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Assessing the Factors Affecting the Adoption of Tele-Dentistry in Kenya

Kanaan Paresh Dave

Strathmore Business School

Strathmore University

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KANAAN PARESH DAVE

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

Kanaan Dave

K.Dave

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APPROVAL

The dissertation of Kanaan Paresh Dave was approved by the following:

Dr. Ben Ngoye (Supervisor)

Strathmore Business School

20.05.2024

Dr. Ceaser Mwangi

Executive Dean

Strathmore University Business School.

Dr. Bernard Shibwabo

Director, Office of Graduate Studies

ABSTRACT

Tele-dentistry, as a modality for oral health service delivery, offers a transformative approach to patient and practitioner consultations and is gaining global recognition. In Kenya, oral healthcare is often overlooked, and a significant gap exists in access to dental care, particularly in rural and suburban areas. The application of tele-dentistry is still to be more actively implemented as there are currently less than five tele-dentistry licenses issued by the Kenya Medical Practitioners and Dentists Council. The aim of this study was to assess the factors affecting the uptake of tele-dentistry amongst dental practitioners in Kenya, as guided by the Technology Acceptance Model (TAM), TAM-2, and the diffusion of innovation theory. The factors studied were the perceived ease of use of tele-dentistry, perceived usefulness of tele-dentistry, social and behavioral factors, and technological factors affecting the uptake of tele-dentistry. This was a mixed-method study, collecting both qualitative and quantitative data via questionnaires with open-ended and close-ended questions. The target population was general dentists in Kenya who are practicing and registered with the Kenya Medical Practitioners and Dentists Council and were selected using simple random sampling. A sample size of 266 dentists was used. Questionnaires were sent out as Google forms via WhatsApp and E-mail. Quantitative data was analyzed with SPSS software and has been presented in graphs and tables in the form of summary statistics. Qualitative data was analyzed according to the study objectives and has been presented in a narrative synthesis. The results show that overall, the knowledge of tele-dentistry and the attitude towards it is positive, but the uptake is low. The perceived usefulness and perceived ease of use of tele-dentistry is high. Regression analysis showed that Perceived Usefulness was a major factor affecting the adoption of tele-dentistry. The most significant factors affecting tele-dentistry adoption in Kenya are limited knowledge about the subject, unstable internet connectivity and bandwidth, and the absence of technical infrastructure for tele-dentistry provision. The future for tele-dentistry in Kenya appears promising, provided that upon increased accessibility to education, training, and infrastructure.

Keywords: Tele-dentistry, Technology Acceptance Model, Diffusion of innovation theory, oral health

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List of Abbreviations

KMPDC	Kenya Medical Practitioners and Dentists Council
SGDS	Sustainable Development Goals
TAM	Technology acceptance model
TAM-2	Technology Acceptance model-2
UHC	Universal Health Coverage
UNDP	United Nations Development Programme
UTAUT	Unified theory of acceptance and use of technology

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Chapter 1 : INTRODUCTION

1.1 Background

In September 2015, world leaders at a United Nations summit adopted the 17 Sustainable Development Goals (SDGs), and on 1st January 2016, the 17 SDGs officially came into force. The aim of these SDGs is to universally end poverty and promote peace and prosperity worldwide by the year 2030, ensuring that no one is left behind (United Nations, 2018). All the 17 SDGs are integrated such that actions taken on one of the goals will affect the other 16. It is expected that the developmental goals will balance social, environmental, and economic sustainability (United Nations, 2020). The SDGs were launched in Kenya on 14th September 2016 (Kenya: Sustainable Development Knowledge Platform, 2017). The third SDG is "Good health and well-being." Some of the desired outcomes of SDG-3 are increased life expectancy, reduced child and maternal mortality, and reduced deaths from HIV and malaria (United Nations, 2020).

A significant step to achieving SDG-3 is Universal Health Coverage (UHC). Universal Health Coverage is based on the World Health Organization constitution which declares that health is a fundamental right for all. UHC is focused on ensuring that all individuals have access to health services, when and where they need them, without suffering financial hardship (World Health Organization, 2019). UHC was launched in Kenya in 2018 as part of the Big 4 agenda, and there were plans to implement it fully by 2022 (Kenya Rolls Out Universal Health Coverage, 2018).

WHO's Global strategy on oral health clearly recognizes that achieving the highest attainable standard of health is a fundamental right of every human being, which means that oral health is a public good and achieving good oral health is a public responsibility (Winkelmann et al.,2023). Oral health is a key indicator of overall health, well-being, and quality of life (World Health Organization, 2022) and is a part of the health referred to in UHC. Oral diseases are among the most prevalent diseases globally and lead to serious health and economic burdens (Peres et al.,

2019). The Global Burden of Disease study shows that almost 3.5 billion worldwide are affected by oral disease (Universal Health Coverage, FDI,2019). Oral diseases greatly reduce the quality of life of those affected, hence, a focus on oral health improvement is an essential component of achieving UHC and SDG 3.

Oral healthcare in Kenya is grossly overlooked and underfunded by the government (Ministry of Health, Kenya, 2022). As of 2022, the number of registered and practicing dentists in Kenya was 793, translating to a dentist-to-population ratio of 1.47: 100,000; (Marley, 2022) whereas the recommended ratio by the World Health Organization is 13.3: 100,000 (Yadav & Rai, 2016). Most of these practitioners work in the private sector and are more concentrated in urban areas (Ministry of Health, Kenya, 2022).

The urbanization of lifestyle, growing costs of dental treatment, and the large gaps in service provision of dental treatment have all been correlated with poor oral health and poor clinical outcomes of dental treatment countrywide (Ministry of Health, Kenya,2022). Not only do these poor outcomes affect the individual, but they also have social and economic effects. For example, statistics in the USA show that 34 million school hours are lost each year because of unplanned emergency dental problems (Naavaal & Kelekar, 2018).

Poor oral health and decayed or missing teeth can be a cause of anxiety in individuals seeking jobs, and they often avoid applying for jobs because of this anxiety (The Many Costs (Financial and Well-Being) of Poor Oral Health, College of Dentistry, University of Illinois Chicago). Poor oral health in an individual can have adverse effects on their ability to eat, speak and maintain self-esteem, ultimately diminishing their social interactions and affecting their mental wellbeing negatively (Shappell & Cartier, 2023).

Advancements in oral healthcare research and technology have led to innovative solutions for improving dental care and overall well-being Whereas William Kissick's iron triangle postulates that cost, quality, and access exist in tension such that an increase in quality and access can only be achieved on the back of higher costs, (Lewis, 2017), Coopers' (2005) Diamond Model acknowledges that it is

possible, with innovation, to break, bend or stretch this relationship, that is, it is possible with innovation, to enhance quality and access with minimal increase (if at all) on cost. (Cooper, 2005). Tele-health is one such innovation which encompasses various subclasses, one of which plays a vital role in oral health, known as tele-dentistry.

Tele-dentistry is defined as the use of electronic information, imaging, and communication technologies, including interactive audio, video, and data communications as well as store and forward technologies, to provide and support dental care delivery, diagnosis, consultation, treatment, and transfer of dental information and education (Nutalapati et al., 2011). Tele- dentistry works in four ways: Live video consultations, Store and forward, Remote patient monitoring, and Mobile Health (Crown, 2018).

Live video consultations are also referred to as synchronous tele-dentistry. This takes place in real time, where the healthcare provider and the patient are both online at the same time and can have a conversation. They are connected via computers (camera, speaker, and microphone) and the internet) (PVDA, 2021).

Store and forward is also referred to as asynchronous tele-dentistry where the consultations do not happen in real-time. The patient will record the relevant information, and then send it to the dentist who will look at it and revert to the patient at a later time. This can also include taking pictures and x-rays and then sending them to the dentist for them to have a look (PVDA, 2021). Remote patient monitoring involves collecting personal and medical data from one individual in one location and transmitting the data to the health care provider in a different location via electronic communication technologies (Nutalapati et al., 2011).

Mobile Health involves the use of communication devices and applications that do not necessarily require the dentists' involvement. Examples are, using a mobile application to schedule reminders for dental check-ups, sending out messages to larger groups with oral health care tips, or apps that could be used to input symptoms of dental issues for keeping a track of the symptoms (PVDA, 2021).

Tele-dentistry was first used in 1994, by the Department of Defense in the United States of America. They designed a program called Total Dental Access with the aim of providing dental care to soldiers by dentists via virtual means (Burke, 2020). This program comprised of 15 patients taking intra-oral photographs in a nearby dental clinic at the US Army Base at Fort McPherson, and then sending the photographs via a modem to a dental clinic in Fort Gordon, 120 miles away. The periodontal specialist was able to give periodontal care to the 15 patients, out of which 14 of them benefitted without having to physically go to Fort Gordon (Burke, 2020).

Tele-dentistry is a concept that is gaining popularity worldwide, especially after the onset of the Coronavirus (COVID-19) pandemic. Tele-dentistry is similar to telemedicine, such that consultations between a patient and a practitioner can be done remotely over the phone or computer. Patients do not have to physically attend clinics to have a consultation.

Tele-dentistry can be used to improve oral healthcare by setting up models whereby basic dental services such as oral health education, dental screening, and diagnosis can be done. Early-stage diagnosis of dental diseases such as dental caries and gingivitis can prevent further progression and overall improvements in oral healthcare. If a patient is made aware of their dental conditions at an early stage, they can be referred to facilities offering dental health services and get treatment.

With the rising costs of dental treatment, limited access to dental health providers, and the onset of the COVID-19 pandemic, the concept of tele-dentistry has gained popularity (Dentistry Today, 2022). Consequently, several countries have seen patients benefitting from the application of tele-dentistry, especially during the COVID-19 pandemic, when in-person dental treatment was not possible. For example, the Canadian Dental Association was quick to implement tele-dentistry during the pandemic (Singhal et al., 2021). A study done in Brazil also showed that tele-dentistry was a viable option for the provision of dental care during the pandemic (Santana et al., 2020).

Tele-dentistry has been used in all sub-specialties of dentistry, especially with real

time consultations as well as the store and forward modality where dental photographs and X rays can be sent to a dentist and reviewed later (Abbas et al., 2020). It is an important means of bridging the rural-urban gap in oral health service delivery (Zainab, 2020). For example, a hub-and-spoke model can be set up with dental clinics in Nairobi and small primary health care centers in rural areas. Video consultations can be arranged using this model, and the store and forward mechanism can be used by uploading photographs and sending them to the hub clinic.

In Kenya, however, despite the large gap in oral health service delivery not much is known regarding the use of tele-dentistry, which has the potential of making quality oral care available given that there are very few dentists in the country and most of them practice in urban areas (Ministry of Health, Kenya, 2022). Moreover, tele- dentistry in Kenya can be applied especially for oral health education, for early diagnosis of dental problems, and for continuity in care for patients requiring long-term follow-ups, such as patients with facial trauma, benign tumors, and oral cancer. Tele-dentistry could also be used to bridge the existing gaps in the availability of oral health services, especially in suburban and rural areas.

Despite this potential, it appears that tele-dentistry is not widely applied by dental practitioners in Kenya. There are less than five tele-dentistry licenses issued by the medical board for use in Kenya (Kenya Medical Practitioners and Dentists Council, official register). The process for acquiring a tele-dentistry license is to fill out a form which is available on the KMPDC official website, and to attach a cover letter describing all the services that the facility intends to offer. The officials from the KMPDC are responsible in overseeing that the services being offered virtually are within the scope of the practice of the applicants, and that all information collected is kept confidential.

The adoption of technology is influenced by a multitude of factors, some of which include perceived usefulness, perceived ease of use, social and behavioral aspects, and technological factors. Perceived usefulness refers to the belief that the tele-dentistry will enhance dental care delivery, whereas perceived ease of use

encompasses user-friendliness and accessibility. Social and behavioral factors such as resistance to new technologies also play a significant role. Moreover, technological factors including internet connectivity and availability of technical infrastructure will influence the feasibility of tele-dentistry adoption. Successful implementation of tele-dentistry requires assessment of these factors and addressing them to foster acceptance and utilization among dental practitioners and patients.

Various technology acceptance theories have been used to understand the uptake of technology in medicine and dentistry. This study aimed to adopt concepts from the Technology Acceptance Model (TAM) Technology Acceptance Model -2 (TAM-2) and the Diffusion of innovation theory in understanding the factors affecting the uptake of tele-dentistry in Kenya.

1.2 Problem Statement

Oral health is often overlooked in most healthcare systems worldwide. Kenya is no exception. Healthcare is a major challenge in Kenya, with oral healthcare being grossly neglected. There is an increase in the prevalence of dental disease which can be attributed to modifiable risk behaviors like the consumption of foods with high sugar content and increased consumption of tobacco and alcohol (Ministry of Health, Kenya, 2022). High costs of dental treatment and the lack of availability of dental clinics in semi-urban and rural areas lead to poor clinical outcomes of dental diseases. The limited number of dental professionals and dental clinics in the country further adds to this problem. Most rural areas do not have dental professionals or facilities that offer oral health services. The lack of availability of dentists in rural areas, the high costs of treatment, and the lack of awareness of the importance of oral healthcare are all contributing factors to poor oral health countrywide.

The Kenya National Oral Health Policy (2022-2026) and The Kenya National Oral Health Strategic Plan (2022-2026) mention the use of technology to improve oral

health in the country. They state six policy objectives, out of which objective four (iv) of the policy document states: ‘To strengthen health systems capacity to provide oral health services by improving infrastructure and providing equipment, commodities and technologies”. Tele-dentistry could be used to achieve policy objective four (iv) (Ministry of Health, Kenya, 2022).

Currently, tele-dentistry is a fairly unfamiliar concept in Kenya, as there are less than five tele-dentistry licenses issued by the medical board (KMPDC, official register). It is not widely practiced, but there is scope and potential for using tele-dentistry in Kenya to bridge gaps in oral health service delivery.

While it is apparent that the uptake of tele-dentistry is low in Kenya, the underlying factors causing the hindrance in uptake are not known. A more focused investigation into the barriers, concerns and challenges faced by dentists in adopting tele-dentistry is needed in order to increase the uptake pf tele-dentistry in clinical practice. The limited use of tele-dentistry is a problem for both the dental service providers and the general public, as both are missing out on experiencing the benefits of tele- dentistry. The general public is missing out on the potential for oral health education, early diagnosis, and the ability to provide continued care for long-term treatment.

Dentists are not able to enjoy the benefits of tele-dentistry in improving oral health service delivery from the provider perspective. The Ministry of Health is also on a quest to increase the number of tele-dentistry service providers, as mentioned in the Kenya National Oral Health Strategic Plan, 2022-2026. Hence, understanding the factors that are affecting the uptake of tele-dentistry from the providers’ (dentists’) perspective is a step towards increasing the number of tele-dentistry providers, which benefits the general population and dentists alike.

From the above discussion, it is apparent that there is a gap in oral health service delivery in Kenya. The implementation of tele-dentistry holds promise for expanding access to dental care, particularly in underserved areas. However, significant knowledge gaps hinder its widespread adoption and effectiveness. Furthermore, there is a dearth of research and data on the efficacy of tele-dental

interventions specific to the Kenyan context, leaving practitioners without evidence-based guidelines on the implementation of tele-dentistry.

Addressing the knowledge gaps through targeted education, training initiatives and research is essential to realizing the full potential of tele-dentistry in Kenya. This study attempts to address the knowledge gaps from the practitioner's point of view by assessing the factors that are hindering the adoption of tele-dentistry in Kenya.

Previous studies and reviews of the literature on the adoption of technology in medicine and dentistry identify perceived usefulness, perceived ease of use, technological factors, and social and behavioral factors as the major factors that affect the adoption of technology. Consequently, this study sought to investigate the perceived usefulness, perceived ease of use, technological factors, social and behavioral factors, and any other factors that are affecting the adoption of tele-dentistry in Kenya. Understanding the reasons behind the low uptake of tele-dentistry in Kenya could be used to alter these factors and make tele-dentistry a more adoptable concept amongst dentists in Kenya.

1.3 Objectives of the Study

1.3.1 General Objectives

To assess the factors affecting the adoption of tele-dentistry in Kenya.

1.3.2 Specific Objectives

1. To assess the current knowledge of and attitude towards tele-dentistry amongst dentists in Kenya.
2. To assess the extent to which the dentist perceives tele-dentistry as a useful technology (perceived usefulness of tele-dentistry).
3. To assess the extent to which the dentist perceives tele-dentistry as easy to use (perceived ease of use of tele-dentistry).
4. To determine which social and behavioral factors affect the adoption of tele-dentistry from the perspective of the dentist.
5. To determine which technological factors affect the adoption of tele-dentistry from the perspective of the dentist.

6. To determine any other factors affecting the adoption of tele-dentistry from the perspective of the dentist (medico-legal issues, financial issues, patient confidentiality issues).

1.4 Research Questions

1. What is the general knowledge and understanding of the concept of tele-dentistry among dentists in Kenya?
2. What is the utility of tele-dentistry from the perspective of the dentist in Kenya?
3. Do dentists perceive tele-dentistry as easy or difficult to use?
4. What, in the opinion of dentists, are some of the social, behavioral, and technological factors affecting the uptake of tele-dentistry in Kenya?
5. Are there any other factors (not categorized as social, behavioral, or technological) that affect the uptake of tele-dentistry in Kenya?
6. How can the uptake of tele-dentistry be increased in Kenya?

1.5 Scope of the Study

The study focused on assessing the factors that are affecting the adoption of tele-dentistry by dentists in Kenya as guided by the Technology Acceptance Model and Diffusion of Innovation theory. The sample population was dentists who are actively practicing and are registered with the Kenya Medical Practitioners and Dentists Council, in both the private and public sectors in urban, semi-urban and rural areas in Kenya.

1.6 Significance of the Study

This study holds theoretical significance as it aligns closely with the objectives outlined in The Kenya National Oral Health Policy and The Kenya National Oral Health Strategy, focusing on enhancing the healthcare systems capacity through the adoption of tele-dentistry. By investigating the factors influencing tele-dentistry adoption, contributions can be made to policy objective number four (iv) which emphasizes healthcare infrastructure and technology expansion. The

findings will provide theoretical insights to policy implementation and technology adoption, bridging the gap between policy objectives and real-world implementation for the benefit of stakeholders in this field.

The methodical significance of this study lies in providing a structured data collection framework for researching tele-dentistry adoption in Kenya and uses both, qualitative and quantitative data for a comprehensive understanding. This approach can be used in similar contexts, such as assessing the factors affecting tele-medicine implementation in Kenya, making it a valuable reference for future research.

Chapter 2 : LITERATURE REVIEW

2.1 Introduction to the Literature Review

This chapter highlights the theoretical and empirical review of literature, gaps in the research, the conceptual framework and operationalization of variables.

2.2 Theoretical Framework

This research was guided by the Technology Acceptance Model (Davis 1989) (TAM) and the extension of the Technology Acceptance Model-2 (TAM-2) (Venkatesh and Davis 1996). It also drew on themes from the diffusion of innovation theory.

2.2.1 Technology Acceptance Model

The Technology Acceptance Model (Davis 1989) is used to study the factors that affect the acceptance of new technologies by the users of the technology. (Marikyan& Papagiannidis, 2022). This model is relevant to this study as it provides a structured framework to assess user perceptions, usability and behavioral intentions regarding tele-dentistry, as is explained further below.

In the theory of technology acceptance, the two main aspects discussed are perceived usefulness and perceived ease of use. Perceived usefulness is the individual's perception of how beneficial using a certain technology is, while perceived ease of use is the degree to which an individual believes using the system is effortless or easy to understand. (Marikyan & Papagiannidis.,2022).

According to the Technology acceptance model, technology acceptance is a three-stage- process, where external factors trigger a cognitive response, which in turn creates an attitude (an effective response) towards the technology, and this finally influences the behavior of the user. The ease of use and perceived usefulness of the technology determine the behavioral intent of the user on the use of the technology. (Marikyan, D. & Papagiannidis, S.,2022)

TAM has been found to be useful in studying three major aspects of information technology in healthcare, which are telemedicine, electronic health records and

mobile applications. Between 1999 and 2017, TAM was found to be most used in studies relating to tele-medicine (Rahimi et al., 2018). This is consistent with the results found in a study done about technology acceptance in healthcare, where TAM and its extensions and modifications were the most commonly used models in studying technology acceptance in healthcare (AlQudah et al., 2021). This supports the use of TAM in studying the factors affecting tele-dentistry adoption and implementation. This study followed the aspects of TAM by asking the respondents questions about the perceived usefulness of tele-dentistry and perceived ease of use of tele-dentistry from their point of view.

Note however that, several studies have expressed inadequacies of TAM when addressing the connection between technology and the actual use of it (Malatji et al,.2020). Chandio et al, (2017), for example, indicate that this model is not sufficient in explaining users' adoption and use of new technology (Malatji et al,.2020). Another criticism is that behavioral intention is evaluated as a subjective means.

Behavior cannot be reliably quantified as it is evaluated by a number of subjective factors (Ajibade P, 2018). Finally, Zahid et al (2013) suggest that TAM does not take into account external factors like age and education that could affect acceptance of technology and the willingness to use it (Ajibade P, 2018). These criticisms led to the revision of TAM to TAM-2 which we expound on below.

2.2.2 Technology Acceptance Model-2 (TAM-2)

The extension of the Technology Acceptance Model (TAM), T-A-M-2 by Venkatesh and Davis, (2000), further explains five exogenous factors, and two moderators that influence the perceived usefulness of technology and hence the intention to use the technology (Sullivan, 2016). This extension of the TAM is relevant to this study as it provides a more comprehensive framework by allowing for a deeper exploration of the factors, as is described below.

Five exogenous factors that can determine the perceived usefulness of a technology are subjective norm, image, job relevance, output quality, and result

demonstrability. Two moderators, experience, and voluntariness can also influence the perception of usefulness. Subjective norm states that when an individual does not want to perform a certain behavior but valued social members of a group think they should, the individual will follow the opinion of the group. Image refers to the degree to which the use of an innovation is perceived to enhance one's status in their social system.

Job relevance is the perception of how applicable the technology is to their job. Output quality is the perception of the quality of the technology in performing a task. Result demonstrability is the tangibility of the results after using the technology.

Experience is the passage of time from an individual's initial use of technology. Voluntariness is the extent to which the user perceives the adaption decision to be non-mandatory (Sullivan, 2016). This study incorporated some of the factors discussed in TAM-2 in the questionnaire that was given to participants.

2.2.3 The Diffusion of Innovation Theory (Rogers, 1962)

This theory aims to explain why, how, and the rate at which a new product, service, or process spreads through a social system (Dearing and Cox, 2018). This theory is relevant to this study because it can provide a framework for understanding the process of adoption and implementation of tele-dentistry in Kenya.

The diffusion of innovation theory describes five stages that an innovation goes through during its adoption by individuals. The first stage is knowledge, where the individual is aware of the innovation but needs to gain more information about it. The second stage is persuasion, where the individual's interest in learning about the innovation is growing. The third stage is decision, where the individual makes the decision on whether to accept or reject the innovation. The fourth stage is implementation and the fifth is confirmation (Dearing and Cox, 2018).

The theory also categorizes users of the innovation into innovators, early adopters, early majority, late majority, and laggards. Innovators are amongst the first to try the new product/service/process, early adopters are comfortable with change, the

early majority will accept the innovation with evidence that it is useful, late majority are skeptical of change, and laggards are the most conservative and traditional individuals who are the last to make any changes (Dearing and Cox, 2018). The diffusion of innovation theory has been seen to be useful in understanding the barriers to the diffusion of telehealth and can be used as a framework for understanding the diffusion of telemedicine and tele-dentistry (Helitzer et al., 2003).

2.3 Empirical review

This section reviews the literature related to the objectives of the study.

2.3.1 Knowledge of and Attitude towards Tele-Dentistry amongst Dentists

There are currently no studies done on the knowledge of practitioners on tele-dentistry or telemedicine in Kenya, but there are global studies from which we could draw lessons.

In 2020, an institutional-based cross-sectional study was done in Northwest Ethiopia with the aim of determining the knowledge and awareness of health professionals towards telemedicine services. 423 health professionals at six referral hospitals filled out self-administered questionnaires with questions about their awareness and knowledge of telemedicine. 56% of the respondents had a good understanding and awareness of telemedicine services (Assaye et al., 2022).

A cross-sectional study on 103 dental professionals was done in Kigali, Rwanda, on the Knowledge, Attitude, and Practices of Dental Professionals towards Benefits and Applications of tele-dentistry. Data was collected using a self-administered questionnaire. 99 out of 103 dentists (96%) were aware of the applications and benefits of tele-dentistry. Only 7 practitioners out of the 103 respondents (6.8%) use tele-dentistry in their clinic. 82 respondents (79.6%) showed a positive attitude towards the application and benefits of tele-dentistry, which included, it is useful for the education and training of primary dentists, useful in consultations with specialists, making sound decisions and referring to

appropriate specialists, time-saving and convenient for oral health care delivery. The perceived challenges to the use of tele-dentistry in Rwanda were illiteracy and poverty of the population and the lack of infrastructure. This implies that even though the level of awareness of tele-dentistry is high and the attitude towards its use is positive, the actual application of it is limited (Murererehe et al., 2017).

In 2021, an online based cross-sectional study was done in Saudi Arabia on the knowledge, practice, and attitudes of dental practitioners towards tele-dentistry. 603 dental professionals participated in the study by filling out an online questionnaire. Only 38% of the respondents were aware of what tele-dentistry was, and 23.2% of the participants practiced tele-dentistry at their workplace. However, 66.3% of the participants said they would consider using tele-dentistry in the future. 81.4% of respondents thought that tele-dentistry is a good tool for giving oral hygiene instructions to patients, 77.4% of the participants viewed tele-dentistry as a useful tool during the pandemic as it helped to postpone non-urgent dental visits, 75.9% agreed that tele-dentistry can improve the access to oral health services especially in rural areas and 68.7% agreed that tele-dentistry can save time for the dentists. 69.7% of participants felt the need for training on the use and applications of tele-dentistry and 67.6% of the participants suggested that there was a clear need for government initiatives for tele-dentistry programs. The study concluded that there was poor awareness and practice of tele-dentistry but the positive attitude towards its use and benefits was an encouraging sign. (Nassani et al,.2021).

A nation-wide descriptive questionnaire-based survey was carried out in France between November and December 2020 to assess the knowledge, attitude, and practices of tele-dentistry among dentists in private practice. 5056 responses were recorded. 57.1% of respondents said that they have never heard of tele-dentistry, and only 1.5% of the respondents said that they had attended a tele-dentistry training module during their studies at university. 39.3% of the participants practiced some form of tele-dentistry activities in their clinical practice. 65.7% of participants who did not use tele-dentistry in their practices said they would like to

practice tele-dentistry, and 77.7% of participants said they would be interested in future training for tele-dentistry. The study concluded that there was a significant need for tele-dentistry education and training (Giraudeau et al., 2022).

A mixed-method cross-sectional study was done in the United States to assess dentists' perceptions on the value of tele-dentistry. 2767 dentists completed the survey. 23.21% of dentists used telehealth in their practices and 11% said they planned to use it in the future. Some of the responses received in terms of the value of tele-dentistry included that is timesaving, for both the patient and the practitioner, and that it was of great value during the pandemic. Other reasons included improved access to dental care for the population, providing oral health education to the public, and the ability to reach patients in rural areas where there was a shortage of dentists. A few of the respondents did not see the value of tele-dentistry because they were not convinced about the quality of care they could provide through virtual means (Tiwari et al., 2022).

2.3.2 Perceived Usefulness of Tele-dentistry from the Perspective of the Dentist.

Studies on perceived usefulness of telemedicine and tele-dentistry have been used for this section. A scoping review was done in Iran in 2022 with the aim to determine the main facilitators, barriers, and participants viewpoints of applying tele-dentistry in oral medicine. It applied the Arksey and O'Malley method and 4 databases were searched. A total of 59 studies were included in the review, and found that the most common applications of tele-dentistry were tele-consultation and tele-diagnosis The analysis included the perceived usefulness of tele-dentistry in oral medicine, and 14 domains were explored, which included time, access to oral medicine services, communication between dental clinicians, referrals, triage, travel, cost, education and training, health crisis, surveillance, quality of care, patient management and monitoring, and patient empowerment. The results found that the perceived usefulness of tele-dentistry could be increased by applying facilitator incentives as well as decreasing the barriers to tele-dentistry use. (Niknam et al., 2023)

A questionnaire based, cross-sectional online survey was conducted in England to assess patients and dentists' attitudes towards video consultations during the COVID-19 Pandemic. A total of 157 clinicians responded to the survey. The results found that clinicians in sleep dental medicine found video consultations most easy and useful to carry out and the restorative dentistry department found tele-dentistry less helpful and difficult to use. However, in the post-consultation survey, the perceived usefulness increased. This study shows that tele-dentistry may be a valid option to help service providers and dental patients during the COVID-19 pandemic. It is also a suitable alternative to increase access to healthcare services to patients and save resources. (Menhadji et al., 2021)

A national survey done on the Perceived Usefulness of Increased Telemedicine Use by Pediatric Subspecialists in the United States of America found that physicians perceived that an increase in the use of telemedicine in pediatric subspecialties would improve child health and access to care. The survey was based on a 5-point Likert scale with respondents rating the perceived usefulness of telemedicine on a scale of 1-5. The mean score for perceived usefulness was 3.5 for improved child health and 3.9 for access to care (Schweiberger et al., 2022).

A study done in Eastern Cape, South Africa in 2010 used a quantitative questionnaire-based survey to gather data on user acceptance of health care workers on telemedicine. The study was carried out in 6 hospitals and 25 clinics in the Eastern Cape Province where tele-medical was being used, and 75 medical practitioners were interviewed. 82% of the respondents perceived telemedicine as a useful technology. The respondents were given a list of options to choose from about the areas they found telemedicine to be most useful, and the most common response was "improved effectiveness of healthcare worker" followed by "improved quality of work". The study also found that practitioners in rural areas found telemedicine more useful to their daily activities than those working in urban areas (Cilliers & Flowerday, 2014).

A descriptive, cross-sectional study was done in Malaysia with the aim of exploring the perceptions of dental professionals in Malaysia regarding tele-

dentistry. 310 dental professionals participated in the study which involved 26 5-point Likert scale questions regarding usefulness of tele-dentistry in dental practice and its usefulness for patients. 70% of respondents agreed that tele-dentistry will be beneficial in improving dental practice, and 60% of respondents agreed that tele-dentistry would be beneficial to patients. (Khokhar et al., 2022).

2.3.3 Perceived ease of use of Tele-dentistry from the Perspective of the Dentist.

Studies on perceived ease of use of telemedicine and tele-dentistry have been used for this section. A study in East cape, South Africa, concluded that 84% of respondents agreed that telemedicine would improve service delivery, but 40% said they would be apprehensive to use it. Respondents with higher educational qualifications perceived the technology easy to use as compared to those with lower qualifications. The respondents in rural areas were more apprehensive to use it as compared to those in urban areas (Cilliers & Flowerday, 2014). This suggests that the level of qualifications has an impact on the perceived use of telemedicine.

An exploratory qualitative study done at two government hospitals in Nigeria to investigate the reasons behind the poor uptake of telemedicine found that ease of use was a hindering factor. One of the respondents stated that the complexity of the technology discourages practitioners from using telemedicine (Adenuga, 2020).

A cross-sectional study done in Romania in 2020 using a questionnaire to assess doctors' perceptions regarding tele-consultations found that 28.6% of doctors found tele-consultations easy to do when addressing patients' healthcare remotely, and overall found that doctors could easily adapt to the use of tele-medicine for consultations for remote patients. The findings suggest that there is perceived ease of use of telemedicine for the participants in the Romanian study (Florea et al., 2021).

A questionnaire-based study was done in Indonesia between July and August 2020 to determine the factors influencing telehealth acceptance during the COVID-19

outbreak. The questionnaire was based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model and 118 responses were recorded. The study found that users are highly likely to have a stronger intention to use telemedicine if they perceived it easy to use. (Napitupulu et al., 2021).

2.3.4 Social and Behavioral Factors Inhibiting the Implementation of Tele- dentistry from the Perspective of the Dentist.

A mixed-method case study was carried out in Uganda, titled "Factors affecting Adoption, Implementation and Sustainability of Telemedicine Information Systems in Uganda". The study was carried out a one private hospital and one public hospital in Uganda. 80 participants from each facility were randomly chosen to participate, hence the total number of participants were 160. The results showed that one of the most significant factors was resistance to change by the members of staff (Isabalija et al., 2011).

A similar study done in Rural Australia to identify the barriers to the uptake of telemedicine in Dentistry also found that resistance to new technologies was a hindering factor in telemedicine acceptance (Estai et al., 2016).

A UTAUT questionnaire-based study done in Indonesia found that computer anxiety had a significant impact on the intention to use tele-medicine. Computer anxiety is described as evoking anxious or emotional responses when using a computer. The level of comfort one has with using computers will affect their intention to use it. A practitioner with high computer anxiety is less likely to accept tele-medicine as a way of service provision (Napitupulu et al., 2021).

The Indonesian study also identified Doctors Opinion as a major determinant to acceptance of tele-medicine, where the opinion of the physician will influence the level at which tele-medicine is perceived to be useful and beneficial. This is a social factor that affects adoption of tele-medicine (Napitupulu et al., 2021).

2.3.5 Technological Factors that are inhibiting the Implementation of Tele- dentistry from the Perspective of the Dentist.

An exploratory qualitative study done at two government hospitals in Nigeria found that poor internet bandwidth and a lack of technological infrastructure was a deterrent in implementation of telemedicine (Adenuga, 2020).

A mixed-method study done in Uganda found that a major hindering factor was the lack of skilled staff who were trained to successfully use telemedicine (Isabalija et al., 2011).

A mixed method study was done in Senegal to identify the determinants of the use of telemedicine. 195 participants working at various health centers, both private and public, as well as in urban areas and rural areas were interviewed. The study used the Dahlgren and Whitehead model to classify various factors. Their study found that in terms of technological factors, lack of the necessary equipment was a major determinant. Another factor was the availability of technical staff for maintenance of the equipment. Internet access was also a significant factor, as some respondents stated that the internet connection was poor at their health facilities. A stable electricity supply was also a hindrance to telemedicine at some of these facilities in Senegal (Ly et al., 2017).

The study done in rural parts of Australia on the challenges on uptake of telemedicine in dentistry also stated lack of internet access and poor connectivity as a barrier to implementation, as well as lack of training and technical support (Estai et al., 2016).

2.3.6 Other Factors Inhibiting Implementation of Tele-dentistry from the Perspective of the Dentist.

An exploratory qualitative study done at two government hospitals in Nigeria mentioned additional factors that were hindering the uptake of telemedicine, some of which are medico-legal issues, data security and financial factors. Medico-legal issues include concerns about whether the practitioners are are protected against

legal actions if a medical error was to occur when telemedicine was being used. There were concerns about patient confidentiality and data security as there is a risk of cyber-crime and software copyright issues. Practitioners had concerns about financial issues such as the mode of payment and financial incentives. The respondents felt that telemedicine consultations were an additional service and required extra time out of their schedule for consultations, and hence said they would require additional incentives for it, which the organization might not agree to (Adenuga, (2020).

A study done in rural Australia also mentions data security, lack of a reimbursement structure, lack of legal and ethical guidelines and medico-legal issues as barriers in the uptake of telemedicine in dentistry (Estai et al., 2016).

Finally, a study done in Senegal classified the factors into categories according to the Dahlgren and Whitehead model. One of the concerns stated was ethical concerns about the use of telemedicine. Participants were concerned about the lack of an ethical framework to guide telemedicine practice. There was a concern on the protection of confidentiality when using telemedicine. This also is linked to legal issues and lack of a legal framework when using telemedicine. This study also mentions financial factors as a determinant of telemedicine use. Participants felt that setting up a telemedicine model required a large sum of investment for equipment, training, and maintenance, hence raising concerns about the financial feasibility of telemedicine projects (Ly et al., 2017).

The above studies all mention similar factors that affect telemedicine uptake-medico-legal and ethical issues, data security, patient confidentiality, and financial concerns.

2.4 Gaps from the Empirical Review

From the empirical review, it is apparent that no studies about tele-dentistry have been done in Kenya. There are limited studies done on tele-dentistry and technology acceptance models globally.

The table below summarizes the research gaps.

Table 2.1 Research Gaps

AUTHOR	TITLE	FINDINGS	GAPS	HOW THIS STUDY ADDRESSES THE GAPS	METHODOL-OGIES APPLIED
Murererehe et al., 2017	Knowledge attitudes and practices of Dental Professionals in Rwanda towards the benefits and applications of Tele-dentistry	99 out of 103 dentists were aware of the uses and applications of tele- dentistry, 88% of respondents had a positive attitude towards the application and use of tele-dentistry, but only 7 practitioners used tele-dentistry in their clinics.	The study was limited to practitioners in Kigali, hence is not representative of dentists practicing in rural or suburban areas.	The study population was drawn from the National Register, hence not limited to only one city. It was representative of the country, including rural and sub-urban areas.	Simple Random Sampling was used to select the participants, which allowed for participants from different areas of the country to be selected.

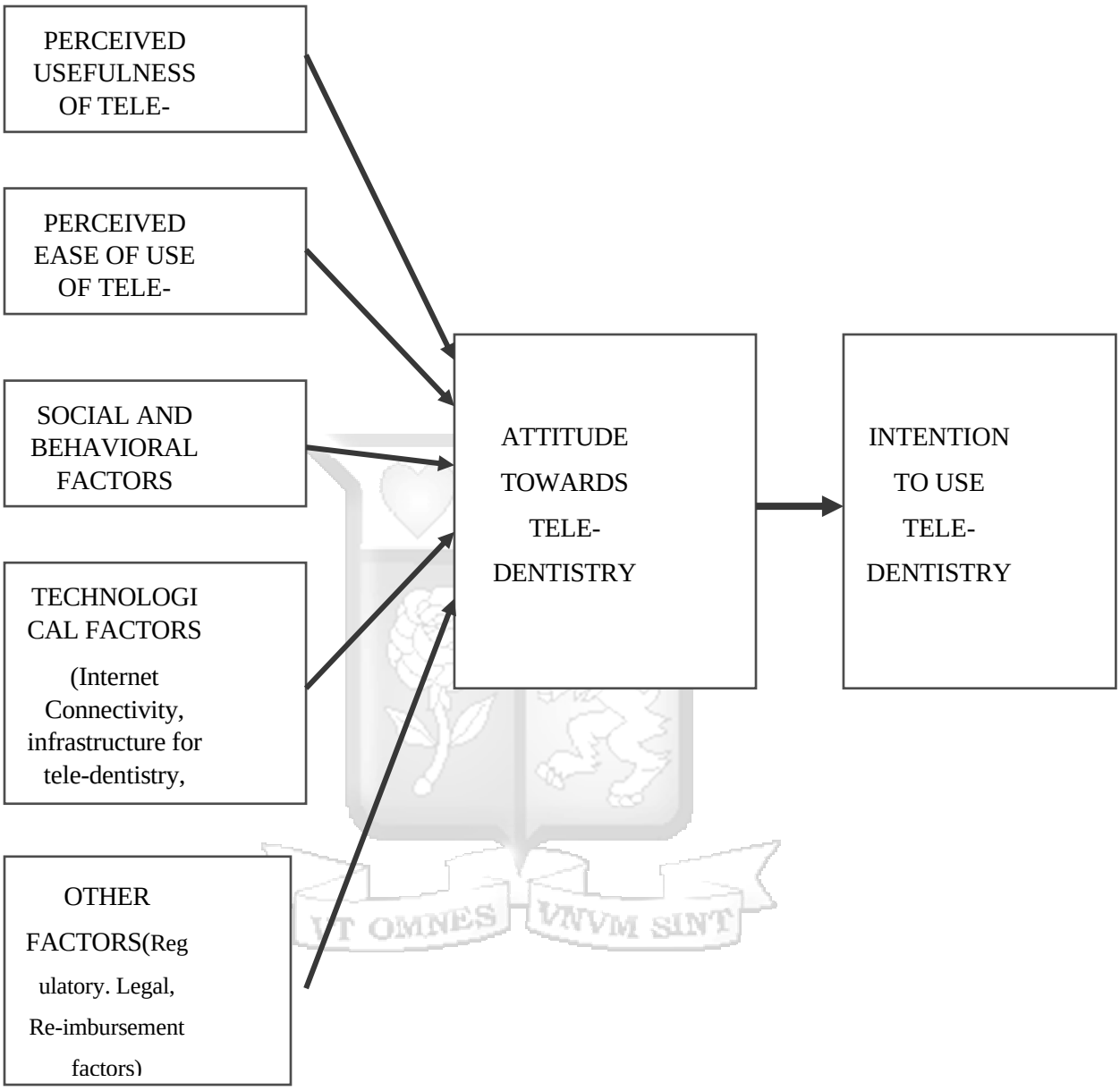
Napitupulu et al, 2021	Factors affecting Telehealth acceptance during COVID-19 Outbreak: extending UTAUT Model	Perceived ease of use, Doctors Opinion and Computer Anxiety were major determinants of tele- health use.	Convenience sampling was used; hence results cannot be generalized. The study also focuses on telemedicine, not tele-dentistry.	Simple Random Sampling was used which supports generalizability.	Simple Random Sampling was used which supports generalizability.
Estai et al., 2016	Challenges in the uptake of telemedicine in Dentistry	Barriers were classified into three categories, individual, infrastructural, and organizational.	This study limits the findings to only three categories and did not use any theoretical framework to guide the research.	Three theories were adopted to guide the questionnaire in this study.	Technology acceptance model, Technology Acceptance Model-2 and Diffusion of Innovation Theory were used to guide the questionnaire.
Adenuga et al., 2020	Telemedicine systems: service adoption	The study identified technological factors, financial factors,	There were only 8 participants interviewed for this	A sample of 266 dentists was used as calculated by Slovin's	Slovin's formula was used to calculate the

	and implementation issues in Nigeria	reimbursement concerns and data protection issues as factors affecting service adoption and implementation	research, which is a very small number and not representative of the population.	formula, which is more representative of the population.	sample size.

2.5 Conceptual framework

The framework links the factors affecting the adoption of tele-dentistry as guided by the TAM, TAM-2 and diffusion of innovation theory to the attitude towards tele-dentistry which eventually determines the intention to use tele- dentistry.

Figure 2.1 Conceptual Framework



2.6 Operationalization of Variables

The table below summarizes the variables and how they were measured.

Table 2.2 Operationalization of variables

VARIABLE	MEASURE	SOURCE
Knowledge and attitude towards tele-dentistry	YES or NO Questions	Questionnaire from Saudi Arabia study (Nassani et al., 2021)
Perceived Usefulness of tele-dentistry	Likert scale responses (Agree, strongly agree, neutral, disagree, strongly disagree)	Technology Acceptance Model (Davis, 1989).
Perceived Ease of Use	Likert scale responses (Agree, strongly agree, neutral, disagree, strongly disagree)	Technology Acceptance Model (Davis, 1989).
Social and behavioral factors	Likert scale responses (Agree, strongly agree, neutral, disagree, strongly disagree)	Study done in South Africa (Cilliers & Flowerday, 2014).
Technological factors	List of options to select from	Senegalese study (Ly et al., 2017) and Nigerian study (Adenuga, 2020).
Other factors	List of options to select From	

Any other factors not mentioned in the lists given, and suggestions to improve tele-dentistry uptake	Qualitative data, open ended questions.	

Chapter 3 : RESEARCH METHODOLOGY

3.1 Overview

This chapter presents the methods that were used to achieve the research objectives and includes research design, target population, sampling method, sampling size, data collection tools and methods, data analysis, reliability and validity, ethical considerations, and dissemination of the findings.

3.2 Research Philosophy

Research philosophy refers to a system of beliefs and assumptions about the development of knowledge. This research was based on pragmatic research philosophy, whereby research starts with a problem, and the outcomes of the research aim to contribute practical solutions that inform future practice. (Saunders et al., 2009). The findings of this study can be applied to increase the uptake of tele- dentistry in clinical practice in Kenya.

3.3 Research design

This was a mixed-method study, where both qualitative and quantitative data were collected. Quantitative data was collected in the form of Likert-scale questions about the degree to which the respondent agrees or disagrees with statements regarding the factors that are affecting tele-dentistry adoption. Mixed method research combines quantitative and qualitative data collection and analysis within a single study. This approach leverages the strengths of both qualitative and quantitative methods which allows for various viewpoints to be investigated (Shorten and Smith, 2017).

Qualitative data was collected in the form of open-ended questions where respondents were asked to mention any other factors that were not mentioned in the questionnaire that they think are affecting the adoption of tele-dentistry, as well as a section where they were asked to mention any suggestions to improve the uptake of tele-dentistry in Kenya.

To address the quantitative aspect of the research questions, Likert-scale responses

were used, which allowed for a structured assessment of participants' agreement or disagreement with predefined statements related to perceived usefulness, perceived ease of use, and social and behavioral factors affecting tele-dentistry adoption. In this manner, a numerical quantification of these variables was recorded, offering insights into the extent to which they influenced the participants perspectives.

The qualitative dimension of this study was designed to further understand the reasons for the underwhelming adoption of tele-dentistry. Through open-ended questions, participants were allowed to express their thoughts, opinions and suggestions beyond the constraints of the Likert scale responses.

The integration of both qualitative and quantitative methos enabled a comprehensive examination of the research questions.

The justifications for using a mixed-method approach are that using a mixed method approach helps to overcome the limitations of each method if used individually. Quantitative data lacks the depth necessary to understand the context of the topic being studied. Qualitative data offers deeper insights but cannot be generalized. Integrating both methods allows for capitalizing the strengths of each method while mitigating their respective limitations. This mixed-method approach enables researchers to gain a comprehensive understanding of the research topic, validate quantitative results with qualitative insights, and explore the complexity and diversity of participants' perspectives.

3.4 Target population

The target population refers to the specific group of individuals that a study aims to investigate and make inferences about (Whaley, 2020). The study population was targeted towards dentists working in both private and government Kenya. The justification for this population was that the study was to determine the factors that are affecting the implementation of tele-dentistry in Kenya. Dentists are the primary service providers in tele-dentistry; hence they were the most appropriate

group of people to gather data from. This population was drawn from the 793 dentists from the KMPDC Registry.

The inclusion criteria: Practicing general and specialist dentists registered with the KMPDC official Register.

The exclusion criteria: Non-practicing dentists who are registered with KMPDC.

The register has details of past practitioners who are registered but not actively practicing anymore, and they were to be excluded from the target population.

3.5 Sampling method

Simple random sampling was used when selecting the participants. Simple random sampling is a form of probability sampling where every member of the population has an equal chance of being selected. (Thomas, 2020). For this study, participants were chosen at random from the official KMPDC register, which has the full names of practicing dentists, arranged in alphabetical order, with their postal box details, e- mail addresses, and phone numbers. The "Random" function on Microsoft Excel was used to generate a list of random numbers which were used to select the dentists from the register, for example, number 6 corresponded to the 6th dentist on the register.

3.6 Sample size determination

Slovins formula was used to calculate sample size: (Ellen, 2020)

$$n = N/(1 + Ne^2)$$

Where:

n is the desired sample size

N is the Total population of dentists

e is the margin of error

N here is 793 dentists. I have used a margin of error of 5% with a confidence interval of 95%.

Using the formula, the sample size calculated was 266 dentists.

3.7 Data collection methods

Data collection is the methodological process of gathering information about a specific subject (Cote, 2021). Data was collected via questionnaires with both open and closed- ended questions. The questions were structured according to the research questions of interest. The questionnaire had the following sections: participant information, knowledge and attitude towards tele-dentistry, perceived ease of use of tele-dentistry, perceived usefulness of tele-dentistry, social and behavioral factors, technological factors, and other factors affecting the implementation of tele-dentistry. Some of the questions used Likert scales to record responses, and some had open-ended responses. The justification of using this format was that close ended questions collect quantitative data which are easily quantifiable and analyzable, allowing for the collection of structured data which can be statistically analyzed such as assessing frequency of behaviors related to tele-dentistry adoption. Open ended questions allow for participants to express their thoughts and feelings which provided richer insights into participant perspectives and reasons behind responses to close-ended questions. Open ended questions were valuable in exploring complex topics such as suggestions to improve tele-dentistry uptake in Kenya as well as allowing for uncovering of themes or issues that cannot be uncovered by close ended questions alone.

3.8 Data collection procedures

Data collection procedures refer to the steps taken to employ the data collection tool to the target population (Taherdoost, 2021). The questionnaires were sent out as a Google Form via email and WhatsApp messages. The email addresses and WhatsApp contacts were taken from the official KMPDC registers. The Google forms had the consent form and the questionnaires. The forms were sent individually to dentists as a Google Form on their personal WhatsApp or e-mail addresses. The justification for using Google forms was that Google

forms are user-friendly and can be effortlessly shared via various platforms. Downloading and extracting data from Goggle forms was fairly feasible as it could be downloaded into Google Sheets which was then converted to Microsoft Excel.

The justification of using WhatsApp as a channel for sending out the questionnaires was that it offers convenience and familiarity as most people use it on a daily basis, enabling quick responses from participants who are active on the platform. E-mail provided a more formal channel. Utilizing both channels allowed for maximum outreach enabling more comprehensive data collection.

3.9 Data analysis

The questionnaires were checked for completeness. Likert scale responses were analyzed using descriptive statistics such as measures of central tendency and summary statistics have been presented in graphs and tables.

Quantitative data was analyzed with SPSS software and Microsoft Excel. A regression analysis was done and has been presented. Qualitative data has been categorized according to the study objectives and has been presented in a narrative synthesis. The data is presented in sub-sections as guided by the research objectives.

3.10 Reliability and Validity

Validity in quantitative questionnaire-based research concerns whether the research measures what it intends to measure. This means ensuring that the questions used in a survey can accurately and reliably measure the intended construct. (Surucu and Maslacki, 2020). Content validity of the questionnaire for this study was ensured through literature review and adaptations from previously validated research questionnaires in this study area. Questions regarding perceived

ease of use and perceived usefulness were guided by the technology acceptance model. (Lewis & Hf, 2019).

Reliability in research refers to the consistency of research results when the same methods are used repeatedly. For this study, internal consistent reliability was ensured by the use of standardized questionnaires in simple English so that all participants were able to understand. A pilot study was done with a smaller group of dentists to assess the clarity of the questionnaire before distributing it to the study population.

3.11 Ethical considerations

The study was conducted after getting approval from The Institutional Review Board of Strathmore University and The National Commission for Science Technology and Innovation. Participants provided informed consent before they filled out the forms. All names and personal details of the respondents remained confidential, and a unique code was used as identification instead of their names.

3.12 Dissemination Plan

The results of this research will be presented to the Strathmore Business School as a prerequisite for the award of the degree of Masters of Business Administration in Healthcare Management. Along with this, the findings will be shared with relevant stakeholders, such as the Kenya Dental Association for insights on how to improve tele-dentistry uptake in the country. The findings could also be shared in suitable forums, such as the annual Kenya Dental Association conference for the knowledge of the attending dentists. Lastly, the findings of this study will also be published in a relevant peer reviewed journal.

Chapter 4 : PRESENTATION OF RESEARCH FINDINGS

4.1 Overview

This chapter presents the research findings as guided by the research objectives and questionnaire. The study findings have been presented in the following order: response rate, demographic data, knowledge, attitude and practice of tele-dentistry, perceived usefulness of tele-dentistry, perceived ease of use of tele-dentistry, social and behavioral factors influencing tele-dentistry, technological factors, and other factors affecting tele-dentistry adoption, and suggestions to improve tele-dentistry adoption.

4.2 Response Rate

A total of 266 questionnaires were sent out, out of which 205 respondents filled out the questionnaire. Out of the 205, 12 questionnaires were incompletely filled hence 193 questionnaires were analyzed, bringing the response rate to 72.5%. This response rate was adequate for the analysis of this research as the minimum expected response rate is 60% (Fincham, 2008).

4.3 Socio-demographic information

4.3.1 Gender Distribution of Participants

Out of the 193 respondents, 51.8% were females and 48.2% were males.

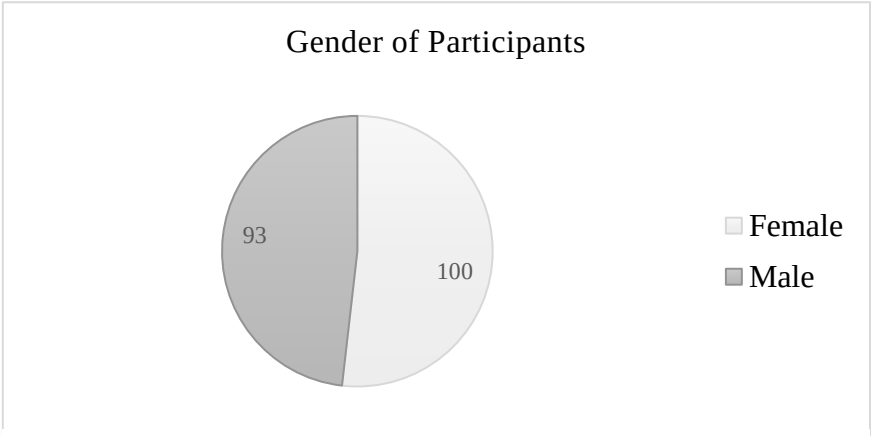


Figure 4.1: Gender distribution of participants

4.3.2 Age Distribution of Participants

The age distribution of the participants in this study was as follows: 49.22% of the respondents were between 24 to 34 years old, which constituted almost half of the total sample size. 29.53% of the participants were aged between 35 to 44 years old, and 13.47% were between 45 to 54 years old. Only 6.22% of the participants were aged between 55 to 64 years old, while 1.55% were between 65 to 74 years old. The age range of the participants varied between 24 to 66 years old, with the youngest participant being 24 years old and the oldest being 66 years old.

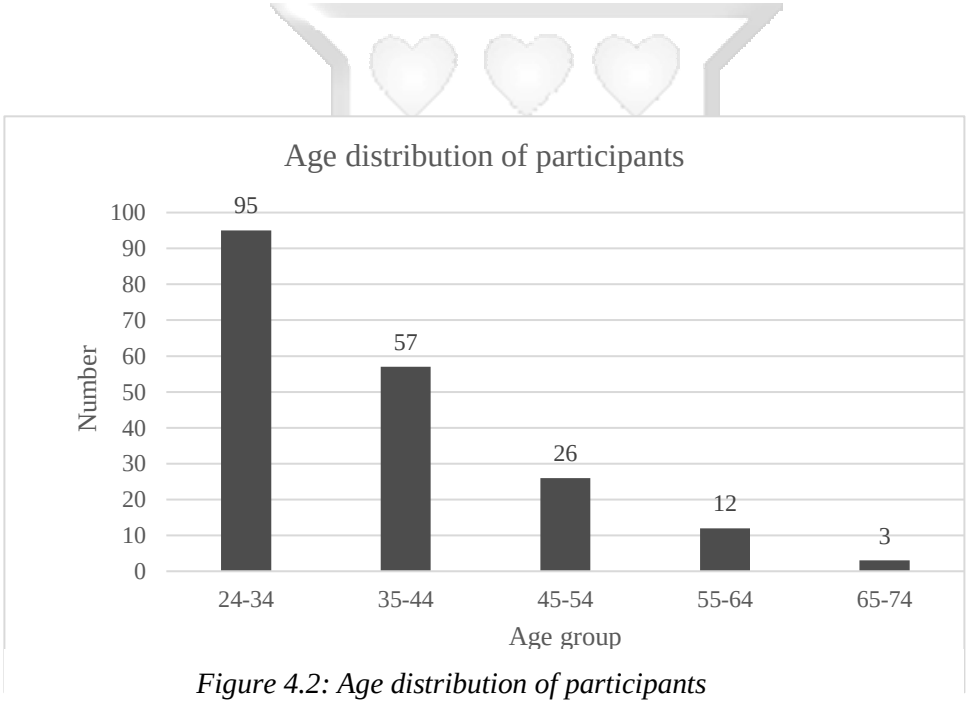


Figure 4.2: Age distribution of participants

4.3.3 County of Work of Participants

The distribution of counties where participants work is shown in the graph below:

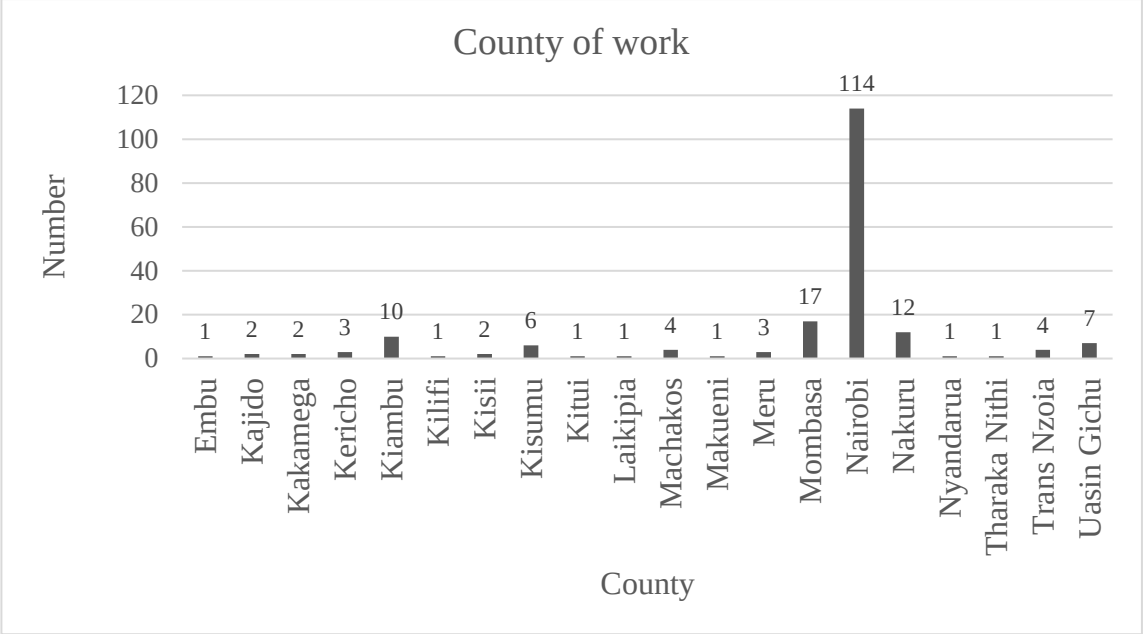


Figure 4.3: County of work

The majority of participants, which comprises 59% of the total respondents are employed in Nairobi County, followed by 8.8% who work in Mombasa County. 6.2% work in Nakuru County, 5.2% work in Kiambu County, and 3.6% work in Uasin Gichu County. 3.1% of participants are from Kisumu County, and 2% from Machakos and Trans Nzoia counties. 1.6% work in Meru County and Kericho county and 1% work in Kisii, Kakamega and Kajiado Counties. 0.5% of participants represent each of the following counties: Embu, Kilifi, Kitui, Laikipia, Makueni, Nyandura, and Tharaka Nithi.

4.3.4 Sector of Work of Participants

The chart below summarizes the distribution of the sectors in which participants work.

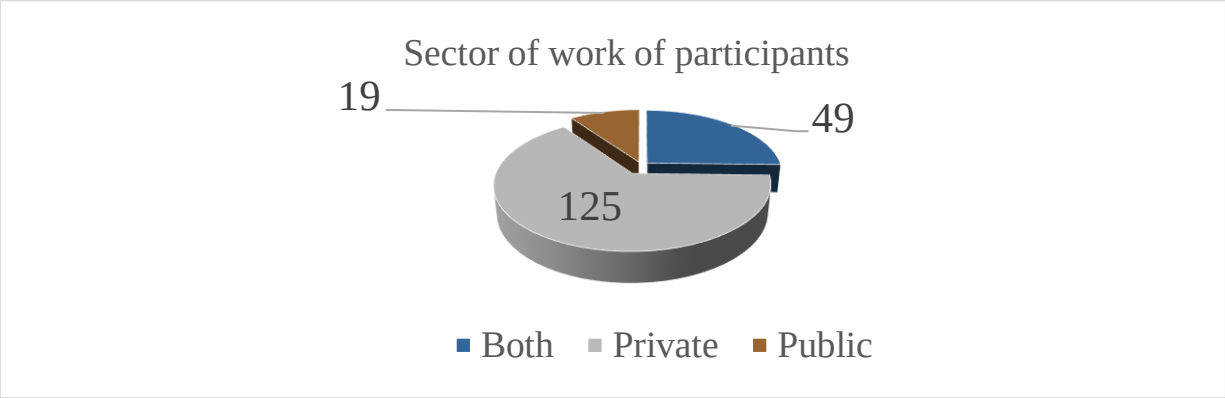


Figure 4.4: Sector of work of participants

In terms of the sector of work, 9.84% of the participants are from the public sector, 64.77% are from the private sector, and 25.39% work in both the private and public sectors.

4.3.5 Educational Qualifications of Participants

In terms of the educational backgrounds of the participants, the distribution is as follows:

66% hold a Bachelor of Dental Surgery, 16.6.% possess a Masters in Dental Surgery, 4.66% have a Masters of Science in Dentistry, 2.6% hold a PhD and 9.84% hold a Post-Graduate Diploma in Dentistry

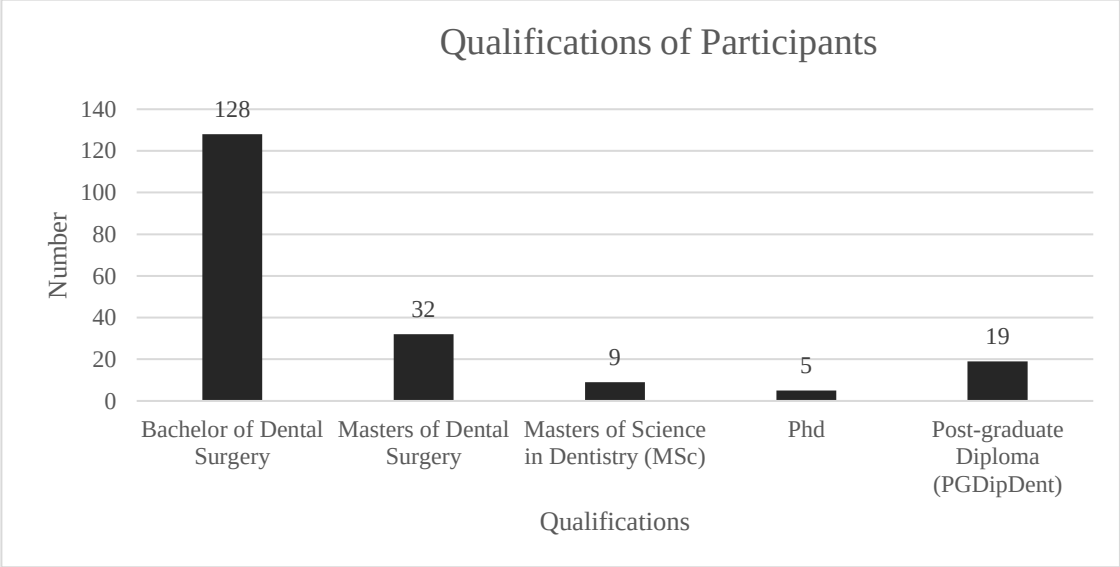


Figure 4.5: Educational Qualifications of the Participants

4.3.6 Number of Years in Clinical Practice.

In terms of the participants years of practice, the distribution is as follows: 40.4% have been in dental practice for 1 to 6 years, 15.5% for 6 to 11 years, 16.6% for 11 to 16 years, 10.9% for 16 to 21 years, 7.3% for 21 to 26 years, 3.6% for 26 to 31 years 3.1% for 31 to 35 years, 1.6% for 36 to 41 years and 1% for 41 to 46 years. The range of experience spans from a minimum of 1 year to a maximum of 42 years.

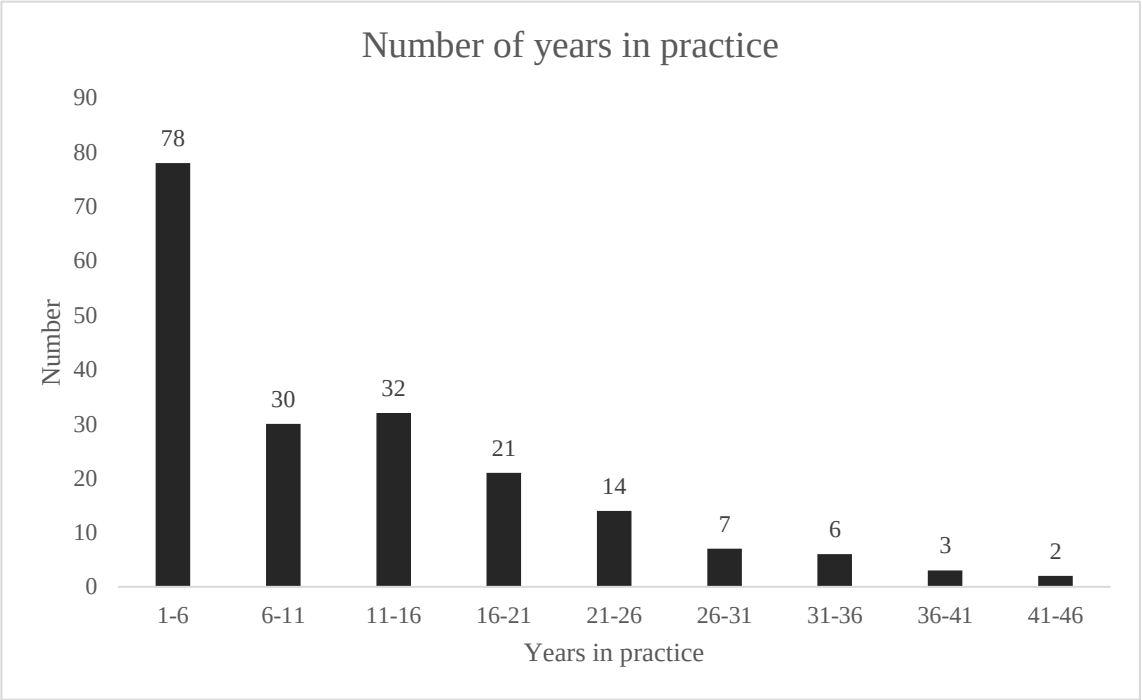


Figure 4.6: Number of years in practice

4.4 Knowledge, Attitude, and Practice of Tele-Dentistry

To assess their knowledge of tele-dentistry, participants were asked whether they had heard about tele-dentistry and if they knew what it is. Out of the 193 respondents, 88.6% said they had heard about tele-dentistry, while 11.4% said they had not heard of it. In response to being asked if they knew what tele-dentistry was, 85% said they knew of it, and 15% said they did not.

To assess the practice of tele-dentistry, participants were asked if they use tele-dentistry in their workplaces. Out of the 193 respondents, 85.5% said they do not use it, while 14.5% said they do.

The next series of questions aimed to assess the attitude of participants towards tele-dentistry. Participants were asked whether they would consider using tele-dentistry in their practices. 175 responses were recorded for this question, out of which 71.4% said they would, but 28.6% said they would not.

This was followed by an open-ended question, asking participants to give reasons to support their above answer. For those expressing their willingness to adopt tele-dentistry in their practices, several common themes emerged. Notably, 15.2% highlighted the enhanced patient access that is made possible with tele-dentistry, while 16.8% emphasized on the convenience that tele-dentistry brings to clinical practice. 12.8% mentioned the potential use of tele-dentistry in streamlining referrals, facilitating multidisciplinary patient care, and supporting collaboration among colleagues with diverse specialties. 12% expressed interest in tele-dentistry as a solution for timesaving. 10.4% of respondents cited technological advancement and adaption and 16% highlighted the potential for broadening their patient base. An additional 2.4% acknowledged the opportunity for international patient collaborations and expanding their global client base. 10.4% of respondents identified tele-dentistry as a means to deliver oral health education, 6.4% mentioned improved patient management and 7.2% discussed its use for follow-ups, reviews, and long-term patient care.

A smaller proportion, 3.2%, identified professional growth as a motivator, and one participant was intrigued by the concept. Additionally, 4% of respondents recognized its efficacy during the COVID-19 pandemic for remote patient care, highlighting its applicability in day-to-day practice. Various participants raised points such as “pre-treatment is easier”, “Improves health seeking behavior of patients” and ‘it is becoming a norm”.

The 28.6% of respondents who would not consider using tele-dentistry in their clinics gave the following reasons to support their answer. A notable 20% of the respondents preferred in-patient treatment, emphasizing the importance of physical interactions for dental treatment. 18% expressed skepticism about the feasibility of providing dental treatment virtually, while 12% believed that tele-dentistry was not applicable to their specific areas of specialization. 14% mentioned the lack of knowledge about tele-dentistry as a reason to not be willing to utilize it in their clinics, with 4% admitting to a lack of understanding of how it operates, and 2% indicating that they are not aware of the technology.

Other reasons given included, the lack of training on using tele-dentistry, being uncomfortable with the method, and 4% found tele-dentistry to be challenging, tedious, and uninteresting. One participant responded that after being in practice for 38 years, learning something new was not a priority to them.6% of respondents mentioned the lack of the required infrastructure for tele-dentistry and expressed concerns about the substantial investment required, coupled with the uncertainty of the returns on investment.

One participant mentioned that their clinic was already well-equipped with state-of the art dental technology which would not be compatible with tele-dentistry as their patients would not be able to enjoy the full benefits of their equipment through virtual means.

Lastly, 12% shared concerns about patient acceptance, patient access to the necessary devices and internet, as well as the impact on doctor-patient relationships in virtual treatment scenarios.

The next question in this section was “Do you think tele-dentistry is valuable in oral health service delivery?” In response, 85% of the participants agreed that tele-dentistry is valuable in oral health service delivery, but 15% disagreed.

This was followed by an open-ended question where participants were asked to give reasons to support their answers. The reasons given by those who agreed that tele-dentistry is valuable are explained as follows. 15.2% recognized the role that tele-dentistry plays in improving access to dental care, particularly for those who reside in areas where dental care is limited. 14% believed that tele-dentistry extends the reach of dental care, allowing a broader and more diverse group of patients to benefit from these services.

12.8% of the respondents mentioned the potential of tele-dentistry to enhance community health education and bridge the gaps in oral health service delivery between rural and urban areas. 4.3% acknowledged that tele-dentistry might be an available tool in addressing the shortage of dentists in the country. 5.5% of participants recognized the global impact of technological advancements and 6.7%

highlighted its proven success in the Western world.

Beyond these specific percentages, other themes emerged, which included the value of tele-dentistry in facilitating communication among dentists, enabling multidisciplinary cases and referrals, both locally and internationally. The aspect of time and cost saving associated with online consultations was also brought out. Other reasons given mentioned that tele-dentistry allows for early diagnosis, timely care, preventive measures, emergency care, remote patient monitoring, and long-term follow-up. It was also seen as a means to ease patient anxiety and minimize the spread of contagious infections.

The respondents who did not find tele-dentistry valuable gave the following reasons to support their answer. A significant majority, comprising 55% emphasized the inability of tele-dentistry to provide dental care effectively as their primary concern. 13.8% expressed a lack of knowledge and information about tele-dentistry, hence leading to their inability to understand the value of tele-dentistry in providing dental care. 7% of the respondents mentioned their limited understanding of how tele-dentistry functions in practical terms. 7% of the respondents raised issues regarding the potential for a misdiagnosis, and 3% had concerns about the completeness of the consultation, which might not adequately address patient concerns. 3% of respondents cited technological barriers, suggesting that patients may lack the necessary technology to access tele-dentistry consultations. Concerns regarding inadequate infrastructure for both providing and receiving tele-dentistry services were also noted as valid reasons for reservations.

4.5 Perceived Usefulness of Tele-dentistry

6 questions regarding the perceived usefulness of tele-dentistry were asked and Likert scales were used to record the responses. The data was then coded as follows:

Table 4.1: Coding of responses

SCALE	**CODE**	**SCORE**
Strongly Agree	SA	5
Agree	A	4
Neutral	N	3
Disagree	D	2
Strongly Disagree	SD	1

The mean, mode and standard deviations were calculated using the relevant scores. The table below summarizes the findings for the 6 questions.

Table 4.2 Perceived usefulness of tele-dentistry

PERCEIVED USEFULNESS OF TELE-DENTISTRY	SA	A	N	D	SD	TOTAL	MEAN	STD.DEV	MODE
Using tele-dentistry would help me to complete tasks more quickly	35	88	30	26	14	193	3.54	3.21	4
Using tele-dentistry would improve my job performance	30	87	35	25	16	193	3.47	3.14	4
Using tele-dentistry in my job would increase my productivity	29	96	29	23	16	193	3.51	3.18	4
Using tele-dentistry in my job would enhance my effectiveness	28	88	38	24	15	193	3.47	3.13	4
Using tele-dentistry would make my job easier	32	84	37	24	16	193	3.48	3.15	4
I would find tele-dentistry useful in my job	41	94	23	20	15	193	3.65	3.32	4

From the summarized table above, the statistical mode of all the responses was 4, which corresponds to “Agree” on the Likert scale. This means that overall, most participants agreed that tele-dentistry is useful in practice.

4.6 Perceived Ease of use of Tele-dentistry

5 questions regarding the perceived ease of use of tele-dentistry were asked and responses were recorded using a Likert scale. The data was coded using the same scale as in section 4.5.

The findings are summarized below:

Table 4.3Perceived ease of use of tele-dentistry

PERCEIVED EASE OF USE	SA	A	N	D	SD	SUM	MEAN	STDDEV	MODE
Learning to operate tele-dentistry would be easy for me	47	91	33	15	7	193	3.81	3.42	4
I would find it easy to get tele-dentistry to do what I want	34	77	45	26	11	193	3.50	3.16	4
My interaction with tele-dentistry would be clear and understandable	36	82	41	23	11	193	3.56	3.22	4
It would be easy for me to become skillful at using tele-dentistry	37	84	40	24	8	193	3.61	3.25	4
I would find tele-dentistry easy to use	44	77	36	27	9	193	3.62	3.27	4

The statistical mode for the responses to the questions for perceived ease of use was 4, which corresponds to "Agree" on the Likert scale. Most participants agreed that they would perceive tele-dentistry as easy to use.

4.7 Social and Behavioral Factors

5 questions pertaining to social and behavioral factors affecting tele-dentistry uptake were asked and responses were recorded using a Likert scale. The data was coded the same way as in section 4.5.

The results are summarized below.

Table 4.4 Social and behavioral factors affecting tele-dentistry.

SOCIAL AND BEHAVIORAL FACTORS	SA	A	N	D	SD	TOTAL	MEAN	STDDEV	MODE
Social/peer pressure would influence me to accept tele-dentistry	19	47	45	67	15	193	2.94	2.64	2
If tele-dentistry became a more popular trend, I would implement it in my clinical practice	45	98	19	22	9	193	3.77	3.40	4
I am resistant to changes in technology	5	14	23	69	82	193	1.92	1.68	1
The lack of physical interaction with	38	70	36	30	19	193	3.40	3.12	4

patients would prevent me from using tele-dentistry									
I am not willing to learn about technological changes	5	9	19	60	100	193	1.75	1.51	1

The statistical mode for "social/peer pressure would influence me to accept tele-dentistry" was 2, which corresponds to "Disagree" on the Likert scale. This means that participants did not believe that social or peer pressure would affect their acceptance of tele-dentistry.

The statistical mode for "if tele-dentistry became a more popular trend, I would implement it in my clinical practice" was 4, which corresponds to "agree" on the Likert scale. This means that a majority of respondents expressed a willingness to incorporate tele-dentistry into their clinical practice if it gained popularity, indicating a positive attitude towards its adoption.

The statistical mode for "I am resistant to changes in technology" was 1, which corresponds to "Strongly Disagree" on the Likert scale. This suggests that respondents expressed a high level of willingness to embrace technological changes, showing a positive attitude towards adopting new technology.

The statistical mode for "The lack of physical interaction with patients would prevent me from using tele-dentistry was 4, which corresponds to "Agree" on the Likert scale. A significant portion of the respondents agreed that the absence of in-person patient interaction would be a hindrance to their adoption of tele-dentistry.

The statistical mode for "I am not willing to learn about technological changes was 1, corresponding to "strongly disagree" on the Likert scale, which means that participants were ready to adopt to technological changes.

4.8 Technological factors affecting the adoption of tele-dentistry.

The participants were given a list of three technological factors and asked which of them would affect their decision to implement tele-dentistry. They could choose more than one option.

75% of participants felt that stable internet connectivity, bandwidth, and data charges would affect their decision to implement tele-dentistry, 81.9% selected the option for infrastructure for tele-dentistry and 48.7% selected the option for technical maintenance as their technical reasons that affect the decision to implement tele-dentistry.

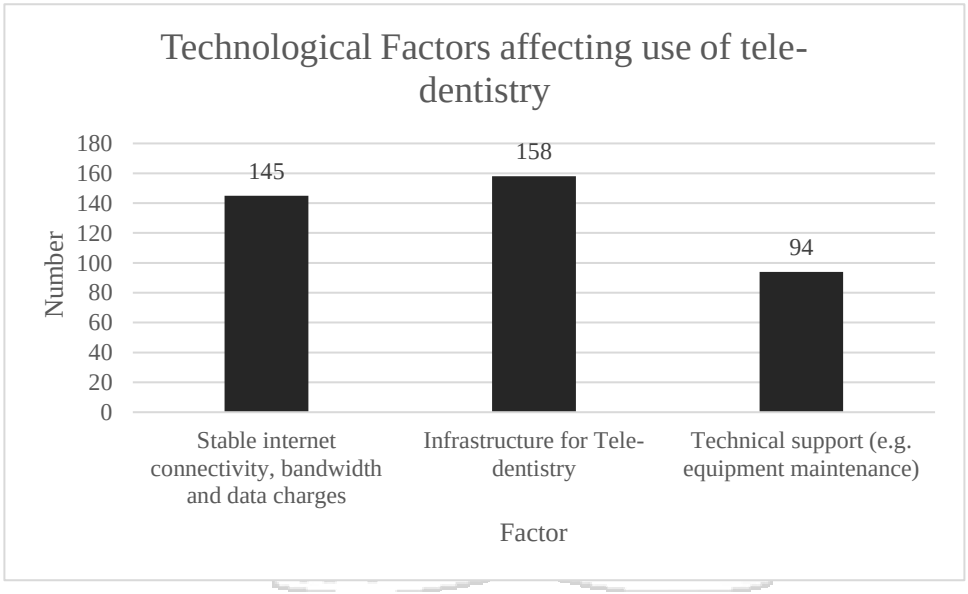


Figure 4.7: Technological factors affecting tele-dentistry adoption

4.9 Other factors affecting the adoption of tele-dentistry.

Participants were given a list of factors which included: medico-legal factors, reimbursement concerns, patient confidentiality, data security, regulatory factors (such as applying for a tele-dentistry license), financial concerns and the limited knowledge on tele-dentistry. They were allowed to choose multiple answers. The results are shown in the graph below.

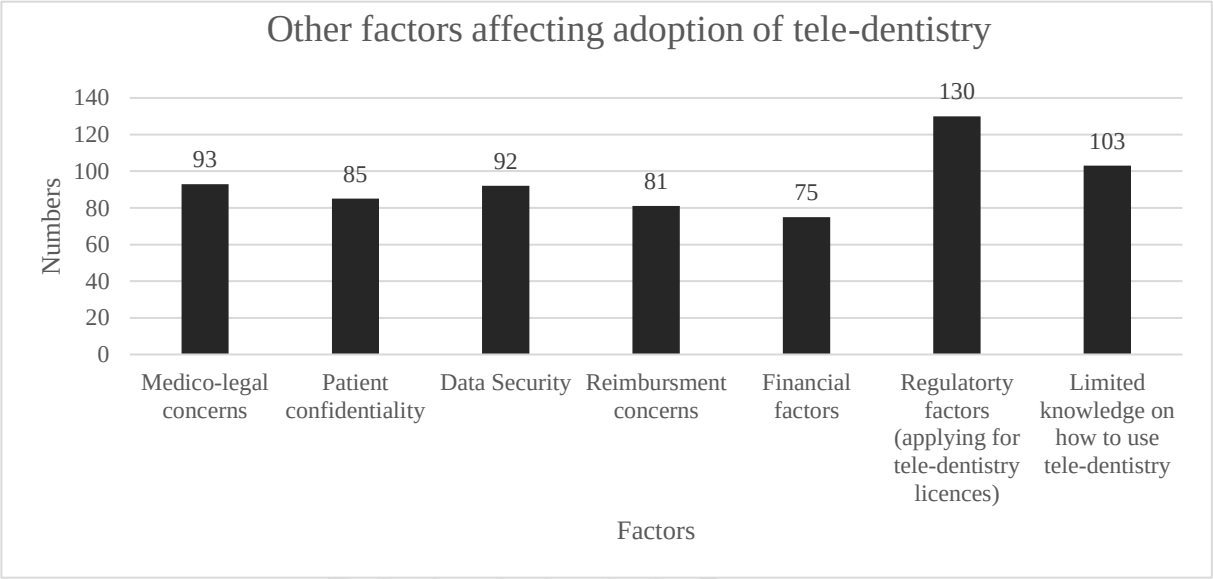


Figure 4.8: Other factors affecting the adoption of tele-dentistry

The breakdown of the results is as follows. 48.2% of participants selected medico-legal concerns, 44% chose patient confidentiality, 47.7% chose data security, 42% selected reimbursement concerns, 38.9% chose financial factors, 67.4% selected regulatory factors and 53.4% selected limited knowledge on how to use tele-dentistry as factors that would affect their decision to implement tele-dentistry.

Participants were asked to mention any factors not mentioned in the questionnaire, that they thought would affect the implementation of tele-dentistry. 8.3% of respondents mentioned patient-related factors, which are summarized as patient acceptability of virtual treatment or consultations, patient literacy levels to use tele-dentistry, and patient access to gadgets and internet connection.

4.10 Suggestions to Improve Tele-dentistry Uptake in Kenya.

The last question was an open-ended question where participants were asked to give their suggestions on how to improve tele-dentistry uptake in Kenya and the responses are summarized as follows.

18.7% of respondents mentioned the need to raise awareness about the uses and benefits of tele-dentistry within the dental fraternity. 13% recommended that

dentists need education on tele-dentistry and 5.7% mentioned the need to spread knowledge on the potential benefits of tele-dentistry. 23.3% mentioned the need for training on tele-dentistry, including technical aspects, out of which 82% of this group suggested it should be taught as part of the undergraduate training in dental schools, and during internship training too. 7.25% suggested that there should be Continuous Professional Development (CPD) events organized by the Kenya Dental Association to talk about tele-dentistry. 8.8% touched on the need for patient education and sensitization on the use of tele-dentistry for oral health.

Policy formulation and regulatory frameworks on the use of tele-dentistry by the Ministry of Health and KMPDC were mentioned by 7.77%. 1% mentioned the need for legal support and frameworks for tele-dentistry implementation. One participant suggested that there should be government-led tele-dentistry initiatives.

3.63% suggested exploring how tele-dentistry is working in other countries and adapt similar models or frameworks in Kenya. One of the respondents also mentioned the idea of having webinars with international dentists who are successfully using tele-dentistry in their practices to learn from them.

4.14% gave healthcare financing as a suggestion to aid in setting up the infrastructure needed for tele-dentistry. 2.07% mentioned insurance financing as a method of reimbursement may increase the uptake of tele-dentistry. 13.47% talked about the need for better infrastructure, availability of gadgets, stable internet, reliable electricity, and making patients computer literate. 1.04% mentioned data /cyber security as their concern and said that it is important to guarantee patients' confidentiality and data safety for better use of tele-dentistry.

Other suggestions included creating a mobile application that is standardized for all users, clarity on reimbursement structures, awareness of potential medico-legal issues and how to handle them and exploring its uses in non-clinical oral health.

Finally, 14% of respondents said they had no suggestions on how to improve the uptake of tele-dentistry. A few of them said they do not have sufficient understanding of the topic to give feasible suggestions, and 3 of them said they are

not in favor of using technology in dentistry, hence they have no suggestions. Respondent 112 said they do not have any suggestions as they do not think it is an efficient way of helping patients. Respondent 120 said they do not see the value of tele-dentistry and hence have no suggestions to improve the uptake.

4.11 Regression Analysis

Pseudo R-Square	
Cox and Snell	.571
Nagelkerke	.575
McFadden	.173
Link function: Logit.	

Table 4.5Pseudo R-Square Test

Table 4.6: Logistic regression analysis

Parameter Estimates								
		Estimate	Std. Error	Wald	Df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[PU = 1.00]	4.699	.946	24.656	1	.000	2.844	6.554
	[PU = 1.17]	4.836	.946	26.162	1	.000	2.983	6.690
	[PU = 1.33]	4.961	.945	27.543	1	.000	3.109	6.814
	[PU = 1.83]	5.077	.946	28.821	1	.000	3.223	6.930
	[PU = 2.00]	6.737	.986	46.695	1	.000	4.805	8.669
	[PU = 2.33]	6.964	.993	49.181	1	.000	5.018	8.911
	[PU = 2.50]	7.037	.995	49.975	1	.000	5.086	8.988
	[PU = 2.83]	7.109	.998	50.762	1	.000	5.153	9.065
	[PU = 3.00]	7.881	1.024	59.198	1	.000	5.874	9.889
	[PU = 3.17]	8.254	1.037	63.406	1	.000	6.222	10.285
	[PU = 3.33]	8.517	1.045	66.438	1	.000	6.469	10.565
	[PU = 3.50]	8.864	1.056	70.485	1	.000	6.795	10.933
	[PU = 3.67]	9.141	1.064	73.776	1	.000	7.055	11.227

	[PU = 3.83]	9.431	1.073	77.243	1	.000	7.328	11.534
	[PU = 4.00]	11.404	1.148	98.617	1	.000	9.153	13.655
	[PU = 4.17]	11.736	1.162	102.077	1	.000	9.459	14.012
	[PU = 4.33]	12.005	1.172	104.841	1	.000	9.707	14.303
	[PU = 4.50]	12.394	1.188	108.803	1	.000	10.065	14.723
	[PU = 4.67]	12.469	1.191	109.563	1	.000	10.134	14.803
	[PU = 4.83]	12.697	1.200	111.890	1	.000	10.344	15.049
Location	PEOU	2.313	.202	131.474	1	.000	1.918	2.709
	SB	.385	.235	2.688	1	.101	-.075	.845
Link function: Logit.								

The regression analysis included a Pseudo-R test for Likert-scale variables, specifically, Perceived Ease of Use, Perceived Usefulness, and Social and Behavioral factors. The results, summarized in the table, revealed Pseudo R-square values of 0.173 for McFadden, 0.571 for Cox and Snell, and 0.575 for Nagelkerke. These values suggest that the model explains a significant amount of variance in the outcome variable. The high Pseudo R-square values also indicate that the independent variables play a crucial role in predicting the outcome variable, which has important implications for designing interventions to enhance the outcome variable.

Additionally, a logistic regression analysis was performed, and the results are presented in the table. The parameter estimates for different levels of the Perceived Usefulness (PU) variable indicate their impact on the outcome. The Threshold

values corresponding to PU values are presented alongside their respective estimates, standard errors, Wald statistics, degrees of freedom (Df), significance (Sig.), and 95% confidence intervals.

The analysis demonstrated that Perceived Usefulness, Perceived Ease of Use (PEOU), and Social and Behavioral (SB) variables are all statistically significant predictors of the outcome variable, with p-values less than 0.05. The positive coefficient for the Perceived Usefulness variable suggests that higher PU values are associated with an increased likelihood of the outcome variable occurring.

In contrast, the negative coefficients for the PEOU and SB variables indicate that higher values of Perceived Ease of Use and Social and Behavioral factors do not contribute to an increased probability of the outcome variable occurring. This finding implies that Perceived Usefulness has the most significant impact on the intention to use tele-dentistry, compared to Perceived Ease of Use and Social and Behavioral factors.

In summary, the regression analysis and logistic regression both support the importance of Perceived Usefulness as a significant predictor of the outcome variable, suggesting that interventions aimed at improving tele-dentistry adoption should focus on enhancing the perceived usefulness of the service.

Chapter 5 : DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents the discussion of the study results aligned to the study objectives; the conclusions drawn. recommendations from the study, limitations of the study and areas for further research.

5.2 Interpretation of the Findings of the Study.

5.2.1 Knowledge of and attitude towards tele-dentistry of dentists in Kenya

In regard to the knowledge of tele-dentistry of dentists in Kenya, the study found that 88.6% of participants were familiar with the concept of tele-dentistry, while 11.4% were not. Furthermore, 85.5% of participants claimed to understand tele-dentistry, but 14.5% said they did not. These findings closely mirror those of the study done in Rwanda (Murerehe et al., 2017) where 96% of respondents were aware of tele-dentistry. However, the awareness observed in this study surpasses that reported among practitioners in Saudi Arabia (Nassani et al., 2021), which was 38%, and in Ethiopia which was 56% (Assaye et al., 2022). The awareness of respondents in this study is higher than that of respondents in France, where 57% of respondents had never heard of tele-dentistry (Giraudeau et al., 2022).

In terms of the practice of tele-dentistry, this study found that 85.5% of respondents did not use tele-dentistry in their workplaces, while 14.5% said they do. This reflects a low uptake of tele-dentistry in clinical practice with relatively few dentists providing the services. These findings align with the study conducted in Rwanda (Murerehe et al., 2017) where only 6.8% of participants reported using tele-dentistry in their practices. However, the findings differ from the study in Sudi Arabia (Nassani et al., 2021) where 23.2% of respondents reported practicing some form of tele-dentistry in their clinics. Similarly, the study in France found that 39% of respondents use tele-dentistry in their clinics, indicating greater utilization compared to this study.

175 responses were recorded when inquiring whether participants would contemplate adopting tele-dentistry in their practices. 71.4% of participants expressed their willingness to consider adopting tele-dentistry, while 28.6% said they would not. These results align closely with those found in the Saudi Arabian study (Nassani et al., 2021) where 66.3% indicated a willingness to consider using tele-dentistry in the future. Similarly, the study done in France found that 65.7% of respondents reported a similar inclination toward considering tele-dentistry in the future.

The respondents who would consider the adoption of tele-dentistry gave a range of reasons to support their choice. These encompass increased patient accessibility, streamlined referrals and collaborative care with specialists, remote consultations with peers and international patients, and the potential to expand their patient base. Furthermore, they highlighted the utility of tele-dentistry for oral health education, long-term patient follow-up, remote patient monitoring, and fostering professional development. These reasons align with those identified in the studies done in Rwanda and Saudi Arabia, demonstrating the broad array of potential applications and benefits in the field of dentistry.

In contrast, the practitioners who were not willing to embrace tele-dentistry expressed a preference for in-person patient interactions and emphasized that dental care cannot be effectively administered virtually. They also mentioned a lack of knowledge and training in tele-dentistry or inadequately equipped clinics lacking the necessary infrastructure for tele-dentistry. The issue of infrastructure was also noted in the Rwandan study.

A smaller proportion of respondents expressed reluctance to embrace tele-dentistry compared to those who showed willingness, and the barriers mentioned against its adoption can potentially be mitigated to shift this perspective. In general, there exists a positive inclination toward considering the incorporation of tele-dentistry into practice, aligning with the results of similar studies conducted in Rwanda, Saudi Arabia, and France

When asked if they perceived tele-dentistry to be valuable in oral health service delivery, 85% said yes, but 15% said no. Participants were asked to support their answers with a reason. The reasons supporting the recognition of tele-dentistry as valuable in oral health service delivery included enhanced access to care, the expansion of patient networks, community-based oral health education, bridging the rural-urban oral health care gap, and addressing the shortage of dentists within the country. Additional factors included streamlining referral processes, collaborative consultations with specialists for cases requiring multidisciplinary care, early diagnosis, prompt intervention, remote patient monitoring, saving patients travel time and expenses, and reducing the transmission of contagious infections. These insights mirror those found in a United States-based study (Tiwari et al., 2022), examining the perceived value of tele-dentistry among dentists, which highlighted time savings, enhanced patient access, outreach to underserved rural areas with limited dentist availability, and oral health education. The many factors supporting the value of tele-dentistry in delivering oral health services demonstrate that practitioners possess a solid grasp of how to incorporate tele-dentistry into their service provision effectively.

The reasons for not considering tele-dentistry valuable in oral health service delivery were similar to those mentioned in the reasons given for not considering using tele-dentistry in clinical practice, and include, the need for in-person interactions for treatment, the opinion that dental care cannot be provided virtually, insufficient knowledge on the usage of tele-dentistry, the need for expensive infrastructure and patients limited access to good internet and necessary gadgets for receiving tele-dentistry services. One reason mentioned above was also mentioned in the United States-based study (Tiwari et al., 2022) was that respondents were not convinced of the quality of care that could be provided virtually. The negative attitude toward tele-dentistry is supported by few, and modifiable factors, which can be worked on to improve the attitude towards it.

Overall, the knowledge of tele-dentistry and the attitude towards it were significantly positive, but the use of it in practice was low. This is consistent with

the findings from the studies done in Rwanda, Saudi Arabia and France.

5.2.2 Perceived Usefulness of Tele-dentistry from the Perspective of the Dentist.

6 questions were asked regarding the perceived usefulness of tele-dentistry. The 6 questions were:

1. Using tele-dentistry would help me to complete tasks quickly.
2. Using tele-dentistry would improve my job performance.
3. Using tele-dentistry in my job would increase my productivity.
4. Using tele-dentistry would enhance my effect.
5. Using tele-dentistry would make my job easier.
6. I would find tele-dentistry useful in my job.

When it comes to the perceived usefulness of tele-dentistry, the statistical mode for all six questions was 4, which corresponds with “Agree”, indicating that overall, participants perceive tele-dentistry as beneficial. This aligns with the "perceived usefulness" concept in the Technology Acceptance Model and suggests that dentists are willing to adopt tele-dentistry due to its perceived benefits for their practice. This positive perception of usefulness is in line with findings from studies conducted in the Eastern Cape, South Africa (Cilliers and Flowerday, 2014), where 82% of respondents found telemedicine useful, and a study in Malaysia (Khokhar et al., 2022) where 70% of respondents agreed that tele-dentistry would improve dental practice.

5.2.3 Perceived Ease of Use of Tele-dentistry

5 questions regarding the perceived ease of use of tele-dentistry were asked. The 5 questions were:

1. Learning to operate tele-dentistry would be easy for me.
2. I would find it easy to get tele-dentistry to do what I want.
3. My interaction with tele-dentistry would be clear and understandable.
4. It would be easy for me to become skillful at using tele-dentistry.
5. I would find tele-dentistry ease to use.

For the perceived ease of use of tele-dentistry, in all five questions, the statistical mode was 4, which corresponds to “Agree”. This implies that participants generally believed that utilizing tele-dentistry would require minimal effort, aligning with the "perceived ease of use" concept in the Technology Acceptance Model. These results contrast with studies conducted in the Eastern Cape, South Africa (Cilliers and Flowerday, 2014), where 40% of respondents were hesitant to use telemedicine due to perceived difficulty, and a study in Nigeria (Adenuga, 2020) that found ease of use to be a hindrance to telemedicine adoption in the country. The positive outcome of this question suggests that with training or learning opportunities, dentists would likely quickly adapt and feel comfortable implementing tele-dentistry in their practice. This is consistent with the findings of an Indonesian study (Napitupulu et al., 2021), which concluded that users are more inclined to embrace telemedicine when they perceive it as easy to use.

5.2.4 Social and behavioral factors affecting tele-dentistry.

5 questions were asked when assessing the social and behavioral factors affecting tele-dentistry adoption. The first statement was “social or peer pressure would influence me to accept tele-dentistry”. The statistical mode for this was 2, which corresponds to “Disagree”, implying that participants expressed that social pressure would not influence their acceptance of the technology. Hence, it can be concluded that social and peer pressure does not exert a significant influence on the behavioral aspects of tele-dentistry adoption. This contrasts with the results of the study done in Indonesia (Napitupulu et al., 2021), where the doctor's opinion played a crucial role in determining the acceptance of telemedicine. It was found that the physician's viewpoint influenced the perceived utility and benefits of telemedicine.

The second statement aimed to assess if practitioners would adopt tele-dentistry if it became a popular trend. The statistical mode for this was 4, which corresponds to “Agree”. Most participants expressed their willingness to incorporate tele-dentistry in their clinics if it gained wider popularity, suggesting that adaptability to trends is a notable social and behavioral factor influencing the adoption of tele-

dentistry.

As for the third statement which was “I am resistant to changes in technology”, the statistical mode was 1, which corresponds to “Strongly Disagree”. Most participants exhibited openness to technological changes, indicating that resistance to change is not a significant behavioral factor affecting the adoption of tele-dentistry. This finding contrasts with the study done in Uganda (Isabalija et al., 2011) which identified resistance to change by staff members as a substantial obstacle to adopting and implementing telemedicine systems. Additionally, the study done in Rural Australia (Estai et al., 2016) found that resistance to new technologies hindered the acceptance of telemedicine in dentistry.

The fourth statement was “The lack of physical interaction with patients would prevent me from using tele-dentistry” and the statistical mode for this was 4, corresponding to “Agree”. It appears that practitioners generally prefer in-person, physical patient appointments, which serves as a significant behavioral factor influencing the adoption of tele-dentistry. This observation aligns with that of a United States-based study (Tiwari et al., 2022) where respondents hesitant about tele-dentistry cited concerns about the quality of care they could provide virtually.

The final statement was “I am not willing to learn about technological changes” and the statistical mode for this was 1, corresponding to “strongly disagree”. The limited uptake of tele-dentistry is not attributable to participants' unwillingness to adapt to technological changes; hence this was not a significant behavioral factor affecting the adoption of tele-dentistry.

5.2.5 Technological Changes Affecting Tele-Dentistry Adoption.

Participants were presented with three technological factors and asked to indicate which ones they believed would influence their decision to implement tele-dentistry.

The most frequently chosen technological factor was "tele-dentistry infrastructure," selected by 158 participants (81.8%). Following closely was

"reliable internet connectivity, bandwidth, and data charges," chosen by 145 respondents (75%). In contrast, the factor with the lowest rate of selection, by 94 participants (48.7%), pertained to technical support, such as equipment maintenance.

These findings highlight that the most substantial technological obstacle to adopting tele-dentistry is the availability of the necessary infrastructure, followed by the presence of a dependable internet connection that can support high-quality tele-dentistry services. This aligns with research conducted in Nigeria (Adenuga, 2020), which identified a lack of technological infrastructure and poor internet bandwidth as deterrents to telemedicine implementation. Similar results are observed in studies from Senegal (Ly et al., 2017) and rural Australia (Estai et al., 2016), which both emphasized the shortage of essential equipment and inadequate internet connectivity as significant barriers to the use of telemedicine, including tele-dentistry.

Notably, data charges were acknowledged as a concern, as services like tele-dentistry require substantial data consumption to function effectively.

In contrast, the availability (or lack thereof) of technical support emerged as a relatively minor technological factor, indicating that people may have relatively easy access to technical assistance when needed or may not require it extensively. This varies from findings in the Senegal study (Ly et al., 2017), where the availability of technical staff for equipment maintenance was a notable hindrance, and the rural Australia study (Estai et al., 2016), which underscored the lack of technical support as an obstacle to the adoption of telemedicine in dentistry.

5.2.6 Other Factors Affecting Tele-Dentistry Adoption.

Participants were presented with a list of seven options to determine any other factors influencing their decision to implement tele-dentistry. The foremost choice among them was "regulatory factors, including applying for tele-dentistry licenses," with 67.4% opting for this selection. Subsequently, "limited knowledge

of tele-dentistry usage" was chosen by 53.4% of participants. Other considerations included medico-legal concerns (48%), data security (47.6%), patient confidentiality (44%), reimbursement concerns (42%), and financial concerns (39%).

These findings diverge slightly from a study conducted in Nigeria (Adenuga, 2020), where medico-legal issues, financial challenges, patient confidentiality, and data security were identified as the more prominent factors affecting the adoption of telemedicine. Similarly, a study from Australia (Estai et al., 2016) reported different results, emphasizing the absence of reimbursement structures, insufficient legal and ethical guidelines, and medico-legal factors as barriers to the acceptance of telemedicine. Notably, the study from Senegal (Ly et al., 2017) echoed the same factors found in the Nigerian and Australian studies.

In light of these findings, it becomes evident that to enhance the adoption of tele-dentistry, regulatory bodies such as KMPDC and the Ministry of Health should establish clear policies, guidelines, and regulatory frameworks for tele-dentistry requirements. Moreover, greater emphasis should be placed on training and educating practitioners to address the limitation of tele-dentistry knowledge as a hindrance to its implementation.

5.3 Conclusion

This study leads to the conclusion that, despite the low adoption of tele-dentistry in Kenya, there is a predominantly positive attitude toward its utility and advantages. An impressive 85% of the respondents expressed agreement with the value of tele-dentistry in oral health service delivery and provided various justifications for their stance. The study highlights that Kenyan dentists believe tele-dentistry can enhance patient access to dental services, streamline the referral process, facilitate multi-disciplinary care, and bridge the rural-urban service gap.

The research was guided by the Technology Acceptance Model (TAM), which gauges technology acceptance through perceived usefulness and ease of use. Overall, dentists perceived tele-dentistry as both valuable and user-friendly, suggesting, in accordance with TAM, a heightened intention to embrace and adapt tele-dentistry. Additionally, the study drew insights from TAM-2 and the diffusion of innovation theory to comprehend other factors influencing tele-dentistry adoption in Kenya, including social and behavioral, technological, and miscellaneous factors. Notably, the study's most compelling findings regarding social and behavioral aspects indicate that more dentists would embrace tele-dentistry if it became a popular trend, but concerns about the lack of physical interaction might hinder its clinic-based use. Concerning technological factors, a stable internet connection and sufficient bandwidth emerged as the most significant considerations, closely followed by the availability of technical infrastructure. Regulatory factors and limited knowledge of tele-dentistry also featured prominently.

Suggestions to promote tele-dentistry adoption primarily revolved around education, training, and raising awareness, with a notable recommendation being its inclusion in undergraduate dental training programs. Enhancing internet connectivity and ensuring the availability of necessary tele-dentistry equipment were other frequently mentioned ideas.

In summary, the principal factors affecting tele-dentistry adoption in Kenya are the limited knowledge about the subject, unstable internet connectivity and bandwidth, and the absence of technical infrastructure for tele-dentistry provision. Other factors from the survey held comparatively less significance. The outlook for tele-dentistry in Kenya appears promising, contingent upon increased accessibility to education, training, and infrastructure.

5.4 Recommendations

Objective number 4 in the Kenya National Oral Health Policy states "To strengthen health systems capacity to provide oral health services by improving infrastructure and providing equipment, commodities and technologies". One of the key measures for this objective is "the number of facilities using tele-dentistry for training and surveillance".

An important starting point to achieve this objective and to improve the uptake of tele-dentistry in Kenya is to focus on educating and training dental professionals on how to use tele-dentistry. It would be valuable to include a module on tele-dentistry in undergraduate training institutes as part of the syllabus. Trainings can be held during the internship period of newly graduated dentists. The Kenya Dental Association should organize continuous professional development (CPD) events to highlight the applications and advantages of tele-dentistry, as well as advocate for it as a mode of bridging the rural-urban gap in oral health service provision.

The Ministry of Health and KMPDC ought to play an active role in promoting tele-dentistry as an acceptable and feasible method of healthcare provision, and design programs to educate the public on the same, so that there is acceptability on both, the provider and user side. Adopting tele-dentistry models from countries where it has worked can also provide guidance on the various ways to use it.

There needs to be an improvement in the internet connection, as well as a reduction in data charges, more so in rural areas, to facilitate the process of tele-dentistry

more seamlessly. Poor internet connection and data charges are a major hindrance to quality service delivery via tele-dentistry. Network providers can be roped into tele-dentistry programs to provide quality and affordable data and internet bandwidth to improve the technical aspect.

5.5 Limitations

The structured nature of the questionnaire may have confined the responses of the participants and hence in-depth data could not be collected.

This study focused only on the provider (dentists) aspect, but the user (patient) input is equally important to understand the uptake of tele-dentistry in Kenya.

5.6 Areas for Further Research

A similar study can be done to assess the factors hindering the uptake of tele-dentistry in Kenya from the user (patient) perspective. A quantitative, interview-based study can be done to further explore dentists' perspectives and suggestions to improve tele-dentistry uptake in Kenya.

Chapter 6 : REFERENCES

Abbas, B., Wajahat, M., Saleem, Z., Imran, E., Sajjad, M., & Khurshid, Z. (2020, December). Role of Teledentistry in COVID-19 Pandemic: A Nationwide Comparative Analysis among Dental Professionals. *European Journal of Dentistry*, 14(S01), S116–S122. https://doi.org/10.1055/s-0040-1722107

Adenuga, K. I. (2020, March 25). Telemedicine system: service adoption and implementation issues in Nigeria. Indian Journal of Science and *Technology,* 13(12),1321–1327. https://doi.org/10.17485/ijst/v13i12.180

Ajibade, Patrick, "Technology Acceptance Model Limitations and Criticisms: Exploring the Practical Applications and Use in Technology-related Studies, Mixed method, and Qualitative Researches" (2018). *Library Philosophy and Practice (e- journal).* 1941.

AlQudah, A. A., Al-Emran, M., & Shaalan, K. (2021). Technology Acceptance in Healthcare: A Systematic Review. *Applied Sciences,* 11(22), 10537. https://doi.org/10.3390/app112210537

Assaye, B. T., Jemere, A. T., & Nigatu, A. M. (2022, January). Knowledge and awareness of health professionals towards telemedicine services in Northwest, Ethiopia. DIGITAL HEALTH, 8, 205520762211432. https://doi.org/10.1177/20552076221143250

Burke, E. (2020, August 10). How did we get here? A brief history of Teledentistry. Medium. https://medium.com/oraleye-network-news/how-did-we-get-here-a- briefhistory-of-teledentistry-f985b8e0b7b3

Cilliers, L., & Flowerday, S. (2014, September). User Acceptance of Telemedicine by Health Care Workers a Case of the Eastern Cape Province, South Africa. The Electronic Journal of Information Systems in Developing Countries, 65(1), 1– 10.https://doi.org/10.1002/j.1681-4835.2014.tb00467.x

Cooper R.G (2005). Winning at new products: Pathways to Profitable Innovation https://www.five-is.com/wp-

content/uploads/2013/12/Cooper_2005_Pathways_to_Profitable_Innovation.pdf

Cote, C. (2021, December 2). 7 Data Collection Methods in Business Analytics. Harvard Business School. https://online.hbs.edu/blog/post/data-collection-methods

Crown, C. A. (2018). A Beginner's Guide to Teledentistry. Today's RDH. Retrieved from https://www.todaysrdh.com/a-beginners-guide-to-teledentistry

Dearing, J. W., & Cox, J. G. (2018, February). Diffusion Of Innovations Theory, Principles, And Practice. Health Affairs, 37(2), 183–190. https://doi.org/10.1377/hlthaff.2017.1104

Ellen, S. (2020, December 14). Slovin's Formula Sampling Techniques. Sciencing. https://sciencing.com/slovins-formula-sampling-techniques-5475547.html

Estai, M., Kruger, E., Tennant, M., Bunt, S., & Kanagasingam, Y. (2016, November 28). Challenges in the uptake of telemedicine in dentistry. Rural and Remote Health. https://doi.org/10.22605/rrh3915

Fincham, J. E. (2008). Response Rates and Responsiveness for Surveys, Standards, and the Journal. American Journal of Pharmaceutical Education, 72(2). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2384218/#:~:text=Response%20rates%20approximating%2060%25%20for

Florea, M., Lazea, C., Gaga, R., Sur, G., Lotrean, L., Puia, A., Stanescu, A. M. A., Lupsor-Platon, M., Florea, H., & Sur, M. L. (2021, April). Lights and Shadows of the Perception of the Use of Telemedicine by Romanian Family Doctors During the COVID-19 Pandemic. International Journal of General Medicine, Volume 14, 1575–1587. https://doi.org/10.2147/ijgm.s309519

Giraudeau, N., Bauer, M., Tramini, P., Inquimbert, C., & Toupenay, S. (2022, January) A national teledentistry study on the knowledge, attitudes, training

and practices of private dentists. DIGITAL HEALTH, 8, 205520762210850. https://doi.org/10.1177/205520762210 85069

Helitzer, D., Heath, D., Maltrud, K., Sullivan, E., & Alverson, D. (2003). Assessing or predicting adoption of telehealth using the diffusion of innovations theory: a practical example from a rural program in New Mexico. Telemedicine Journal and E-Health : The Official Journal of the American Telemedicine Association, 9(2), 179–187. https://doi.org/10.1089/153056203766437516

Isabalija, D. S. R., Mayoka, K. G., Rwashana, D. A. S., & Mbarika, P. V. W. (2011). Factors Affecting Adoption, Implementation and Sustainability of TelemedicineInformation Systems in Uganda. Journal of Health Informatics in Developing Countries, 5(2). https://www.jhidc.org/index.php/jhidc/article/view/72

Jampani, N. D., Nutalapati, R., K. Dontula, B. S., & Boyapati, R. (2011). Applications of teledentistry: A literature review and update. Journal of International Society of Preventive & Community Dentistry, 1(2), 37-44. https://doi.org/10.4103/2231-0762.97695

Kenya rolls out Universal Health Coverage. (2018). WHO | Regional Office for Africa. https://www.afro.who.int/news/kenya-rolls-out-universal-health-coverage

Kenya: Sustainable Development Knowledge Platform. (2017, July 19). Kenya.

Khokhar, R. A., Ismail, W. A., Sunny, A., Shaikh, G. M., Ghous, S., Ansari, M., Zia, S. H.,Arshad, S., & Alam, M. K. (2022, July 20). Awareness regarding Teledentistry among Dental Professionals in Malaysia. BioMedResearch International, 2022, 1–8. https://doi.org/10.1155/2022/3750556

Lewis, J., & Hf, S. (2019). Comparison of Four TAM Item Formats: Effect of Response Option Labels and Order. Journal of Usability Studies, 14, 224–236. https://uxpajournal.org/wp content/uploads/sites/7/pdf/JUS_Lewis_August2019.pdf

Lewis, W. (2017, May 20). What is the Iron Triangle of Health Care? Medium. https://medium.com/more-health/what-is-the-iron-triangle-of-health-care-9ce6f5276077

Ly, B. A., Labonté, R., Bourgeault, I. L., & Niang, M. N. (2017). The individual and contextual determinants of the use of telemedicine: A descriptive study of the perceptions of Senegal's physicians and telemedicine projects managers. PLOSONE, 12(7), e0181070. https://doi.org/10.1371/journal.pone.0181070

Malatji, W. R., Eck, R. V., & Zuva, T. (2020). Understanding the usage, Modifications, Limitations and Criticisms of Technology Acceptance Model (TAM). Advances in Science, Technology and Engineering Systems Journal, 5(6),113–117. https://doi.org/10.25046/aj050612

Marikyan, D. & Papagiannidis, S. (2022) Technology Acceptance Model: A review In TheoryHub Book. http://open.ncl.ac.uk

Marley. (2022, October 31). Kenya Facing Acute Shortage of Dentists as Cases of Oral Diseases Rise. Oral Health Group. https://www.oralhealthgroup.com/news/kenya-facing-acute-shortage-of-dentists-as-cases-of-oral-diseases-rise-1003969559/

Menhadji, P., Patel, R., Asimakopoulou, K., Quinn, B., Khoshkhounejad, G., Pasha, P., Garcia Sanchez, R., Ide, M., Kalsi, P., & Nibali, L. (2021). Patients' and dentists' perceptions of tele-dentistry at the time of COVID-19. A questionnaire-based study. Journal of Dentistry, 113, 103782. https://doi.org/10.1016/j.jdent.2021.103782

Ministry of Health, Kenya. (2022). Kenya National Oral Health Strategic Plan. https://www.health.go.ke/wp-content/uploads/2022/06/KENYANATIONAL- ORAL-HEALTH-STRATEGIC-PLAN-2022-2026.pdf

Ministry of Health, Kenya. (2022). The Kenya National Oral Health Policy, 2022-2030. Ministry of Health, Kenya. . In https://www.health.go.ke/wp-

content/uploads/2022/06/KENYA-NATIONAL-ORAL-HEALTH-POLICY- 2022- 2030.pdf.

Murererehe, J., Uwambaye, P., Isyagi, M., Nyandwi, T., & Njunwa, K. (2017, May 24). Knowledge, attitude and practices of dental professionals in Rwanda towards the benefits and applications of teledentistry. Rwanda Journal, 4(1),39. https://doi.org/10.4314/rj.v4i1.6f

Naavaal, S., & Kelekar, U. (2018, March 1). School Hours Lost Due to Acute/Unplanned Dental Care. Health Behavior and Policy Review, 5(2), 66–73.https://doi.org/10.14485/hbpr.5.2.7

Napitupulu, D., Yacub, R., & Putra, A. (2021, June 30). Factor Influencing of Telehealth Acceptance During COVID-19 Outbreak: Extending UTAUT Model. International Journal of Intelligent Engineering and Systems, 14(3), 267–281. https://doi.org/10.22266/ijies2021.0630.23

Nassani, M. Z., Al-Maweri, S. A., AlSheddi, A., Alomran, A., Aldawsari, M. N., Aljubarah, A., Almuhanna, A. M., Almutairi, N. M., Alsalhani, A. B., & Noushad, M. (2021, December 4). Teledentistry—Knowledge, Practice, and Attitudes of Dental Practitioners in Saudi Arabia: A Nationwide Web-Based Survey. Healthcare,9(12), 1682. https://doi.org/10.3390/healthcare9121682

Niknam, F., Sharifian, R., Azadeh Bashiri, Mardani, M., Akbari, R., Haitham Tuffaha, Do, L., & Bastani, P. (2023). Tele-dentistry, its trends, scope, and future framework in oral medicine; a scoping review during January 1999 to December 2021. 81(1). https://doi.org/10.1186/s13690-023-01128-w

Nutalapati, R., Boyapati, R., Jampani, N., & Dontula, B. S. K. (2011). Applications of teledentistry: A literature review and update. Journal of International Society of Preventive and Community Dentistry, 1(2), 37. https://doi.org/10.4103/2231-0762.97695

Peres, M. A., Macpherson, L. M. D., Weyant, R. J., Daly, B., Venturelli, R., Mathur, M.R.,Listl, S., Celeste, R. K., Guarnizo-Herreño, C. C., Kearns,

C., Benzian, H., Allison, P., & Watt, R. G. (2019, July). Oral diseases: a global public healthchallenge. The Lancet, 394(10194), 249–260. https://doi.org/10.1016/s0140-6736(19)31146-8

PVDA A. (2021, April 26). 3 Forms of Teledentistry | Parkview Dental Associates, SC. Parkview Dental Associates SC. https://parkviewdentalwi.com/teledentistry/3-common-forms-of-teledentistry/

Rahimi, B., Nadri, H., Lotfnezhad Afshar, H., & Timpka, T. (2018). A Systematic Review of the Technology Acceptance Model in Health Informatics. Applied clinical informatics, 9(3), 604–634. https://doi.org/10.1055/s-0038-1668091

Santana, L. A. D. M., Santos, M. A. L. D., Albuquerque, H. I. M. D., Costa, S. F. D. S., Rezende-Silva, E., Gercina, A. C., & Takeshita, W. M. (2020). Teledentistry inBrazil: a viable alternative during COVID-19 pandemic. Revista Brasileira De Epidemiologia, 23. https://doi.org/10.1590/1980-549720200082

Saunders, Mark & Lewis, P. & Thornhill, A.. (2009). Understanding research philosophies and approaches. Research Methods for Business Students. 4. 106-135. https://www.researchgate.net/publication/309102603_Understanding_research_philosophies_and_approaches/citation/download

Schweiberger, K., Bohnhoff, J., Hanmer, J., & Ray, K. N. (2022, September 1). Perceived Usefulness of Increased Telemedicine Use by Pediatric Subspecialists: A National Survey. Telemedicine and E-Health, 28(9), 1367– 1373. https://doi.org/10.1089/tmj.2021.0583

Shappell, A. V., & Cartier, P. (2023). Understanding the Mental-Dental health connection said to be integral to patient care. Psychiatric News, 58(07). https://doi.org/10.1176/appi.pn.2023.07.6.15

Shorten, A., & Smith, J. (2017). Mixed Methods Research: Expanding the

Evidence Base. Evidence Based Nursing, 20(3), 74–75. http://dx.doi.org/10.1136/eb-2017-102699

Singhal, S., Mohapatra, S., & Quiñonez, C. (2021, December 21). Reviewing Teledentistry Usage in Canada during COVID-19 to Determine Possible Future Opportunities. International Journal of Environmental Research and Public Health,19(1), 31. https://doi.org/10.3390/ijerph19010031

Sullivan, M. (2016, August 23). Extended technology acceptance model (TAM2) [Personality & TKMS series] - RealKM. (2023, March 22). RealKM. https://realkm.com/2016/08/24/extended-technology-acceptance-model-tam2- personality-tkms-series/

Surucu, L., & Maslakci, A. (2020). VALIDITY AND RELIABILITY IN QUANTITATIVE RESEARCH. Business & Management Studies: An International Journal, 8(3), 2694–2726. https://doi.org/10.15295/bmij.v8i3.1540

Sustainable Development Knowledge Platform https://sustainabledevelopment.un.org/memberstates/kenya#:~:text=The%20l aunch%20of%20the%20SDGs,of%20the%20SDGs%20in%20Kenya

Taherdoost, H. (2021). Data Collection Methods and Tools for Research; a Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. International Journal of Academic Research in Management (IJARM), 10(1), 10–38. https://hal.science/hal-03741847/document

The Many Costs (Financial and Well-Being) of Poor Oral Health | College of Dentistry | University of Illinois Chicago. (2019, August 6). The Many Costs (Financial and Well-Being) of Poor Oral Health | College of Dentistry | University of Illinois Chicago. https://dentistry.uic.edu/news-stories/the-many-costs- financial-and-well-being-of-poor-oral-health/)

Thomas, L. (2020, August 28). An introduction to simple random sampling. Scribbr. https://www.scribbr.com/methodology/simple-random

sampling/#:~:text=Simple%20random%20sampling%20is%20a

Tiwari, T., Diep, V., Tranby, E., Thakkar-Samtani, M., & Frantsve-Hawley, J. (2022, May 13). Dentist perceptions about the value of teledentistry. BMC Oral Health, 22(1). https://doi.org/10.1186/s12903-022-02208-z

Today, D. (2022, September 8). Teledentistry is Increasing Convenience for Dentists and Patients. Dentistry Today. https://www.dentistrytoday.com/how- teledentistry-is-increasing-convenience-for-dentists-and-patients/

United Nations Sustainable Development. (2018, June 20) The Sustainable Development Agenda. https://www.un.org/sustainabledevelopment/development-agenda-retired/

United Nations. (2020, September 19). Sustainable Development Goals. United Nations Sustainable Development; United Nations. https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Universal health coverage | FDI. (2019, June 20). Universal Health Coverage | FDI. https://www.fdiworlddental.org/universal-health-coverage

Whaley, J. (2020, February 24). Understanding Target Population in Research. OvationMR. https://www.ovationmr.com/target-population-in-research/

Winkelmann, J., Listl, S., van Ginneken, E., Vassallo, P., & Benzian, H. (2023). Universal health coverage cannot be universal without oral health. The Lancet Public Health, 8(1), e8–e10. https://doi.org/10.1016/s2468-2667(22)00315-2

World Health Organization. (2019, July 16). Universal health coverage. WHO; World Health Organization: WHO https://www.who.int/health-topics/universalhealth-coverage#tab=tab1

World Health Organization. (2022). Oral Health. World Health Organization. https://www.who.int/health-topics/oral-health#tab=tab_1

Yadav, R., & Rai, R. (2016, June 10). Dental education: Do we really have too many graduates? British Dental Journal, 220(11), 558–558. https://doi.org/10.1038/sj.bdj.2016.394

Zainab, D. (2020, March 24). Teledentistry-Filling The Oral Health Gaps In Remote Areas. *DentalReach - Leading Dental Magazine - Dentistry Journal*, News & Events.https://dentalreach.today/dental-news/teledentistry-filling-the-oral- health-gaps-in- remote-areas/

Appendix 1: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **138866**

Date of Issue: **31/May/2023**

RESEARCH LICENSE

This is to Certify that Dr.. Kanaan Paresh Dave of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Assessing the factors affecting the adoption of tele-dentistry in Kenya for the period ending : 31/May/2024.

License No: **NACOSTI/P/23/26429**

138866

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 2: SU-ISERC Clearance

Strathmore UNIVERSITY

Final Decision

This is to certify that the application for ethics clearance submitted by:
Principal Investigator: Dr. Dave, Kanaan Paresh
Reference number: SU-ISERC1726/23
For Study: "Factors affecting tele-dentistry adoption in Kenya"
Was reviewed and received the following status: "approved"
Reviewer Comments
The SU-ISERC wishes you all the best with this research undertaking.
23 May 2023 07:25:35

Appendix 3: Introduction Letter

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

15th March 2023

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – KANAAN PARESH DAVE

This is to introduce Kanaan Paresh Dave, a Master of Business Administration in Healthcare Management (MBA-HCM) student at Strathmore University Business School, student number 138876/21. As part of our MBA-HCM Programme, Kanaan is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MBA-HCM course. To this effect, she would like to request for appropriate data from your organization.

Kanaan is undertaking a research paper on **"Factors Affecting Implementation and Application of Tele-Dentistry in Kenya"** The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MBA-HCM Programme seeks to establish links with industry, and one of the ways of doing so is directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Njoki Kiagiri
Manager – Graduate Programmes.
Strathmore University Business School

Appendix 4: Proposed Work Plan

STAGE DESCRIPTION	PROPOSED TIMELINE
Proposal Presentation	Third week of March
Ethical approval	Second week of April
Data Collection	Third week of April
Data analysis and interpretation Report Writing-first draft	Fourth week of April
Submission of dissertation	Second week of May
Oral defense of dissertation	Third week of May
Correction of dissertation	Last week of May

Appendix 5: Proposed budget

ITEM	UNIT PRICE	QUANTITY	TOTAL (Ksh.)
Printing and Binding of proposal	800/-	3 copies	2400/-
Printing andBinding of Dissertation	2000	3	6000
Miscellaneous Expenses	15,000	1	15,000
TOTAL			23,400/-

Appendix 6: Participant Information and Consent Form

PARTICIPANT INFORMATION AND CONSENT FORM

ASSESSING THE FACTORS AFFECTING THE ADOPTION OF TELE-DENTISTRY IN KENYA

Section 1: **Information Sheet**

Investigator: Kanaan Paresh Dave

Institutional Affiliation: Strathmore Business School

Section 2: Information Sheet – The Study

2.1 Why is this study being carried out?

This study is being carried out to identify the factors that are affecting the adoption of tele-dentistry in Kenya, and subsequently identify ways to improve the uptake of tele-dentistry in Kenya.

2.2. Do I have to take part?

No. Taking part in this study is entirely optional and the decision rests only with you. If you decide to take part, you will be asked to complete a questionnaire to get information on the factors affecting the adoption of tele-dentistry. If you are not able to answer all the questions successfully the first time, you may be asked to sit through another informational session after which you may be asked to answer the questions a second time. You are free to decline to take part in the study from this study at any time without giving any reasons.

2.3. Who is eligible to take part in this study?

Dentists in the private and public sector in Kenya who are registered with KMPDC and are practicing dentistry.

2.4. Who is not eligible to take part in this study?

Practitioners who are not registered with KMPDC and are not actively practicing dentistry.

2.5. What will taking part in this study involve for me?

You will be approached by Kanaan Dave and requested to take part in the study. If you are satisfied that you fully understand the goals behind this study, you will be asked to sign the informed consent form (this form) and then taken through a questionnaire to complete.

2.6. Are there any risks or dangers in taking part in this study?

There are no risks in taking part in this study. All the information you provide will be treated as confidential and will not be used in any way without your express permission.

2.7. Are there any benefits of taking part in this study?

The information will be used to improve tele-dentistry uptake in Kenya, which has the potential to improve oral health service delivery in the country.

2.8. What will happen to me if I refuse to take part in this study?

Participation in this study is entirely voluntary. Even if you decide to take part at first but later change your mind, you are free to withdraw at any time without explanation.

2.9. Compensation

There is no financial compensation involved in this study.

2.10. Who can I contact in case I have further questions?

You can contact me, KANAAN DAVE at Strathmore Business School, or by e-mail, kanaan.paresh@strathmore.edu or by phone (+245737 044 265)

If you want to ask someone independent anything about this research, please contact:

The Secretary–Strathmore University Institutional Ethics Review Board, P. O. BOX 59857, 00200, Nairobi, email ethicsreview@strathmore.edu Tel number: +254 703 034 375

I _____, have had the study explained to me. I have understood all that I have read and have had explained to me and had my questions answered satisfactorily. I understand that I can change my mind at any stage.

Please tick the boxes that apply to you;

☐I AGREE to take part in this research

☐ I DON'T AGREE to take part in this research.

Participant's Signature:

_____

Date: _____/ _____/ _____ DD / MM / YEAR

Participant's Name: _____

Time:_____/_____(Please print name) HR / MN

I_____ (Kanaan Dave) certify that I have followed the SOP for this study and have explained the study information to the study participant named above, and that s/he has understood the nature and the purpose of the study and consents to the participation in the study. S/he has been given opportunity to ask questions which have been answered satisfactorily.

Investigator's Signature:

_____

Date: _____/_____/_____DD / MM / YEAR

Investigator's Name:

_____

Time: _____/_____ HR / MN

Appendix 7: Questionnaire

QUESTIONNAIRE: Factors affecting the adoption of Tele-Dentistry in Kenya.

SECTION A **PARTICIPANT INFORMATION**	
Participant Initials	
Gender	MALE ☐ FEMALE ☐
Age (Years)	
COUNTY OF WORK	
Sector of work	Private ☐ Public ☐ Both ☐
Educational Qualifications	Bachelor of Dental Surgery ☐ Master of Dental Surgery ☐ Post-Graduate Diploma in Dentistry ☐ Masters of Science in Dentistry ☐ PHD ☐
Number of years in clinical practice	

SECTION B:		
KNOWLEDGE AND ATTITUDE TOWARDS TELE-DENTISTRY		
Have you heard about tele-dentistry?	YES NO	☐ ☐
Do you know what tele-dentistry is?	YES NO	☐ ☐
Do you practice tele-dentistry in your place of work?	YES NO	☐ ☐
If you do not, would you consider using tele-dentistry?	YES NO	☐ ☐
Please give a reason for your above answer (Yes or No)		
Do you think that tele-dentistry is valuable in oral health service delivery?	YES NO	☐ ☐
Please give a reason for your above answer (Yes or No)		

For the following questions, please select the answer that you feel is most appropriate for you.

SECTION 3 **PERCEIVED USEFULNESS OF TELE-DENTISTRY**		
Using tele-dentistry would enable meto complete tasks more quickly.	Strongly agree. Agree Neither agree nor disagree Disagree Strongly disagree.	☐ ☐ ☐ ☐ ☐
Using tele-dentistry would improve my job performance.	Strongly agree. Agree Neither agree nor disagree Disagree Strongly disagree.	☐ ☐ ☐ ☐ ☐
Using tele-dentistry in my job would increase my productivity.	Strongly agree. Agree Neither agree nor disagree Disagree Strongly disagree.	☐ ☐ ☐ ☐ ☐
Using tele-dentistry would enhance my effectiveness on the job.	Strongly agree. Agree Neither agree nor disagree	☐ ☐ ☐

	Disagree ☐ Strongly disagree. ☐
Using tele-dentistry would make my job easier.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
I would find tele-dentistry useful in my job	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐

SECTION D: PERCEIVED EASE OF USE OF TELE-DENTISTRY	
Learning to operate tele-dentistry would be easy for me.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
I would find it easy to get tele-dentistry to do what I want.	Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
My interaction with tele-dentistry would be clear and understandable.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐

It would be easy for me to become skillful at using tele-dentistry.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
I would find tele-dentistry easy to use.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree Disagree ☐ Strongly disagree. ☐

SECTION E: **SOCIAL AND BEHAVIORAL FACTORS AFFECTING TELE- DENTISTRY**	
Social / peer pressure would influence me to accept tele- dentistry	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐

If tele-dentistry became a more popular trend, I would implement it in my clinical practice.	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
I am resistant to changes in technology	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
The lack of physical interaction with patients would prevent me from using tele-dentistry	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐
I am not willing to learn about technological changes	Strongly agree. ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree. ☐

For the following questions, please tick/select the options that you feel most appropriate. You may select more than one.

TECHNOLOGICAL FACTORS
Which of the following technological factors would hinder you from implementing tele-dentistry?
Stable internet connectivity, bandwidth, and data charges. ☐
Infrastructure for tele-dentistry ☐
Technical support (e.g., equipment maintenance) ☐
Any other technological factors (Please state)

OTHER FACTORS

Which of the following factors would hinder you from implementing tele-dentistry?

Medico-legal concerns ☐

Patient confidentiality ☐

Data security ☐

Re-imbursement concerns ☐

Financial factors ☐

Regulatory factors (applying for tele-dentistry licenses) ☐

Limited knowledge on how to use tele-dentistry. ☐

ANY OTHER FACTORS:

Please mention any other factors that would affect your decision to implement tele- dentistry.

Please mention below any suggestions to help improve the acceptance and implementation of tele-dentistry in Kenya.

END

THANK YOU FOR YOUR PARTICIPATION