the moderators of the relationships.

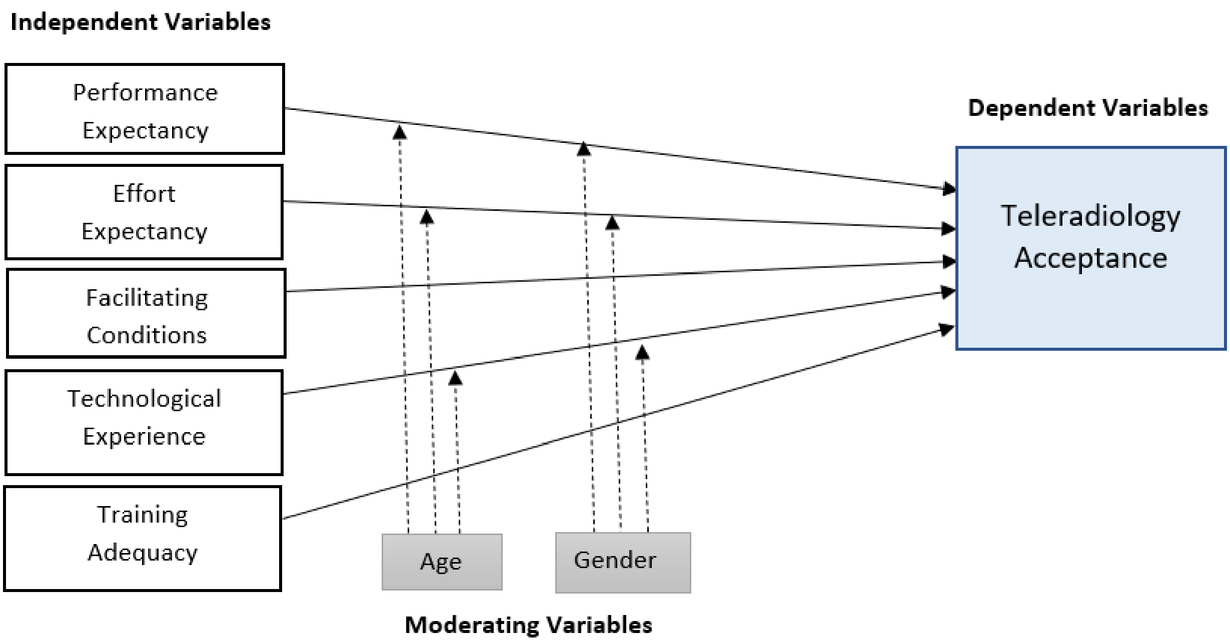

Figure 2. 7: Conceptual Model

2.7 The Study Hypotheses

The following discussions explain the basis on which the study's hypotheses were derived.

2.7.1 Performance Expectancy

PE is defined as the degree to which an individual believes that using a particular technology will help him or her gain in job performance (Venkatesh et al., 2003). This construct is similar to the perceived usefulness (PU) construct in TAM. Previous research on acceptance of health IT has shown that health professionals are more independent when deciding on a technology acceptance, as opposed to their business counterparts mainly because they focus more on usability and what the system can do for them than how easy the system is to use (Chrismar & Wiley-Patton, 2006). Teleradiology is often implemented with the goal of making the radiology department more efficient and improving access to radiology services to patients or clients. Efficiency in a radiology department points to: faster retrieval of patient images, faster reporting by radiologists from any geographical location, more accurate capturing of patient details by radiographers, less or completely no use of film in the department, and finally, overall reduction in operational costs. In the context of teleradiology implementation, PE is therefore the degree to which the end user believes that using teleradiology systems will help him to achieve these goals. The researcher thus proposes:

H1: *Performance Expectancy will have a positive influence on teleradiology acceptance.*

2.7.2 Effort Expectancy

Effort Expectancy (EE) is defined as the degree of ease associated with the use of a system. (Venkatesh et al., 2003). In other technology acceptance models such as TAM, MPCU and IDT, this construct is referred to as Perceived Ease of Use (Davis, 1985), Complexity (Thompson et al., 1991) and Ease of Use (Robey, 1979), respectively. The UTAUT model depicts this construct as having a direct influence on Behavioural Intention (BI) which consequently influences use of the system. This study thus postulates that EE will have a direct influence on the acceptance of teleradiology.

H2: *Effort Expectancy will have a positive influence on teleradiology acceptance.*

2.7.3 Facilitating Conditions

This construct is concerned with the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh et al., 2003). Facilitating conditions incorporates factors such as top management support in increasing the access to the workstations, provision of training or workshops to the users and provision of technical support in case of difficulty in using the system are easy access to workstations, readily available IT support in case of difficulty while using the system. This study thus hypothesizes that:

H3: *Facilitating Conditions will have a positive influence on teleradiology acceptance.*

2.7.4 Technological Experience

Technological experience defined as the duration of past use of computer and the Internet; and the current frequency of using both. In UTAUT model experience is used as a moderating variable but in this study, it will be operationalized as a direct determinant of teleradiology acceptance. This is because evidence from empirical research done by Karuri (2015) suggested that the status of a user's prior technology experience would contribute to their level of computer anxiety which would thus affect the acceptance of the technology. Karuri (2015) concluded that technological experience may be more relevant in the context of developing countries like Kenya due to the prevalent challenges of lagging behind in computerizing of healthcare systems. This study thus hypothesizes that:

H4: *Technology Experience will have a negative influence in the acceptance of teleradiology.*

2.7.5 Training Adequacy

Training adequacy (TA) is defined as the degree to which a user believes that the training he or she received is adequate to enable him use a particular technology effectively (Karuri, 2015). It is anticipated that the more the users perceive the training received to be adequate, the higher will be their acceptance of that technology. Training is expected to increase the individual's belief in their capacity to undertake a certain function, as well as to increase his or her actual ability to use the system.

Adequacy of training will thus help users to become more comfortable while using a technology artifact, and thus impact positively on their behavioural intention and consequently on their actual use of the system (Aggelidis & Chatzoglou, 2009). Thus, this study hypothesizes that:

H5: *Training Adequacy will have a significant positive influence on teleradiology acceptance.*

2.7.6 The Moderators

A moderator variable is one that has some strong effect on an independent variable and dependent variable relationship. The presence of the moderator variable effects some changes in the original relationship between the independent and dependent variables. Gender, age, experience, and voluntariness of use were identified as moderators in the UTAUT model. For our model voluntariness of use was left out as a variable in the assumption that the case study would be undertaken in a mandatory context where there is institution policy for the use of the system. Technology Experience variable was operationalized as a direct determinant of teleradiology acceptance leaving only gender and age as the moderating variables. The following hypotheses summarize some of the expected contribution of the moderating effects.

H6: *The effect of performance expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for men and particularly for younger men.*

H7: *The effect of effort expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women.*

H8: *The effect of technological experience on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women.*

2.8 Operationalization of Variables

The study variables were operationalized to make them measurable by looking at all possible behavioural properties which make up each variable. Each of the variables was measured using one or more measurable element referred to as indicators as shown in Table 2.1 below

Table 2. 2: Operationalization of study Variables

Variable/ Indicator Code	Indicator	References
Performance Expectancy (PE)		(Venkatesh et al., 2003), (Karuri, 2015),
PE1	Time it takes to complete a task	
PE2	Influence of the system on the quality of healthcare	
PE3	Level of efficiency and effectiveness on the job	
PE4	Influence of the system on job productivity	
PE5	Ease of performing a task	
Effort Expectancy (EE)		(Venkatesh et al., 2003), (Karuri, 2015)
EE1	Clarity of the system	
EE2	Ease of learning to use the system	
EE3	Ease of becoming skillful in using the system.	
EE4	Overall ease of system use	
Facilitating Conditions (FC)		(Venkatesh et al., 2003), (Karuri, 2015)
FC1	Availability of necessary hardware to support system use.	
FC2	Availability of Internet	
FC3	Availability of knowledge sources to support system use	
FC4	Availability of technical support in case of system difficulties	
FC5	Effect on how an individual likes working	
Technology Experience (TEx)		(Karuri, 2015), (Mbelwa et al., 2019)
TEx1	Length of time in years/months of computer use	
TEx2	Frequency of computer use in hours per week	
TEx3	Length of time in years/months of Internet use	
TEx4	Frequency of Internet use in hours per week	
Training Adequacy (TAd)		(Karuri, 2015), (Mbelwa et al., 2019)
TAd1	Effectiveness of training in system use	
TAd2	Availability of training reference documents	
TAd3	Adequacy of training received for efficient system use	
TAd4	Need for further training for efficient system use	
Technology Acceptance (TAc)		(Goodarzi et al., 2016), (Aldosari, 2012)
TAc1	Admirability and likability of the system	
TAc2	Ease of learning to use the system	
TAc3	Frequency of complains during system use	
TAc4	Level of proficiency required in System Use.	
TAc5	Cooperation among the personnel during system use	
TAc6	Frequency of mistakes during system use	
TAc7	Effect of system use on working processes	
TAc8	Enjoyability of system use	
TAc9	Preference over traditional paper-based/film-based printing	

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used to achieve the research objectives. It presents the research design and strategy used, target population for the study and the sample size used, the data collection procedure, analysis and research instruments the study adopted.

3.2 Research Design

Research design is essential as it provides structure on how the researcher should collect data and analyze data for the sole purpose of answering questions that caused the study to be undertaken. Research designs are categorized broadly as either qualitative or quantitative. Karuri (2015) says that quantitative research relies heavily on positivism and is most useful when a theory is already established and when individual relationships need to be quantified and validated. On the other hand, qualitative research is based on based on interpretivism, and employs analyses and interpretations of observations for the purpose of discovering underlying meaning and patterns of relationships. This study will be mainly taking the quantitative design.

3.3 Research Strategy

This study employed a multiple case study research strategy of two teleradiology centers in Nairobi County to address the objectives in question. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). Case study designs have been used across a number of disciplines, particularly the social sciences, education, business, law, and health, to address a wide range of research questions (Harrison et al., 2017).

3.4 Target Population

The target population for this study was two teleradiology centers in Nairobi County that have fully adopted teleradiology systems in form of interactive PACS. These facilities will be either government based of private based, but the inclusivity criteria will be the implementation or adoption of teleradiology systems. The researcher chose two teleradiology centers as research sites due to the limited time for this study and due to proximity of the sites.

Table 3. 1: Target Population

Teleradiology center	Population
Public/Government Sector	26
Private/Non-government Sector	41
Total	**67**

3.5 Sampling Size

The study adopted Slovin's formula (Slovin, 1960) to obtain a sample size of 60 participants. The Slovin's formula is given as follows: $n = N/(1+Ne^2)$, where n is the sample size, N is the population size and e is the margin of error to be decided by the researcher. Hair et al. (2006) provides guidelines in sample size estimation to allow generalizability of scientific results. One of the guidelines is that sample sizes larger than 30 and less than 500 are appropriate for most researchers. A sample size of 60 falls within this range according to the guideline.

3.6 Data Collection Instrument

The main data collection instrument for this study was a structured questionnaire comprising of a pre-formulated written set of statements adopted from the UTAUT model with some modifications to enable measurement for all the new variables in the proposed model. The primary purpose of a questionnaire is to obtain valid data from qualified respondents in a bid to meet research objectives and answer research questions. Mugenda (2008) reckons that a questionnaire is a better tool compared to interviews because it can be administered to a large number of respondents simultaneously, it is cheaper, time saving and does not require a lot of expertise to understand. Karuri (2015) also agrees that a structured questionnaire is the most efficient and effective tool for data collection when there are defined variables that require to be measured.

3.6.1 Design and Development of the Research Instrument

The following are the steps that have been taken to design and develop the questionnaire for this study:

i. First, the study objectives were formulated and discussed with research experts to ensure their clarity and their capacity to address the identified research questions.

ii. A review of existing literature on various technology acceptance models was conducted to guide the design of the conceptual model, along with selection of the appropriate variables.

iii. The variables selected were then operationalized to formulate key indicators that would in turn be used to derive the variable measurement statements.

iv. Measurement statements were then derived from the variable indicators and a measurement scale defined as shown in Table 3.2 below. This would form the basis of the final instrument layout.

Table 3. 2: Variable Measurement Statements and Measurement Scale Development

Indicator Code	Measurement Statement	Measurement Scale
Performance Expectancy (PE)		
PE1	Using teleradiology systems will enable me to accomplish tasks more quickly	Likert Scale
PE2	Using teleradiology systems improves the quality of my work in provision of better patient care.	
PE3	Using teleradiology systems increases my efficiency and effectiveness on the job.	
PE4	Using teleradiology systems enhances my job productivity.	
PE5	Using teleradiology systems makes my job easier to perform.	
Effort Expectancy (EE)		
EE1	My interaction with teleradiology systems is clear and easy to understand	Likert Scale
EE2	Learning to use teleradiology systems has been easy for me	
EE3	It is easy to become skillful at using teleradiology systems	
EE4	Overall, I would find teleradiology systems easy to use	
Facilitating Conditions (FC)		
FC1	I have the resources (e.g., computer, diagnostic monitor etc.) necessary to use teleradiology systems.	Likert Scale
FC2	Access to the Internet is available any time I want to use teleradiology	
FC3	I have knowledge sources (e.g., standard operating procedures, consultants) to support my use of teleradiology.	
FC4	There is technical support available for assistance with teleradiology system difficulties.	
FC5	Using teleradiology fits well with the way I like to work	
Technology Experience (TEx)		
TEx1	For how long have you been using a computer?	User Defined Scale
TEx2	Approximately how many hours per week do you use a computer?	
TEx3	How long have you been using the Internet?	
TEx4	Currently, how often do you use the Internet?	
Training Adequacy (TAd)		
TAd1	The training received on teleradiology is very helpful in my use of the system	Likert Scale
TAd2	I have training reference documents that I can consult in my use of teleradiology systems	
TAd3	I feel the training received is adequate for my efficient use of teleradiology systems	
TAd4	I need further training to enable me to use the teleradiology system efficiently	
Technology Acceptance (TAc)		
TAc1	The teleradiology system is admirable and I like it	Likert Scale
TAc2	It is difficult to learn how to use the teleradiology system	
TAc3	Use of the teleradiology system is often annoying and results in my complaining about it.	
TAc4	Use of the teleradiology system requires a high level of proficiency.	
TAc5	There is a lack of cooperation among the personnel when using the teleradiology system.	
TAc6	I rarely make a mistake or commit an error while using the teleradiology system.	
TAc7	Use of the teleradiology system results in a delay in my working processes.	
TAc8	I enjoy working with the teleradiology system.	
TAc9	I prefer the teleradiology system to the traditional system of paper-based and film-based printing.	

3.6.2 Final Research Instrument Layout

The questionnaires will be divided into 2 parts: respondent characteristics questions that will obtain data about the respondent's basic information such as gender and age, and Likert or user defined scale questions to be used in the measurement of the conceptual model variables. All indicator measures except those associated with Technology Experience (TEx) construct will use a 5-Point Likert type scale ranging from strongly agree to strongly disagree. The exception was made for Technology Experience which used a user defined scale as defined by the researcher. A copy the questionnaire is included in Appendix 1.

3.6.3 Pilot Testing

The questionnaire was pre-tested first to make appropriate modifications before embarking on the main study. This was carried out a week prior to the main study. Pilot testing shall entail picking 10 respondents and administering the questionnaire to them to help determine its mechanics and point out any problems with test instructions, instances where items are not clear, help format the questionnaire and remove any noted typographical errors or inconsistencies (Mugenda & Mugenda, 2003). During piloting, the respondents familiarized themselves with the study. Due diligence was taken to ensure that the questions asked in the questionnaires were not too lengthy or so worded that would make respondents unable to follow them.

3.6.4 Validity of Research Instrument

Validity is the accuracy and meaning of inferences which are based on the research results (Patton, 2002). Validity of the research instruments was determined through content validity. Content related validity is ideal for this study since it is consistent with the objectives of the study. Research supervisor from School of Computing and Informatics scrutinized and checked whether research questionnaire measured what they are supposed to measure. Amendments done by research supervisor on the research instrument were made prior to field study.

3.6.5 Reliability of Research Instrument

To measure the reliability coefficient of the research instrument, Cronbach's Alpha reliability coefficient was obtained for all the variables in the study. Cronbach's alpha coefficient is like probability and therefore ranges between zero and one. A coefficient of zero implies that the instrument had no internal consistency while that of one implied a complete internal consistency. Karuri (2015) observed that a reliable research instrument should have a composite Cronbach Alpha Reliability coefficient of at least 0.7 for all items under study. If the composite reliability coefficient is less than 0.7, then the instrument will have to be revised before administration.

3.7 Data Collection Procedure

The researcher sought approval from the necessary authorities and teleradiology centers to conduct research in their institutions. Thereafter, the researcher sought respondents' consent to participate electronically and within the consent, inserted a link to the electronic questionnaire as well. The questionnaire was be disseminated electronically to prevent spread of Covid-19 and to ensure maximum participation since respondents can answer at their free time from their mobile devices.

3.8 Data Analysis

Analysis of the quantitative data collected was done using SPSS software and results presented using descriptive statistics and inferential statistics. The descriptive statistics included standard deviations, means, frequencies and percentages while inferential statistics entailed correlation and multiple regression analysis. The multiple regression analysis consisted of the model summary, analysis of variance (ANOVA) and regression coefficient. The multiple regressions determined the relative importance of each independent variable with respect to Teleradiology Acceptance (dependent variable) and this was determined by the regression coefficients. Correlation analysis determined whether any association existed between the study variables and determination of the nature of the relationships (i.e., whether positive or negative relationship). A measure of whether there existed any statistical significance difference between the means of independent groups was achieved from ANOVA results findings. The multiple linear regression analysis was expressed as follows

$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 \ldots + \beta nXn + \varepsilon$

Where:

Y = Teleradiology Acceptance,

X1 = Performance Expectancy,

X2 = Effort Expectancy,

X3 = Facilitating Conditions,

X4 = Technology Experience,

X5 = Training Adequacy

$\beta 1$, $\beta 2$ and $\beta 3$ are independent variables regression coefficient

ε = is the unexplained variance errors term

3.9 Ethical Considerations

All questionnaires given to the respondents will be anonymized to make sure that their identity is concealed and to ensure the respondents give their honest opinions. All the data collected will only be used for the purposes of completion of this study and before commencement of the data collection, the researcher will seek all the formal permission and authorization needed to conduct the study from the two teleradiology centers.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION OF FINDINGS.

4.1 Introduction

This chapter presents data analysis, findings, and discussions. Data collected to support the objectives of the study were analyzed using Statistical Package for Social Sciences and results presented using descriptive statistics and inferential statistics.

4.2 Response Rate

The sample size of the study was more than 30 but less than 500 respondents. 60 questionnaires were distributed to various professional in the health sector. Data was successfully collected from 45 respondents, which represented a response rate of 75%, while the non-response rate was 25%.

Table 4. 1: Response Rate

Category	**Frequency**	**Percentage**
Response	50	83
Non-Response	10	17
Total	**60**	**100**

4.3 Reliability Tests Results

Cronbach's alpha was used to test the reliability of the questionnaire. The findings indicate that the scales were reliable because their reliability value exceeded a threshold of 0.7. (Cronbach, 1951).

Table 4. 2: Reliability Analysis

Variables	**Cronbach's Value**	**Alpha comments**
Performance expectancy	0.838	Good
Effort expectancy	0.721	Acceptable
Facilitating conditions	0.711	Acceptable
Technology Experience	0.706	Acceptable
Training adequacy	0.741	Acceptable
Teleradiology acceptance	0.757	Good

4.4 Respondents' Demographics

The study captured the following individual attributes of the respondents.

4.4.1 Respondents' Age

As presented in table 4.3, it is evident that most of the respondents were between 30-39 years (46.0%), 22.0% were between 20-29 years, 24.0% were between 40-49 years while 4% were above 50 years and below 20 years.

Table 4. 3: Respondents' Age

Age	Frequency	Percent
Below 20	2	4.0
20-29 years	11	22.0
30-39 Years	23	46.0
40-49 Years	12	24.0
Above 50 years	2	4.0
Total	50	100.0

4.4.2 Respondents' Gender

As presented in table 4.4, it is evident that majority of the respondents were male (56.0%) while female respondents were 44.0%.

Table 4. 4: Respondents' Gender

Gender	Frequency	Percent
Male	28	56.0
Female	22	44.0
Total	50	100.0

4.4.3 Respondents' Profession

As presented in the table 4.5, it is evident that most of the respondents (18.0%) were radiologists, and others, 16.0% were general physicians and radiographers. The least number respondents was evident among sonographer (2.0%) and Teleradiology Administrators (6.0%). The results shows that the respondents were the accurate target group as they had knowledge relevant to the study.

Table 4. 5: Respondents' Profession

Category	Frequency	Percent
Radiologist	9	18.0
General Physician	8	16.0
Radiographer	8	16.0
Sonographer	1	2.0
Imaging Nurse	7	14.0
Teleradiology Data Assistant	5	10.0
Teleradiology Administrator	3	6.0
Other	9	18.0
Total	50	100.0

4.4.4 Respondents' Health Sector

As shown in table 4.6 majority of the respondents (62.0%) worked in Private/Non-government health sector, while 38.0% worked in Public/government sector.

Table 4. 6: Respondents' Health Sector

Category	Frequency	Percent
Public/Government Sector	19	38.0
Private/Non-government Sector	31	62.0
Total	**50**	**100.0**

4.5 Descriptive Statistics

Descriptive statistics was applied to establish the prevalence in the data. The descriptive statistics applied include the mean, percentage and standard deviation. Data was represented in tables.

4.5.1 Performance Expectancy

This study sought to determine the effect of Performance Expectancy on Teleradiology Acceptance. Respondents were provided with statements relevant to performance expectancy and were required to answer to the extent which they agreed with the statements where, 1 is "Strongly agree", 2 is "Agree", 3 is "Neither agree nor disagree", 4 is "Disagree" and 5 is " Strongly disagree". Analysis of the response is shown in Table 4.7.

Table 4. 7: Performance Expectancy and Teleradiology Acceptance

Statement	Mean	Std. Deviation
Use of Teleradiology Systems Makes Job Easier to Perform	1.3556	.60886
Use Of Teleradiology Systems to Accomplish Tasks	1.3556	.57031
Use of Teleradiology Systems Enhances Job Productivity	1.3333	.52223
Use of Teleradiology Systems Improves Quality of Work	1.3111	.51444
Use of Teleradiology Systems Increases Efficiency and Effectiveness	1.3111	.46818

The largest mean score was shown where the respondents agreed they use teleradiology system to make job easier to perform (M=1.3556, SD=0.60886), Use of teleradiology systems to accomplish tasks (M=1.3556, SD=0.57031). The findings suggest that these statements were more prevalent under performance expectancy. The smallest mean was shown where the respondents used teleradiology systems to increase efficiency and effectiveness (M=1.3111, SD=0.46818), and use of teleradiology systems to improve the quality of work (M=1.3111, SD=0.51444). The findings suggest that they were less prevalent under performance expectancy.

4.5.2 Effort Expectancy

Respondents were provided with statements relevant to effort expectancy and were required to answer to the extent which they agreed with the statements, where 1 is “Strongly agree”, 2 is “Agree”, 3 is “Neither agree nor disagree”, 4 is “Disagree” and 5 is “Strongly disagree”. Analysis of the response is shown in table 4.8. The largest mean was evident where learning to use teleradiology systems has been easy (M=2.1111, SD=0.83182) and where it is easy to become skillful at use of teleradiology systems (M=1.9778, SD=0.81153). The findings suggest that the statements were more prevalent under effort expectancy. The smallest mean was evident where overall respondents find teleradiology systems easy to use (M=1.8889, SD=0.95874) and where interaction with teleradiology systems is clear and easy (M=1.5333, SD=0.62523). The findings suggest that the statements are less prevalent under effort expectancy.

Table 4. 8: Effort Expectancy and Teleradiology Acceptance

Statement	**Mean**	**Std. Deviation**
Learning To Use Teleradiology Systems Has been Easy	2.1111	0.83182
It is Easy to Become Skillful at Use of Teleradiology Systems	1.9778	0.81153
Overall, I Find Teleradiology Systems Easy to Use	1.8889	0.95874
Interaction With Teleradiology Systems Is Clear and Easy	1.5333	0.62523

4.5.3 Facilitating Conditions

Respondents were provided with statements relevant to facilitating conditions and were required to answer to the extent which they agreed with the statements, where1 is “Strongly agree”, 2 is “Agree”, 3 is “Neither agree nor disagree”, 4 is “Disagree” and 5 is “Strongly disagree”. Analysis of the response is shown in Table 4.9

Table 4. 9: Facilitating Conditions and Teleradiology Acceptance

Statement	Mean	Std. Deviation
Technical Support Is Available for Assistance with Teleradiology	2.0000	1.02247
Access to Internet Is Available	1.8667	1.14018
I have the Resources to Use Teleradiology Systems	1.8444	.99899
I have Knowledge Sources to support use of Teleradiology Systems	1.7778	.82266
Using Teleradiology systems fits well with the way I like to work	1.6667	.73855

The largest mean was evident where technical support is available for assistance with technology (M=2.0000, SD=1.02247) and access to internet (M=1.8667, SD=1.14018). The findings suggest that the statements were more prevalent under facilitating conditions. The smallest mean was evident where using teleradiology systems fits well the way I like to work (M=1.6667, SD=0.73855) and the respondents had knowledge sources to support use of teleradiology systems (M=1.7778, SD=0.82266). The findings suggest that the statements were less prevalent under facilitating conditions.

4.5.4 Technology Experience

Technology experience refers to the duration of past use of computer and internet; and the current frequency of using both. The study sought to determine the effect of technology experience on Teleradiology acceptance. Respondents were provided with statements relevant to technology experience and were required to answer to the extent which they agreed with the statements where,1 is “Strongly agree”, 2 is “Agree”, 3 is “Neither agree nor disagree”, 4 is “Disagree” and 5 is “ Strongly disagree”. Analysis of the response is shown in table 4.10.

Table 4. 10: Technology Experience and Teleradiology Acceptance

Statement	Mean	Std. Deviation
Approximately How Many Hours Per week do you use a computer	6.3778	1.02888
Currently How Often Do You Use the Internet	5.8222	.64979
Duration of internet use	5.7556	.64511
For how long you have been using a computer	5.7333	.80904

The largest mean was evident in how many hours per week the respondents use a computer (M=6.3778, SD=1.02888) and how they often use the internet (M=5.8222, SD=0.64979). The findings suggest that the statements were more prevalent under technology experience. The smallest mean was evident in how long the respondents have been using a computer (M=5.7333, SD=0.80904) and the duration of internet use (M=5.7556, SD=0.64511). The findings suggest that the statements were less prevalent under technology experience.

4.5.5 Training Adequacy

Training adequacy refers to the degree to which a user believes that the training he or she received is adequate to enable him to use a particular technology effectively. The study sought to determine the effect of training adequacy on teleradiology acceptance. Respondents were provided with statements relevant to technology experience and were required to answer to the extent which they agreed with the statements where,1 is "Strongly agree", 2 is "Agree", 3 is "Neither agree nor disagree", 4 is "Disagree" and 5 is " Strongly disagree". Analysis of the response is shown in table 4.11.

Table 4. 11: Training Adequacy and Teleradiology Acceptance

Statement	Mean	Std. Deviation
I need further training to enable me to use the teleradiology systems	2.7333	1.28629
I have training reference documents that i consult in my use of teleradiology systems	2.4889	1.01404
I feel the training received is adequate for my efficient use of teleradiology systems	2.1111	.80403
The training received on teleradiology is very helpful in my use of the system	1.7778	.90174

The largest mean was evident in respondents need for further training to enable them use teleradiology systems (M=2.7333, SD=1.28629) and having training reference documents to consult in use of teleradiology systems. The findings suggest that the statements were more prevalent under training adequacy. The smallest mean was evident where the respondents feel training received is on teleradiology is very helpful for use of the system (M=1.7778, SD=0.90174) and feeling the training received is adequate for efficient use of teleradiology systems (M=2.1111. SD=0.80403). The findings suggest that the statements were less prevalent under training adequacy.

4.5.6 Teleradiology Acceptance

The study sought to determine the importance of each independent variable considered against teleradiology acceptance. Respondents were provided with statements relevant to technology experience and were required to answer to the extent which they agreed with the statements where,1 is “Strongly agree”, 2 is “Agree”, 3 is “Neither agree nor disagree”, 4 is “Disagree” and 5 is “ Strongly disagree”. Analysis of the response is shown in table 4.12.

Table 4. 12: Teleradiology Acceptance

Statement	Mean	Std. Deviation
Use of Teleradiology system results in delay in my working	3.9111	.97286
There is lack cooperation among the personnel when using the Teleradiology System	3.8444	1.04350
Use of The Teleradiology System is often Annoying and results in my complaining about it	3.7778	.97442
It Is generally difficult to learn how to use Teleradiology Systems	3.5333	.94388
I rarely make a mistake or commit and error while using the Teleradiology System	3.1111	1.00504
Use of Teleradiology System Requires high level of proficiency	2.4000	1.09545
I Enjoy working with teleradiology system	1.6889	.82082
I prefer Teleradiology system to the traditional system of paper-based and film-based printing	1.6667	.90453
The Teleradiology System I Use is Admirable	1.6667	.79772

Based on the findings in the table, the largest mean was evident that use of teleradiology system results in delay in my working (M=3.9111, SD=.97286) and there is lack cooperation among the personnel when using the Teleradiology System (M=3.8444, SD=1.04350). The smallest mean was evident that the teleradiology system in use are admirable (M=1.6667, SD=0.79772) and the respondents prefer teleradiology system to the traditional system of paper-based and film-based printing (M=1.6667, SD=0.90453). The findings indicate the statements that were inclined towards teleradiology acceptance as well as those that were less inclined towards teleradiology acceptance.

4.6 Inferential Statistics

The study applied inferential statistics to establish the relationship between the independent variables and the dependent variables as well as the moderating effect of the relationships. Regression analysis tests and correlation analysis tests were carried out to analyze the data and test the hypotheses.

4.6.1 Regression Analysis

The role of each factor as well as the joint effect of all the factors on teleradiology acceptance was determined through multiple regression analysis. Regression analysis was appropriate for the study because it helps to predict a continuous dependent variable from a number of independent variables.

4.6.1.1 Model Summary

The model summary of the multiple linear regression on the combined independent variables and the dependent variable is illustrated in Table 4.13

Table 4. 13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.496[a]	.246	.187	.42705

a. Predictors: (Constant), Training Adequacy, Performance Expectancy, Technology Experience, Effort Expectancy, Facilitating Conditions

b. Dependent Variable: Teleradiology Acceptance

The model summary indicates that all the five independent variables jointly accounted for 24.6% (R-square=.246) of variation in Teleradiology Acceptance (dependent variable). This means that the other factors not studied in this study contribute 75.4% of variance in teleradiology systems acceptance. The model summary of the multiple linear regression on each of the independent variables and the dependent variable is illustrated in Table 4.14

Table 4. 14: Independent Variables Model Summary

Independent Variable	R	R Square	Adjusted R Square	Std. Error of the Estimate
Performance Expectancy	.094[a]	.009	.006	.47498
Effort Expectancy	.410[a]	.168	.156	.43511
Facilitating Conditions	.300[a]	.090	.706	.45518
Technology Experience	.380[a]	.144	.132	.44133
Training Adequacy	.188[a]	.035	.021	.46862

R square value of 0.009 shows that Performance expectancy as an independent variable explains 0.9% of variance in teleradiology acceptance. R square value of 0.168 shows that effort expectancy as an independent variable explains 16.8% of variance in teleradiology acceptance. R square value of 0.090 shows that facilitating conditions explains 9% of variance in teleradiology acceptance. R square value of 0.144 shows that technology experience explains 14.4% of variance in teleradiology acceptance while R square value of 0.035 shows that training adequacy explains 3.5% of variance in teleradiology acceptance.

4.6.1.2 Analysis of Variance (ANOVA)

Table 4. 15: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.945	5	.761	4.174	002[b]
Residual	37.975	44	.182		
Total	43.920	49			

a. **Dependent Variable:** TAc
b. Predictors: (Constant), TAd, PE, TEx, EE, FC.

The results show that the P value was 0.002 which is less than 0.05 thus showing that the independent variables; Training adequacy, Performance Expectancy, Technology Experience, Effort Expectancy, Facilitating Conditions have a significant influence in acceptance of teleradiology systems. If the P value was greater than 0.05 significant value, then the independent variables would not explain the variation in the dependent variable. F value of 4.174 with a significant level of 0.002 is enough to conclude that the independent variables significantly influence acceptance of teleradiology systems.

4.6.1.3 Regression Coefficients

The results indicated in Table 4.13 show the regression coefficients of the regression model that was used to predict the effect of the independent variables on Teleradiology Acceptance and in effect test the hypotheses. Regression coefficients are represented by β (Beta) values.

Table 4. 16: Regression Coefficients

		Unstandardized Coefficients		**Standardized Coefficients**		
Model		**β**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	4.220	.824		5.124	.000
	Performance expectancy	.017	.148	.013	.113	.011
	Effort expectancy	.160	.102	.216	1.568	.022
	Facilitating conditions	.077	.096	.129	.803	.027
	Technology experience	.155	.093	.199	1.233	.002
	Training adequacy	.171	.091	.224	1.875	.015

a. Dependent Variable: Teleradiology Acceptance

As presented in Table 4.16, Performance Expectancy had a beta coefficient of 0.017 which was found to be positive at 0.011 significant level. Effort Expectancy had a beta coefficient of 0.160 which was found to be positive at 0.022 significant level. Facilitating Conditions had a beta coefficient of 0.77 which was found to be positive at 0.027 significant level. Technology Experience had a beta coefficient of 0.155 which was found to be positive at 0.002 significant level. Training Adequacy had a beta coefficient of 0.171 which was found to be positive at 0.015 significant level. These P-values are all less than 0.05, implying that all the independent variables significantly determined the acceptance of teleradiology systems. The regression model generated was thus expressed as:

$$\mathbf{Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + \varepsilon}$$

$$Y = 4.220 + 0.017X_1 + 0.160X_2 + 0.077X_3 + 0.155X_4 + 0.171X_5 + \varepsilon$$

Y = Teleradiology Acceptance,

X_1 = Performance Expectancy,

X_2 = Effort Expectancy

X_3 = Facilitating Conditions,

X_4 = Technology Experience,

X_5 = Training Adequacy

4.6.2 Correlation Analysis

In addition to testing the direct predictors of the relationships the study also sought to establish the effects of two moderating variables on the direct relationships. This was done using 2-tailed Pearson's Correlation analysis as shown in Table 4.17.

Table 4. 17: Correlations Analysis

		Age	**Gender**	**Performance Expectancy**	**Effort Expectancy**	**Technological Experience**
Age	Pearson Correlation	1	-.271*	.037	.104	.365**
	Sig. (2-tailed)		.023	.763	.029	.002
	N	50	50	50	50	50
Gender	Pearson Correlation	-.271*	1	.079	.260*	.202
	Sig. (2-tailed)	.023		.515	.030	.094
	N	50	50	50	50	50

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

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

4.7 Discussion of the Findings

4.7.1 Factors Contributing to Teleradiology Acceptance

Data findings from Table 4.16 show that Performance Expectancy had a regression coefficient of β=0.017 and a significance value of p=0.011 implying that the Performance Expectancy positively and significantly predicted teleradiology acceptance. In a study by Goodarzi et al. (2016), Perceived Usefulness which is similar to Performance Expectancy in UTAUT model had the highest significance to acceptance of PACS systems. A unit increase in Performance Expectancy in the current study would lead to a 0.017 increase in acceptance of teleradiology systems thus **H1:** *"Performance Expectancy will have a positive influence on teleradiology acceptance"* was supported.

The findings further indicated that Effort Expectancy had a regression coefficient of β=0.160 and significance value of p=0.022 implying that Effort Expectancy positively and significantly predicted the acceptance of teleradiology systems. Effort expectancy also positive significance in a study that was carried out to evaluate the acceptability of PACS among hospital healthcare based on UTAUT model (Ahmadi et al., 2017). There was also a significant association between Effort Expectance and a health worker's intention to use DHIS2 in Kenya (KARURI et al., 2017). In this study, a unit increase in Effort Expectancy would lead to a 0.160 increase in acceptance of teleradiology system, therefore **H2:** *"Effort Expectancy will have a positive influence on teleradiology acceptance"* was supported.

The findings show that Facilitating Conditions had a regression coefficient of β=0.077 and significance value of p=0.027 implying that Facilitating condition has a positive and significant influence on Teleradiology acceptance. This is in line with acceptance studies carried out by Ahmadi et al. (2017) and Karuri et al. (2017). (Pynoo et al., 2012)A unit increase in facilitating conditions would lead to a 0.077 increase in acceptance of teleradiology systems, thus **H3:** "*Facilitating Conditions will have a positive influence on teleradiology acceptance"* was supported.

The findings also show that Technology Experience had a regression coefficient of β=0.155 and a significance value of p=0.002 implying that Technology Experience positively and significantly influenced Teleradiology Acceptance. This is in line with Karuri et al (2017) evaluated the influence of Technology Experience on use of DHIS2 in Kenya. In her study, she used Computer Anxiety as an intervening variable to determine the influence of Technology Experience to use of DHIS2. In this study Technology experience was evaluated as a direct determinant of Teleradiology Acceptance and it was found that a unit increase in technology experience would lead to a 0.155 increase in acceptance of teleradiology systems therefore **H4:** *"Technology Experience will have a negative influence in the acceptance of teleradiology"* was not supported.

The findings also show that Training Adequacy had a regression coefficient of β=0.171 and a significance value of p=0.015 implying that Training Adequacy positively and significantly influenced Teleradiology Acceptance. This may be attributed to the fact that users of teleradiology systems were well trained at the time of study. This is contrary to findings from Karuri (2015) that concluded that Training Adequacy had a positive influence but had no statistical significance to behavioral intention and use of DHIS2 in Kenya. This was also contrary to findings from a study that found out that training adequacy does not have a significant influence on the use of mobile health applications (Mbelwa et al., 2019). From the data findings, a unit increase in training adequacy would lead to a 0.171 increase in acceptance of teleradiology systems therefore **H5:** *"Training Adequacy will have a significant positive influence on teleradiology acceptance"* was supported.

From the results on the correlation coefficient between age and Performance Expectancy, there is a positive correlation between age and performance expectancy, r(50) = 0.037, P= 0.763 This indicates a moderate linear relationship between age and performance expectancy and the relationship is not statistically significant (P>0.05). This is contrary to findings by Karuri(2015) that found that the relationship between age and performance expectancy was found to be stronger for older men rather for young men. That meant that there existed a statistical relationship between age and performance expectancy. There is positive correlation between gender and performance expectancy, r(50) = 0.079, P= 0.515. This indicates a moderate linear relationship between gender and performance expectancy and the relationship is not statistically significant (P>0.05) thus **H6:** *"The effect of performance* *expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for men and particularly for younger men"* was not supported.

From the results on the correlation coefficient between age and effort expectancy, there is a positive correlation between age and effort expectancy, r(50) = 0.104, P= 0.029. This indicates a weak linear relationship between age and effort expectancy and the relationship is statistically significant (P<0.05). There is a positive correlation between gender and effort expectancy, r(50) = 0.260, P =0.030. This indicates a weak linear relationship between gender and effort expectancy and the relationship is statistically significant (P<0.05) thus **H7:** *"The effect of effort expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women "*was supported. This was similar to study findings by Karuri(2015) that showed that the moderated path relationship of effort expectancy on behavioural intention was moderated by age such that the effect was stronger for women and especially younger men.

There is a positive correlation between age and technological experience, r(50) =0.365, P=0.002. This indicates a very weak linear relationship between age and technological experience and the relationship is statistically significant (P<0.05). There is a positive correlation between gender and technological experience, r(50) =0.202, P= 0.094. This indicates a very strong linear relationship between gender and technological experience and the relationship is not statistically significant (P>0.05) thus **H8: "***The effect of technological experience on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women"* was not supported. This is similar to the findings from Karuri (2015) that showed that the effect of computer anxiety on behaviour intention was not moderated by either gender or age. Technology Experience had a negative influence on Computer Anxiety. Table 4.18 below shows a summary of the hypotheses and the test results.

Table 4. 18: Summary of Hypothesis Testing

Hypothesis	Relationship	Result
Performance Expectancy will have a positive influence on teleradiology acceptance	H1	Supported
Effort Expectancy will have a positive influence on teleradiology acceptance	H2	Supported
Facilitating Conditions will have a positive influence on teleradiology acceptance	H3	Supported
Technology Experience will have a negative influence in the acceptance of teleradiology	H4	Not supported
Training Adequacy will have a significant positive influence on teleradiology acceptance	H5	Supported
The effect of performance expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for men and particularly for younger men	H6	Not supported
The effect of effort expectancy on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women	H7	Supported
The effect of technological experience on teleradiology acceptance will be moderated by gender and age, such that the effect will be stronger for women and particularly for younger women	H8	Not Supported

4.7.2 Revised model for Acceptance of Teleradiology Systems in Kenya

The findings from this study are clear evidence that the factors provided by the extended model on their own are not adequate to predict the acceptance of Teleradiology systems in Kenya. There is therefore a need to explore the contribution of other factors in explaining the variance in Teleradiology Acceptance in Kenya. Even though the original factors existing in UTAUT were also included in the extended model, it was apparent that the strength of contribution of most of these factors was contrary to what had been found when UTAUT model was tested in different contexts.

The researcher adapted the original UTAUT model by adding extra factors from review of other literature studies (Technology experience and Training Adequacy). The new factors were added to the existing factors in UTAUT to formulate a conceptual research model for predicting acceptance of teleradiology systems in Kenya. After model analysis, the extended model was revised, and the non-significant factors dropped from the model. Figure 4.1 below is an illustration of the revised model after the data analysis findings. Overall, the 5 direct factors were able to contribute to 24.6% of variation in acceptance of teleradiology systems with Effort Expectancy being the most significant factor that contributed 16.8% of variation in Teleradiology Acceptance.

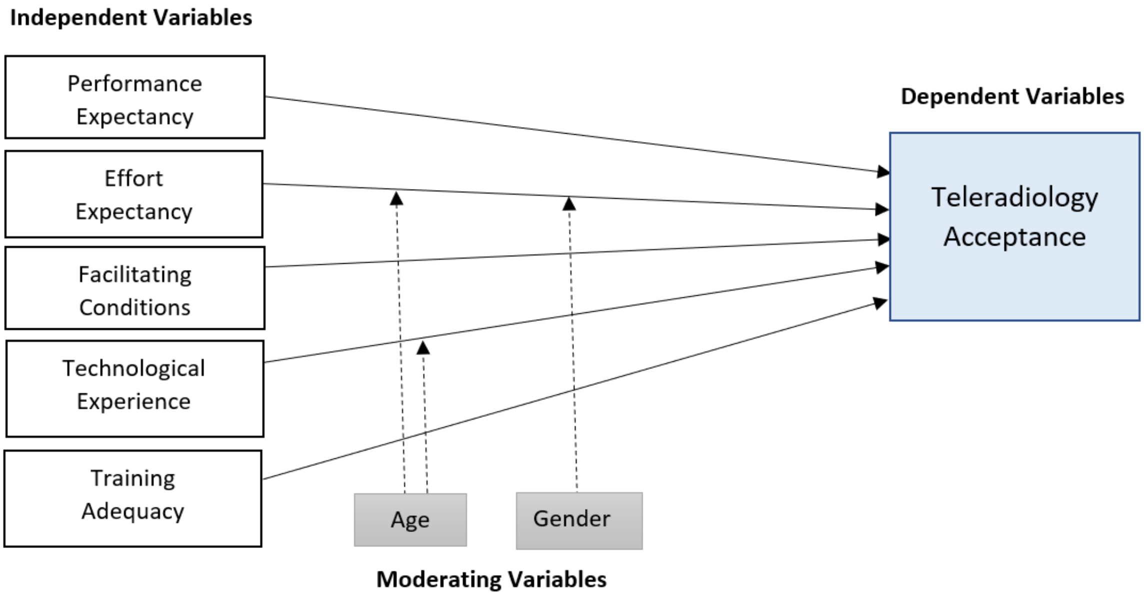

Figure 4. 1: Revised model for Acceptance of Teleradiology Systems in Kenya

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section covers a summary of the key findings already demonstrated in chapter four and continues to discuss these findings in relation to the objectives of this study. Conclusions and recommendations are drawn based on the discussions found in this chapter.

5.2 Summary of Findings

The study started by identifying the overall objective as *"to extend the knowledge and understanding of healthcare technology acceptance by developing a model to investigate the factors that influence teleradiology acceptance in Kenya"* This section summarizes how the specific objectives were achieved and the corresponding research questions answered by the end of this study.

Objective 1: *"Develop a technology acceptance model based on the baseline UTAUT to investigate on the factors that influence teleradiology acceptance in Kenya".*

The focus of this study was to extend the baseline UTAUT model to investigate the factors that influence teleradiology acceptance in Kenya. The study started by developing a conceptual model informed by the knowledge acquired from the relevant literature review and understanding of the context within which computerization of health information systems is happening in Kenya. The baseline UTAUT model was adapted to include Training Adequacy as a direct determinant of teleradiology acceptance. Technology Experience was also used as a direct determinant of teleradiology acceptance rather than a relationship moderator. Voluntariness of use and Social Influence were omitted since the study would be carried out in the context of a mandatory environment where use of the teleradiology systems was a mandatory requirement as per the institution's policy thus the two variables were of no significance to this study(Prasanna & Huggins, 2016). Age and Gender were the only moderators used in this study. The variables were operationalized and the research instrument for testing the proposed model was developed, tested, and confirmed to be a valid and viable conceptualization of the relationships influencing teleradiology acceptance.

Objective 2: *"Validate the model using empirical data collected from two teleradiology centers in Nairobi County".*

Validation of the proposed conceptual model was done using quantitative data obtained from 50 users of teleradiology systems from two teleradiology centers in Nairobi. The validity and reliability of the data collection instruments were tested before embarking on the main study to ensure understandability and validity of the instrument. Cronbach's alpha was used to test the reliability of the variables and the test exhibited good and acceptable reliability. After data collection, findings were drawn from the data using regression and correlation analysis to examine the extent to which the factors in the conceptual model were able to predict teleradiology acceptance. The regression model analysis revealed that Performance Expectancy, Effort Expectancy, Technology Experience, Facilitating Conditions and Training Adequacy were able to explain 24.6% of the variance in Teleradiology Acceptance. Out of the five independent variables, Effort expectancy was the most significant by being able to explain 16% of variance in Teleradiology Acceptance.

5.3 Conclusion and Recommendations

Theoretically, the findings from this study will be relevant to researchers in Health Information Systems in Kenya and other developing countries. To the researcher's knowledge this is first ever scholarly study based on UTAUT model to study user acceptance of Teleradiology Systems in Kenya. The main theoretical contribution for researchers gained from this study was the extension of the Unified Theory of Acceptance and Use of Technology(UTAUT) model (Venkatesh et al., 2003) to study acceptance and use of a new technology artifact in a new organizational setting.. Another major contribution is the proposed model identified and validated new variables which were of significance to the acceptance of teleradiology systems in the context of developing countries. The findings from this case study can be extended to explain acceptance of HIS in other similar settings

Findings from this study also have practical significance and contribution to management and system implementation groups on the approaches to use in implementation of health information systems in the context of developing countries. By understanding the factors that are paramount to users in determining their level of acceptance of teleradiology, this category of stakeholders can plan for more effective health information systems deployment approaches, including guiding system developers on the customization needed in the software to make them acceptable to the intended users of the systems.

The newly added factor of Training Adequacy was found to be of significance in the overall user acceptance of teleradiology systems and this can be beneficial to managers of teleradiology centers to carefully plan for training sessions during system deployment. Effort Expectancy was also the most significant factor in this study and is associated with the ease of use of the system (Venkatesh et al., 2003). The ease of use of a system is greatly influenced by the training received in the early stages of post-implementation (Davis, 1985). It is therefore paramount that management ensure that users get adequate training on health information systems during implementation. This training should be done effectively to enhance the targeted users' awareness of the system's usefulness and ease of use. One possible way of achieving this would be to introduce foundational courses on ICT and e-health in general to build a good foundation for more specialized training on specific systems such as teleradiology and PACS systems in future. Additionally, there might be need to use formal and informal assessment methods to do regular evaluations of training adequacy from the user perspective.

Apart from Effort Expectancy and Technology Experience, the other most significant factor was Facilitating Conditions explaining 9% of the variance in Teleradiology systems. This is not a surprise considering that developing countries suffer from inadequate resources which hampers effective implementation of health information systems (Karuri, 2015). Management can help to facilitate the needed ICT resources such as Internet, specialized diagnostic monitors, responsive technical support, and knowledge resources to the teleradiology users to ensure that the systems are implemented and fully utilized to realize their benefits.

5.4 Study Limitations

The first limitation of this study is that only two teleradiology centers that have implemented the technology in Nairobi county were selected for the study. This was mainly because of the time allocated to complete the study in the current pandemic period where movement in and out of health centers is highly restricted. The targeted respondents for this research were people working in a hospital or clinic setup and they were always busy and the practicability of engaging all respondents to fill out the questionnaire was remote. Another limitation was that the data collection for this study was done using a cross-sectional approach. Although it has its advantages, the problem is that the study does not have the benefit of examining the change in variable relationships over time. These limitations notwithstanding, the study provided useful findings which contribute considerably to expanding knowledge and understanding of factors that influence acceptance of teleradiology and other HIS in the context of developing countries.

5.5 Suggestions for Future Research

This study focused on identifying the factors that influence the acceptance of Teleradiology Systems in Nairobi County by using a case of two health centers that have implemented the technology. The study successfully extended the UTAUT model to develop a unique model to explain acceptance of teleradiology systems in Kenya however there are still some aspects that would benefit from further exploration in future research. First, the extended model was able to explain only 24.6% of variance in teleradiology acceptance, further research is needed to explain the remaining unexplained 75.4% of variance in acceptance of teleradiology systems. Second, it would be beneficial for future research to apply a longitudinal study approach to test the how the predictive effect of the different factors varies across time. This would also allow for a larger target population to be also considered to make the study even more representative across the entire country. Third, its recommended if the extended model was cross validated in another type of HIS to test its effectiveness in determining the level of acceptance.

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APPENDICES

APPENDIX 1: STUDY QUESTIONNAIRE

PART A – Respondent Characteristics
Please tick the correct option(s) or fill in the blanks where appropriate.

1. *What is your Age in years?*
   i. Below 20 ( )
   ii. 20-29 ( )
   iii. 30-39 ( )
   iv. 40-49 ( )
   v. Above 50 ( )

2. *What is your Gender?*
   i. Male ( )
   ii. Female ( )

3. *Which type of teleradiology center do you work for?*
   i. Government Teleradiology center ( )
   ii. Private Teleradiology center ( )

4. *What is your Profession?*
   i. Radiologist ( )
   ii. General Physician ( )
   iii. Radiographer ( )
   iv. Sonographer ( )
   v. Nurse ( )
   vi. Data Specialist ( )
   vii. Clinical Officer ( )
   viii. Other ____________________________ [Please specify]

PART B – User Opinion on the use of Teleradiology Systems.

Please select only one option that most closely fits your opinion for each statement in relation to the use of teleradiology systems.

Indicator Code	**Measurement Statement**	**1**	**2**	**3**	**4**	**5**
Performance Expectancy (PE)						
PE1	*Using teleradiology systems will enable me to accomplish tasks more quickly*					
PE2	*Using teleradiology systems improves the quality of my work in provision of better patient care.*					
PE3	*Using teleradiology systems increases my efficiency and effectiveness on the job.*					
PE4	*Using teleradiology systems enhances my job productivity.*					
PE5	*Using teleradiology systems makes my job easier to perform.*					
Effort Expectancy (EE)						
EE1	*My interaction with teleradiology systems is clear and easy to understand*					
EE2	*Learning to use teleradiology systems has been easy for me*					
EE3	*It is easy to become skillful at using teleradiology systems*					
EE4	*Overall, I would find teleradiology systems easy to use*					
Facilitating Conditions (FC)						
FC1	*I have the resources (e.g., computer, diagnostic monitor etc.) necessary to use teleradiology systems.*					
FC2	*Access to the Internet is available any time I want to use teleradiology*					
FC3	*I have knowledge sources (e.g., standard operating procedures, consultants) to support my use of teleradiology.*					
FC4	*There is technical support available for assistance with teleradiology system difficulties.*					
FC5	*Using teleradiology fits well with the way I like to work*					
Training Adequacy (TAd)						
TAd1	*The training received on teleradiology is very helpful in my use of the system*					
TAd2	*I have training reference documents that I can consult in my use of teleradiology systems*					
TAd3	*I feel the training received is adequate for my efficient use of teleradiology systems*					
TAd4	*I need further training to enable me to use the teleradiology system efficiently*					
Technology Acceptance (TAc)						

TAc1	*The teleradiology system is admirable and I like it*					
TAc2	*It is difficult to learn how to use the teleradiology system*					
TAc3	*Use of the teleradiology system is often annoying and results in my complaining about it.*					
TAc4	*Use of the teleradiology system requires a high level of proficiency.*					
TAc5	*There is a lack of cooperation among the personnel when using the teleradiology system.*					
TAc6	*I rarely make a mistake or commit an error while using the teleradiology system.*					
TAc7	*Use of the teleradiology system results in a delay in my working processes.*					
TAc8	*I enjoy working with the teleradiology system.*					
TAc9	*I prefer the teleradiology system to the traditional system of paper-based and film-based printing.*					

Where:

1. = Strongly Disagree
2. = Disagree
3. = Neither Disagree Nor Disagree
4. = Agree
5. = Strongly Disagree

PART C – User – Defined Information use of Teleradiology Systems.

Please select only one option that correctly answers the question

TEx1 For how long have you been using a computer?

1. Never Used ( )
2. Less than 1 month ( )
3. 1-6 months ( )
4. 1-2 years ( )
5. 2-5 years ( )
6. More than 5 years ( )

TEx2 Approximately how many hours per week do you use a computer?

1. Never Use ( )
2. Less than 1 hour ( )
3. 1-2 hours a week ( )
4. 2-4 hours a week ( )
5. 4-6 hours a week ( )
6. 6-8 hours a week ( )
7. More than 8 hours ( )

TEx3 How long have you been using the Internet?

1. Never Used ( )
2. Less than 1 month ( )

3. 1-6 months ( )
4. 1-2 years ( )
5. 2-5 years ( )
6. More than 5 years ( )

TEx4 Currently, how often do you use the Internet?

1. Never Use ( )
2. Less than once a month ( )
3. Once a month ( )
4. A few times a month ( )
5. A few times a week ( )
6. At least once a day ( )

APPENDIX 2: UON RESEARCH AUTHORIZATION

UNIVERSITY OF NAIROBI
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES
SCHOOL OF COMPUTING AND INFORMATICS

Telephone: 4447870/4446543/4444919
Telegrams: "Varsity" Nairobi
Telefax: +254-20-4447870
Email: director-sci@uonbi.ac.ke

P. O. Box 30197
00100 GPO
Nairobi, Kenya

Our Ref: UON/CBPS/SCI/ MSC/ITM/2019

6th July 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: DATA COLLECTION PERMIT : KAVOI SEBASTIAN HERMAN IRANGWATWA REG. NO P54/34326/2019

The above named is a bona fide student pursuing an MSc course in Information Systems at the School of Computing and Informatics, University of Nairobi. He is currently carrying out his research on the project entitled ***"Teleradiology Systems Acceptance in Nairobi County: A Case of Health Facilities in Nairobi"***. He is under supervision of Prof. Agnes N. Wausi.

The project involves gathering relevant information from various institutions and he has informed the office that he would wish to carry his research in your organization.

We would be grateful if you could assist Mr. Irangatwa as he gathers data for his research.

If you have any queries about the exercise please do not hesitate to contact us.

Yours sincerely

School of Computing & Informatics
University of NAIROBI
P. O. Box 30197
NAIROBI

PROF. ROBERT O. OBOKO
DIRECTOR
SCHOOL OF COMPUTING & INFORMATICS