Applied Research Project Proposal

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Perspectives of Adoption of Telemedicine in South Africa.

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List of Acronymns and Abbreviations

AIDS - Acquired Immune Deficiency Syndrome

EMR - Electronic Medical Records

HIV- Human Immunodeficiency Virus

ICT - Information and Communication Technology

IT - Information Technology

SA- South Africa

TAM - Technology Acceptance Model

TB - Tuberculosis

WHO -World Health Organisation

ABSTRACT

The research investigated the potentials and barriers of the adoption of telemedicine in Johannesburg, South Africa. Their research adopted correlation research design for the study. The research sampled 124 respondents who were health practitioners from eight different hospitals in Johannesburg, South Africa. The data collection instrument were questionnaires. The three hypotheses of the research were tested using correlation to draw inferences. In the end, the research found that the perceived usefulness of telemedicine has significant effects on the behavioral intention of health professionals and that both the external and internal variables have significant effects on perceived ease of use of telemedicine by health professionals. To this end, this research recommended that since telephonic consultation is the main telemedicine technology in South Africa, it is essential for the hospital's management to make adequate provision of all the facilities to sustain telemedicine so that it would make practitioners' work easier and enable them to embrace the technology.

CHAPTER ONE - INTRODUCTION

1.1 Background to the study

Developing countries all over the world have started adopting telemedicine in their healthcare system in order to improve the quality of health care service delivery; especially in the rural areas. According to Flodgren et al (2015), telemedicine is the use of telecommunication systems to deliver health care at a distance. The authors further asserted that telemedicine has the potential to improve patient health outcomes, access to health care and reduce healthcare costs. Mars (2013) presented the contextual definition of telemedicine as prescribed by the American Telemedicine Association as 'the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or healthcare provider and for the purpose of patient care".

Telemedicine is applicable in all areas of health care service delivery such as paediatrics, emergency medicine, radiology, mental health, neurology etc. Kachieng'a, (2012) observed that "the key future of telemedicine services, is the use of multimedia peripheral devices that include electronic versions of standard diagnosis and examination tools as well as other sense extending implements like document stands, derma scopes and microscopes". These multimedia peripheral devices enable the clinician to better approximate an on-site physical examination. Telemedicine technology makes use of information and communication technologies such as digital cameras, mobile ECG device, etc. These are used by health professionals such as surgeons, clinical consultants, doctors etc., to exchange health related information on diagnosis, treatment and prevention of diseases among health professionals in various countries of the world.

Although some of these countries have been able to adopt multimedia peripheral devices of telemedicine technologies, sustaining the various telemedicine projects have become very challenging. Other developing counties are yet to enjoy the benefits of telemedicine because of various challenges associated with project implementation and sustenance. Some of the

challenges include; poor technology, inadequate finance, poor patients' personal data management and absence of skilled health professionals. (Manyisa and van Aswegen; 2017).

It was argued that absence of skilled health professionals is not because there are no competent health professionals but that the health professional's available frequently shy away from utilizing telemedicine. They prefer the face-to-face approach which is considered cumbersome and time consuming when compared to telemedicine. Although the reasons for their preference has not yet been ascertained, part of the research has suggested that some of the health practitioners shy away because they are not comfortable with the remuneration attached to this service by the hospital management because regardless of the numbers of patients attended to, their remuneration on each consultation on telemedicine platforms are lower compared to a face to face consultation.

Thus, conscious effort must be made to understand the workings of this telemedicine technology, both in developed and developing countries in comparison with South Africa, to enable policy makers ascertain the state of telemedicine in South Africa and to identify areas of improvements. This has become necessary at this time because all clinical telecommunication or Information Technology IT initiatives require ongoing and onerous training (both technical and nontechnical) of physicians, which has not been provided for in any of the government policies that has been accessed for this research.

1.2 Statement of the Research Problem

Over the years, South Africa has been ravaged by all kinds of diseases and infections. Popular among which are heart disease, diabetes mellitus, asthma, HIV and TB. According to World Health Organisation (2008) South Africa has the largest number of HIV/AIDs positive people in the world with more than 17.6% of its population testing positive. Similarly, the same report showed that 17% of South Africa (SA) population (comprising of those in rural and urban areas) suffer from cardiovascular disease. Glaziou et al (2015) reported that India and South Africa alone are responsible for one third of global TB deaths. However, since 2010,

new HIV infections have decreased by 49% and AIDS-related deaths have decreased by 29% (UNAIDS, 2017).

World Health Organization (2008) noted that in addition to HIV/AIDs and cardiovascular diseases, 12% of the population suffer from intentional and unintentional injuries, 10% suffer from infectious and parasitic disease, 7.5% suffer from malignant neoplasm while 1.0% suffer from tuberculosis (Health Systems Trust, 2008).

This implies that over 64.2% of the population in South Africa suffers from various health challenges which calls for serious medical attention. Despite the fact that telemedicine has been formally introduced to address these challenges since 1998 (Gulube and Wynchank; 2001), it has been observed that health practitioners seems to prefer the traditional; face to face approach which is cumbersome, stressful, ineffective and inefficient to cater for the ever-increasing health crises of the nation and the insufficient health practitioners which is a general challenge in all health institutions in South Africa, Sub Saharan Africa and the world at large.

Although telemedicine is one major approach to combating these challenges; yet, there is still serious contention on whether hospitals should continue to use it because of certain anomalies that surrounds its adoption, such as; poor remuneration as suggested by health practitioner and Information and Communcation Technology (ICT) expertise, lack of motivation, culture and tradition challenges, perceived cost implication, physician license, privacy and confidentiality of patients details etc.; these constitute some of the reasons why some physicians shy away from telemedicine (Van Dyk and Schutte, 2010).

Mars (2009) argued that even though frantic efforts has been made by the National Department of Health to set up various telemedicine projects that would further enhance the quality of health service delivery, setting up these projects were supported by the National Health Act No. 61 of 2003, Section 74, health practitioners end up underutilising and eventually abandoning the projects.

Van Dyk and Schutte (2010) noted that the challenges that are been experienced in South Africa are not only peculiar to South Africa alone, but are also experienced in developed

countries of the world when they newly introduced telemedicine in the 1980s. Countries like the United States of America had few challenges with their health personnel's but more grave challenges with their "software contractors who ran over budget and completed far later than planned, which is if at all they ever completed them" (Van Dyk and Schutte, 2010:62). It is premised on the challenges identified that this research is designed to examine the potentials and barriers of the uptake of telemedicine in South Africa. It is expected that if the challenges faced by the adoption of telemedicine in South Africa are properly identified and contextualised, the benefits of its uptimal use will be achieved and the many health problems confronting the populace would be ameliorated.

1.3 Research Questions

Based on the problems aforementioned, the following research questions will be answered by this research.

1. What is the nature of telemedicine in Johannesburg, South Africa?
2. What are the perceptions of healthcare professionals about the benefits and challenges of telemedicine usage in Johannesburg, South Africa?
3. What are the challenges confronting telemedicine in Johannesburg, South Africa?
4. What are the barriers confronting telemedicine in Johannesburg?

1.4 Aim and Objectives

The Aim of this research is to examine the potentials and barriers of the adoption of telemedicine in Johannesburg, South Africa. The research would have the following objectives:

1. To carry out a holistic assessment of the nature and state of telemedicine in Johannesburg, South Africa.
2. To determine the perceptions of healthcare professionals about the benefits and challenges of telemedicine usage in Johannesburg, South Africa.
3. To identify the major challenges confronting telemedicine in Johannesburg, South Africa?

4. To identify the barriers confronting telemedicine in Johannesburg?

1.5 Research Hypotheses

For this study, the following hypothesis would be tested:

Hypothesis One

H_O The perceived usefulness of telemedicine has no significant effect on the behavioral intention of health professionals

H_i The perceived usefulness of telemedicine has significant effect on the behavioral intention of health professionals

Hypothesis Two

H_O External variables have no significant effect on perceived ease of telemedicine by health professionals

H_i External variables has significant effect on perceived ease of telemedicine by health professionals

Hypothesis three

H_O Internal variables has no significant effect on perceived ease of telemedicine by health professionals

Hi Internal variables has significant effect on perceived ease of telemedicine by health professionals

The internal variables are factors that are inherent in the respondents, factors such as age, length of years as a doctor and education. The external variables are factors such as perception and expections e.g. perceived ease of use of telemedicine, readiness to try telemedicine and other observability issues as presented in chapter 4.

1.6 Rationale for the Study

The country under study is one of the developing countries in Africa. Though some developing countries refer to South Africa as a developed country when comparing it with their countries , that does not change its status. South Africa with a population of over 55 million (CIA,2017), 64 % reside in rural areas while 36% reside in urban areas, yet there has not been adequate provision of health facilities for those in the rural areas while health facilities keeps improving by the day in the urban areas. Even though telemedicine has been

adopted to bridge the gap; yet several factors are seriously militating against the actualization of telemedicine projects. In fact, the attitude of health care professionals towards implementing and sustaining telemedicine projects and technology is not encouraging, which is one of the objectives to be examined by this research.

Since this research is aimed at examining the potentials and barriers of the adoption of telemedicine in Johannesburg, South Africa, the findings and recommendations of this research would be of immense benefit to policy makers and indeed the government because it would guide them to carry out a thorough assessment of the challenges of implementing telemedicine projects and even sustaining them. This would further enable the design of a more effective policy framework that would tackle challenges of low codes for health practitioners and at the same time manage failed projects. In addition, the findings of this research would serve as a source of enlightenment and reorientation for health practitioners if assessed, as it would enlighten them on the opportunities embedded in telemedicine and how to improve on their attitude towards it.

1.7 Scope and Delimitation

This study centers on the potentials and barriers in the adoption of telemedicine in Johannesburg, South Africa. The research only examined medical practitioners and doctors registered in selected eight hospitals (5 Private and 3 Public). Only related works in this regard were considered. Research works outside the defined scope were not considered.

The research specifically chose Johannesburg for the study because there are substantial numbers of hospitals and medical practitioners there (both rural and urban areas). Furthermore, the researcher chose eight hospitals because they are the main hospitals that have initiated the telemedicine projects and are struggling to sustain them. Also, the researcher decided to select some of these hospitals because some of the medical practitioners there seems not to be paying maximum attention to the use of telemedicine facilities. Also, the research adopted four models to explain the phenomenon under study. These models include the following; Lewin’s Model, Causal Model of Organisational Performance and

Change, Layered Telemedicine Implementation Model and Technology Acceptance Model (TAM)

In addition, this research adopts descriptive survey research design. For this research, 124 health practitioners were randomly selected from all the eight hospitals. The sample was chosen based on the recommendation of the Raosoft sample size calculator. The instrument adopted for this study is a structured questionnaire. Frequency count, Simple percentage, Cross tabulation and Pearson Product Moment Correlation were used to analyze the data collected for the study. It is essential to note that this research is a cross sectional study and as such the study was carried out within the space of a year.

1.8 Chapter Outline

This study will contain five chapters all of which would be presented in a sequential manner: Chapter 1, gives an introduction into study, it would present a background to the study which would be immediately followed by a clear articulation of the statement of problems regarding potentials and barriers of the adoption of telemedicine in South Africa. It will proceed to give some basic information on the research question which was derived from the statement of problem. The study would further present a general aim of the study after which it would highlight the five specific objectives and the hypotheses of the study. The rationale of the study would be given in order to give the readers an idea of the reason why this research is embarked upon. The chapter also contains a scope of the research and the chapter outline after which the operationalization of key concepts would be presented.

Chapter 2 focuses on the theories of change and telemedicine. It discusses the concepts and definition of telemedicine and its types and applications. It examines the implementation and sustenance of telemedicine in other countries especially in South Africa. It also examines the challenges confronting telemedicine all over the world and in South Africa, impact of education, training, and literacy levels in South Africa.

Chapter 3 presents the methodology used, it would discuss the design, populations of the study and the sample and sampling technique. It thoroughly explains the instrument that is

used for this correlational survey which is a structured questionnaire as well as the method of data analysis.

Chapter 4 provides adequate information on the data analysis and presentation, hypotheses testing coupled with the discussion of the findings which would be done using relevant literatures.

Chapter 5 presents the introduction, findings, summary of this research work, the conclusion of this research, the major recommendation as well as basic suggestion for further study.

CHAPTER TWO - REVIEW OF LITERATURE

2.1 Introduction

This chapter reviews the relevant literature. It also presents the reviews under some basic themes. The theoretical framework follows, and a summary of the chapter is presented.

2.2 Concept of Telemedicine

Telemedicine is not a new concept. It has been in existence for over five decades. According to Benshoter (1967), the concept of telemedicine can be traced to 1959 in an experiment carried out by University of Nebraska school of medicine. It was the use of closed-circuit television and telephones to communicate psychiatric and other health information between health practitioners in Norfolk state hospital and those in Nebraska psychiatric institute. They set the pace for the new concept of telemedicine. According to Maxmen (1978), the need for expansion and replication of the concept which supported information exchange necessitated the rural and urban telemedicine projects, where several satellites were designed to support the various televisions in the rural areas to the urban areas and support various video connection to the main source so that they can supply adequate services.

Despite the urge to improve the sophistication of these telemedicine facilities, cost of devices and expertise constituted a setback and blurred the technology for over ten years (Bashur, 1997). Brecht (1997) posited that the military revised the use of Information and Communcaition Technology (ICT) in the United States military and correctional institution where some of these technologies were designed for certain needs; most especially to resolve the use of transportation cost and difficulty which they often experience. Thus, these systems were designed to link the military base with other health professionals from other hospitals to guide on managing the officers or victim's health condition. McGowan and KienzIe (2000) argued that if not for Information and Communication Technology (ICT), telemedicine would have been a forgotten concept. Therefore, now the definition of the concept has moved from just mere communication between health professionals using telephones. Now, it can be

better defined as "the use of electronic information and communication technologies to provide and support health care when distance separates the participants (McGowan and KienzIe, 2000). The World Health Organization's WHO (2010:16) definition of telemedicine, is the "delivery of health care services, where distance is a critical factor, by all health care professionals'. This involves using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities". This definition is all-encompassing because, apart from the fact that it suggests the advantage of telemedicine, it also suggests how it works and what it is (and can be) used for.

Information and Communication Technology (ICT) has been introduced to enhance the quality of telemedicine, Brown (2006) noted that it has improved so much that the communication can be enhanced using satellites technology, and two or more health professionals can discuss consultancy services through video conferencing facilities and other mobile devices that support both asynchronous and synchronous communication, where the communication can as well be similar to a face to face communication. The introduction of Information and Communication Technology (ICT) into telemedicine has enabled it to provide clinical support, overcome various geographical barriers, most especially the locations that are far apart and rural-urban areas. It connects users from various locations, utilizing various Information and Commnication Technology (ICT) devices to improve health outcomes.

2.3 Application of telemedicine

Telemedicine has been widely applied by health practitioners to tackle a wide range of health challenges all over the world. Craig (2005) posited that telemedicine application is classified into two basic categories which are the ‘timing of the information transmitted' and ‘interaction between individuals.' By ‘individual' Craig (2005) meant interaction between health professionals which is on one side and interaction between health professionals and patients

on the other side. Sood et al. (2007) argued that information transmitted or exchanged are pre-recorded by the two categories of individuals that were initially identified; health professional-health professional/ health professional-patients. Contrary to this argument, Rao and Lombardi (2009) argued that not all information is pre-recorded. Others are real-time information exchange which is regarded as synchronous, where there are instant information exchange and even dialogue. Rao and Lombardi (2009) further argued that both asynchronous and synchronous information exchange is essential in telemedicine. Thus, the use of video conferencing and sending still images, audio and video information through email are the various ways of applying telemedicine which comes under the first classification.

It is noteworthy that the two classification applies to the various health-related setting. Currell et al. (2000) observed that these two broad categories of telemedicine apply to diverse settings to include; 'teleradiology' and 'teledermatology'. Wootton (2000) summarized that the application of the two broad categories could be narrowed down to merely diagnosis and clinical management. A holistic view of the use of these two categories of telemedicine application is presented in Heinzelmann, Lugn, and Kvedar (2005).

2.4 The nature of telemedicine

Several kinds of literature reviewed have shown that telemedicine is one of the biggest breakthroughs that the world health has ever experienced in recent time (Kachieng'a., 2002; Lugn, 2006). Countries like the United Kingdom, Scandinavia, Northern Ireland, North America, and Australia which are developed countries have explored telemedicine from the various dimensions and also enjoyed the benefit embedded in it. These countries use telemedicine for two different purposes, which are diagnosis and clinical management. Even though it is used for the same purpose in developing nations, yet there is a slight difference in the usage. Wootton (2008) posited that in many developing countries, telemedicine is often used for diagnosis rather than clinical management which has tackled several health challenges in those countries. Thus, developing countries have continued to embrace telemedicine. Telemedicine has also been used in the developing countries because it can

easily connect to a low-cost satellite system in their locality which enables their health workers to gain access to other health professionals in developed countries such as America (Yisah, 2008).

Telemedicine has been designed to address various health challenges confronting patients in various health care centers all over the world. The scope of telemedicine is not limited, it can be used to coordinate and supplement the scarce availability of medical resources in rural areas within South Africa (Bashshur, Reardon and Shannon, 2000).

According to Kachieng'a (2012), telemedicine is all about using information and communication technologies for effective delivery of preventive health care services. In other words, it is the direct provision of preventative and clinical care through telecommunication systems to facilitate diagnosis, treatment or a follow up with a patient at a distance to improve their health status. Greenhalgh (2004) earlier asserted that in telemedicine, the communication between medical experts in different locations or between a medical expert and patient is crucial and there are some potential barriers to their communication. This includes the perception of patients that the costs of telemedicine are too high, legal issues relating to patient privacy and confidentiality, organizational culture on knowledge and skill sharing, infrastructural challenges, etc.

Communication in telemedicine often come in three different dimensions. According to Greenhalgh (2004), the first stage of communication is often through telephone and fax, which is often used for patient consultation. This seems to be the first stage of communication in telemedicine. The second stage of telemedicine is the stage of file transfer. At this stage, medical experts store and transfer files to their colleagues to seek their expertise over various health-related issues. There has been serious improvement on this stage when compared with the traditional system of file transfer where there would be a written document which would need to pass through a series of bureaucratic processes before a referral could be made. The transfer or referral process may take days, weeks or even months before being approved by the hospital management which has resulted in various causalities. With the introduction of telemedicine, file transfer and referrals are done quickly with the aid of the various Information and Commnication Technology (ICT) facilities, without even undergoing the

bureaucratic processes that were prevalent in the traditional system. Greenhalgh (2004) noted that telemedicine does not end with just storing and transferring medical images such as scan, x-ray, etc., it goes as far as video conferencing with a team of experts. The third and final dimension supports the use of various telemedicine software's which might be in the form of full motion video images supporting the full range of interactive diagnostic services (Greenhalgh, 2004). It is important to note that telemedicine adopts Information Technology IT systems. The IT system adopted for Telemedicine contains the route/switch, wireless infrastructure, and facilities which support quick and secure data transmission from one location to another. Some of the satellites link urban medical centers to remote clinics and practitioners in nine African nations, the Philippines, and three countries in America where more technical and professional health-related consolation is available (Yisah, 2008). The IT system supports any computer components (servers) that easily support the various telemedicine applications (Kalid, 2016).

2.5 The state of telemedicine in South Africa

It is difficult to attribute a set date to the start of telemedicine in Africa even though Mars (2013:328) reported that 'In Africa, the first reported use of modern telemedicine was in 1984, when a diagnosis of Crouzon's syndrome was made via a satellite link using slowscan television transmission between Swaziland and London'. According to Gulube and Wynchank (2001), a national telemedicine system for South Africa was planned in 1998. In the first phase, starting in 1999, 28 pilot sites were established in six provinces. The initial applications were teleradiology, tele-ultrasound for antenatal services, telepathology and tele-ophthalmology.

Irrespective of when the use of telemedicine commenced in South Africa, the state of infrastructural facilities used for telemedicine in Africa, compared to developed countries of the world is appalling, and this has greatly impacted on the state of development experienced in the used of telemedicine. For instance, the state of internet access in South Africa is not encouraging. According to General Household Survey (2016), less than 38.3% of households

in rural areas in South Africa have access to the mobile internet which is grossly inadequate because of the large population. Furthermore, the research showed that 59.3% of the population of South Africa have access to internet connectivity which implies that less than 21% of those living in the urban area have access to internet connectivity. This shows that internet facilities in South Africa are still underutilized and as such, only less than 59.3% of the population can access telemedicine facilities which is still grossly inadequate. Furthermore, it means that telemedicine technology, which largely depends on internet facility, is not effective. Also, the challenges experienced with poor electronic network has left telecommunication infrastructure in South Africa in a poor state. This has affected the development of telemedicine and limited the area of coverage of telemedicine and its effectiveness in the country.

2.6 The benefits of telemedicine usage

Telemedicine is a remarkable breakthrough experience in the health sector of countries all over the world. It has facilitated the transmission of health-related data of patients with and outside national boundaries. Therefore, countries like South Africa have made frantic effort to ensure that a quick and secure data transmission system is maintained. This was contained in the public service regulation of 2001 which stipulated that ‘all departments shall manage information technology efficiently and effectively.' Also, telemedicine is designed to bridge the gap between the health services in both developed and the developing countries and also rural and urban areas (Lugn, 2006).

Lugn (2006) further posited that 70% of the hospital patients in the Eastern Cape Towns of South Africa (which were rural areas), can have access to hospitals and health professionals in urban areas in Cape Town and Johannesburg or even in other countries through telephones and other telemedicine technologies. Telemedicine breaks through a geographical distance (several kilometers), between rural and urban areas most especially in places like South Africa where the more significant percentage of her population reside in the rural areas. This

is where they lack access to specialized health care services because the most improved health facilities are concentrated in the urban areas (Kachieng'a, 2008).

It also allows for a break through political barriers such as the Federal Government policy on national health which stipulated that the local government is responsible for the delivery of municipal health services (National Health Act No. 61 of 2003). This Act limited the funding of health service delivery to the local government, thereby resulting in the provision of poor and inadequate infrastructural facilities within the health centers. This makes it difficult to cater for critical health conditions at the municipal level. Telemedicine broke through this barrier as stipulated in National Health Act No.74 that; the national department must facilitate and coordinate the establishment, implementation, and maintenance of e-health facility provided by the provincial departments, district health councils, municipalities and the health sector of health information systems at national, provincial and local levels in order to create a comprehensive national health information system. This has allowed telemedicine break through the political barriers because its funding is not under the local government but rather under the national government (Kachieng'a, 2012).

2.7 Challenges confronting telemedicine in Johannesburg, South Africa

Traditionally, the developing world has had little success with Telemedicine. This is especially true in Telemedicine as health care workers must be able to use the equipment and software with reasonable ease and efficiency (Bhattacherjee, 2001). The additional time spent operating new technology is singled out as the most significant factor, and some studies found that certain Information Systems would require more time to operate than the more traditional paper-based methods (Overhage, Perkins, Tierney and McDonald, 2001).

Some of the challenges confronting telemedicine in South Africa include lack of qualified staff and specialist support in rural areas, high staff turnover of staff, as well as a lack of educational opportunities for healthcare workers and long distances that must be traveled by patients to access telemedicine (Telemedicine, 2002).

Another reason for the poor adoption of Telemedicine is human and cultural factors. Resistance to change as well as a lack of basic computer literacy has also been singled out as potential reasons (WHO, 2004). Technological advances in the healthcare sector are made daily, and to keep up with these advances healthcare workers need computer literacy skills. Very often daily duties such as electronic health records include general computer literacy skills which increase the efficiency and effectiveness of healthcare in general. Horsley and Forster (2005) report that the major barriers for physicians to accept new technology are cost and time. This can be attributed to the high costs associated with internet connectivity, high-end video conferencing systems and sophisticated medical devices (Bukachi and Pakenham-Walsh, 2007).

Also, the populations in developing countries are becoming increasingly ill due to the double burden of HIV/AIDS and lifestyle diseases (Kifle, Mbarika, Okoli, Tsuma, Wilkerson, and Tan, 2008). This means that health care workers specifically in the rural areas are challenged with coordinating medical services with limited telemedical resources and case management is becoming increasingly more complicated because the population of patients outweighs the numbers of telemedicine facilities available in the health centers.

Telemedicine projects in South Africa have not successfully impacted the health sector because of the implementation challenges encountered in the country. Yellowlees (2005) noted that some of the challenges facing telemedicine include; abandonment of telemedicine devices, poor maintenance as well as abuse of telemedicine devices within and outside the hospital facilities by health professionals which has damaged the reputation of telemedicine in the country. Another challenge is the isolation of healthcare workers which has accounted for poor service delivery as well as underutilization of telemedicine facilities in rural areas (Aderibigbe, Shonubi, Odusan, Oloruntoba, Agbahowe and Siddique, 2006).

According to the Report of World Health Organization (2006), it was noted that countries in Sub-Saharan Africa such as South Africa have 24% of the burden (of disease), but only 3% of the health workers commanding less than 1% of world health expenditure Micklesfield et al. (2013) noted that South Africa (SA) is undergoing a rapid epidemiological transition and has the highest prevalence of obesity in Sub-Saharan Africa (SSA), with black women being the

most affected (obesity prevalence 31.8%). This is unreasonable for a developing country like that. This has forced several health professionals to leave for developed countries where they would be well compensated for using telemedicine to deliver their services despite the health crises ravaging the country. Thus, the country has been placed at the epicenter of the global health workforce crisis.

Unfortunately, most doctors that are available do not reside in the rural areas. United Nations (2008) noted that larger percentage of Medical practitioners tend to live in urban areas whereas 60% of Africa's population is rural which has made the shortage of health professionals in the rural areas more alarming than any part of the country.

Tanner et al (2015) noted for instance that Africa has 24% of the global disease burden but only 3 % of the global health workforce. The reasons for their shortage in rural areas are obviously because of the inability to access basic social amenities and the pay in the rural areas. Thus, some social amenities and pay also constitute serious challenges to maximizing telemedicine in South Africa.

The overall shortage of staff personnel has also affected the effectiveness of the medical schools and the nature of courses that are taught in the schools. United Nations (2008) observed that since there is a shortage of doctors, there are also insufficient doctors to teach new doctors, nurses and other medical specialist or practitioners, train medical specialists and provide healthcare professionals with continuing professional education and development.

Mars (2009) further noted that the challenges confronting telemedicine in South Africa is not only limited to implementation and sustainability, but the attitude of health professionals towards the project has not been encouraging. Although they have their reasons which are associated with inadequate reward and benefits as earlier mentioned, yet this may not be a justifiable reason to handle telemedicine projects nonchalantly. Mars (2009) further noted that lack of technical support from Information and Communications Technology (ICT) experts, licensed physician, poor remuneration, inadequate infrastructural facilities, absence of computer skills and trainings, workflow disruption, issues of security and privacy of data of

patients concerned, complexity of some devices, inadequate data exchange, poor wireless connectivity, culture, politics and tradition has crippled these telemedicine projects.

Even though tele-education has reduced the sense of isolation among doctors in rural areas in South Africa, research according to Moffatt and Eley (2010) has shown that poor infrastructure in the rural areas have hindered the training and retraining of medical personnel on the use of these telemedicine facilities which led to shortage in the numbers of skilled doctors. It is important to note that when those doctors that are recruited to teach other doctors via tele-education are not well equipped or not trained, there are higher chances that the technology will be underutilized and even go into extinction in the hospitals in the rural areas in South Africa.

Even though there are 39,800 registered medical practitioners with the Health Professions Council of South Africa (HPCSA) yet this figure, in reality, is not sufficient because the figure included retired and non-practicing doctors as well as practitioners who are registered in South Africa but practicing in other countries which have left the government with a vacant post of over 14,000 doctors all over the country (Health Systems Trust. Health Indicators, 2011). Despite the fact that the medical schools is increasing the number of doctors produced is less than 1,300 doctors per annum which are not capable of meeting up with the 14,000-excessive demand in the country. For instance, there has been a serious crisis on the shortage of health professionals in the country. A WHO (2014) report on shortage of health professionals in Sub- Saharan Africa indicated that that 30 countries within the region have 10 or fewer doctors per 100,000 people, and 37 have fewer than 20 doctors per 100,000 people; this falls below the world recommended standard as contained in that same report that a global average of 141 doctors per 100,000 people and 331 per 100,000 people in the European Region.

Another challenge was identified by Tang and Zimmerman, (2013) that safety of patients' personal data with medical and healthcare which are kept in computer systems or transferred from one health practitioner to another has constituted a major challenge. Patients that are more concerned about the issue of data security are those life-threatening disease such as HIV/AIDs. Over time, data of patients have become vulnerable, just like other data, to various

threats such as theft, compromise or voluntary sharing of patients' data by medical practitioners, confiscation of devices, viral attack, interception of transmitted data between devices by hackers, use of counter devices which may leak data, seizure of data by government for survey without adequate permission, are some of the threats to these services. All of these constitute a threat to the effective implementation of telemedicine technologies.

Computer literacy until recently has not been emphasized in tertiary training institutions making the expense and learning curve a barrier to introducing computer networks in health care. A consequence of this insufficient computer literacy is that it still takes about fourteen to seventeen years for medical breakthroughs to become standard practice (Stepankova and Engoya, 2006). Continuing professional education has been identified as an opportunity to increase the computer literacy skills of healthcare workers and has been implemented in South Africa as a requirement for the annual registration of healthcare workers.

2.7.1 Barriers as We Go from Paper-Based System to Paperless

Out of every sector, the health sector is the most sort after sector because of the nature of their services. For a very long time, the health sector has been using a paper system to document all medical details of patients; they transfer cases through the same system. Nevertheless, in recent times, data management is facing the transition from the paper-based system to paperless system (King et al.; 2014). The paperless system has reduced the tension, time constraint, and risk of information loss experienced by Physicians who now crave for automated processes (Castillo, Martínez-García, and Pulido, 2010).

Even though there are a series of benefits that accompany paperless based system in the hospital, yet there are several challenges that militate against electronic health records and other forms of health information technology. Ajami, Ketabi, Saghaeian-Nejad and Heidari, (2011) posited that there are a series of challenges that are experienced in the process of transition from the paper-based system to paperless based system which include the lack of readiness on the part of the organisation to embrace information technology which reduces the risk of information loss and enhance telemedicine. Similarly, Meinert (2004) noted that

another challenge is slow adoption information technology, lack of adequate educational training on utilization of ICT which would enhance Electronic Medical Records EMRs. Also, the poor reception of Technology and lack of basic computer literacy among physician and nurses constituted a great threat to implementing the paperless system in most health institution (WHO, 2004). This implies that since technology in the health sector is a daily occurrence, therefore it is important that health practitioners keep track and should engage in training and retraining which many of the health institutions and even government do not make adequate provision for. The physicians and medical practitioners do not have general computer literacy skills to match the current trend in developed countries which has reduced the effectiveness of the IT devices in health care services. This is especially true in telemedicine because some medical experts cannot use the equipment and software in telemedicine with reasonable ease and efficiency (Bhattacherjee, 2001). Also, another challenge is the high cost associated with internet connectivity, high-end video conferencing systems and sophisticated medical devices (Bukachi and Pakenham-Walsh, 2007).

2.8 Theoretical Framework

Four models were reviewed and adopted for this research, and they were chosen among others because they effectively explain the phenomenon under study. The reviewed models are: Lewin's Model, Causal Model of Organizational Performance and Change, Layered Telemedicine Implementation Model and Technology Acceptance Model (TAM).

2.8.1 Lewin's Model

This theory explains that three stages are essential to achieving effective change management. These stages include: unfreezing the present, moving from the present and freezing. Lewin's (1951) noted that these three stages guarantee long-term change which cannot be short-lived. The implication of this model is that before the needful, lasting change can be achieved, there is need to ensure that the "present" is dismantled, i.e., all the chances of going to the past are completely removed. The model further explains that there must be a progressive movement

from the present into the future. Lewin (1951) further noted that there is a need to put in place all the necessary measures and people to ensure that the change is a permanent one. This implies that any country or organization that wants to introduce telemedicine into their health care system must ensure that they play down the traditional and other health care services that can hinder the effectiveness of telemedicine. They must ensure that all necessary facilities and personnel are put in place to ensure the continuity of the policy. Also, the government needs to design and implement policies that would sustain it. In the South African context, telemedicine even though formally accepted, according to Lewin's model of change management, there is a need to take a step back, review the current policy of telemedicine, assess where the strengths and weaknesses are and identify the causes of the challenges. This would form the 'unfreezing' stage. Effective changes identified should be discussed with all stakeholders to get buy in and then implemented, that would be the 'change' phase and lastly, there is a need for constant reviewing. As technology generally improves and advances, telemedicine should keep pace.

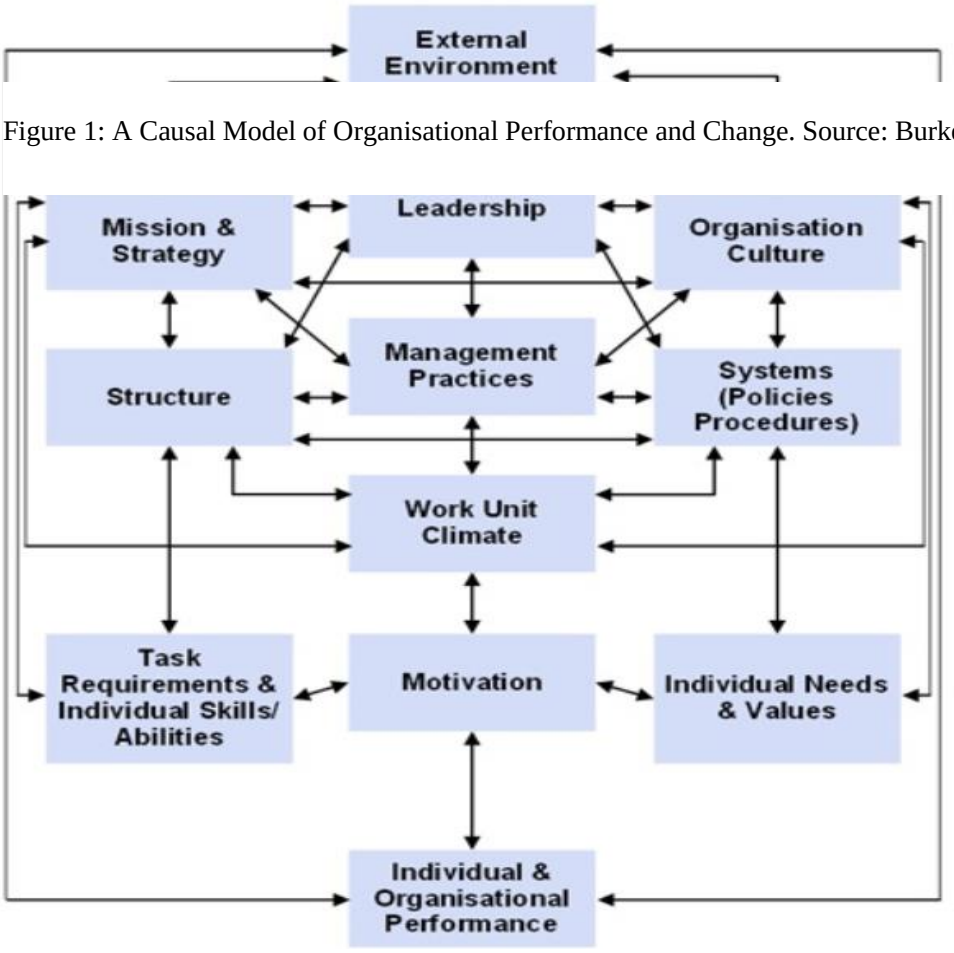
Kritsonis (2005) asserts that the central point of Lewin's model is that 'it is pertinant that the driving and restraining forces must be analyzed before implimenting a planned change'. The three phases of Lewin's model are not rigid (Schein, 2010), rather they are flexible and it varies from one organisation to the other. In the South African context, the most important phase is unarguable the unfreezing phase. Here the responsible bodies for telemedicine should come up with a plan to address the nature of what currently applies before any propositions. This can quite easily be the 'unfreezing' phase, in other words, this phase is about removing rigidity and replacing it with fluidity.

2.8.2 Causal Model of Organizational Performance and Change

This model explains that for any change to occur, there must be a clear understanding of the type of change that is wished. Once this is understood, the next thing is to consider the

'territory. 'In this context, it is to critically study and understand the law of the land; the culture, politics, and environment where the change is about to take place. This will enable the government or the organization that wants to bring about the change to achieve their purpose with the least resistance. There can be design strategies with elements of motivation to persuade people to embrace the change. This is important because they must ensure that the change aligns with the existing culture before eventually working towards the change of the whole culture entirely. To achieve change, effective leaders are needed.

Besides, external factors, politics, and economic factors can go a long way to affect change. The case is the same with telemedicine in South Africa. There are certainly some cultural barriers and challenges where people prefer to use traditional healers rather than wait for a western styled medical doctor. Also, there might be some reasons why doctors and health practitioners are not buying into telemedicine. This could be simple reasons such as not understanding the type of change promised by the use of telemedine.



2.8.3

Figure 1: A Causal Model of Organisational Performance and Change. Source: Burke & Litwin (1992)

Layered Telemedicine Implementation Model

The Layered Telemedicine Implementation Model is one of Telemedicine Maturity Models (TMM) which was designed by Broens et al. (2007). Broens et al. (2007) posited that there are various determinants at every state of progression of telemedicine towards maturity. In line with this, Van Dyk, Schutte, and Fortuin, (2012) observed that the model explains the progression to maturity which is only achievable when there is a progressive move from one stage or phase of implementation to another. As presented in Figure 2 below.

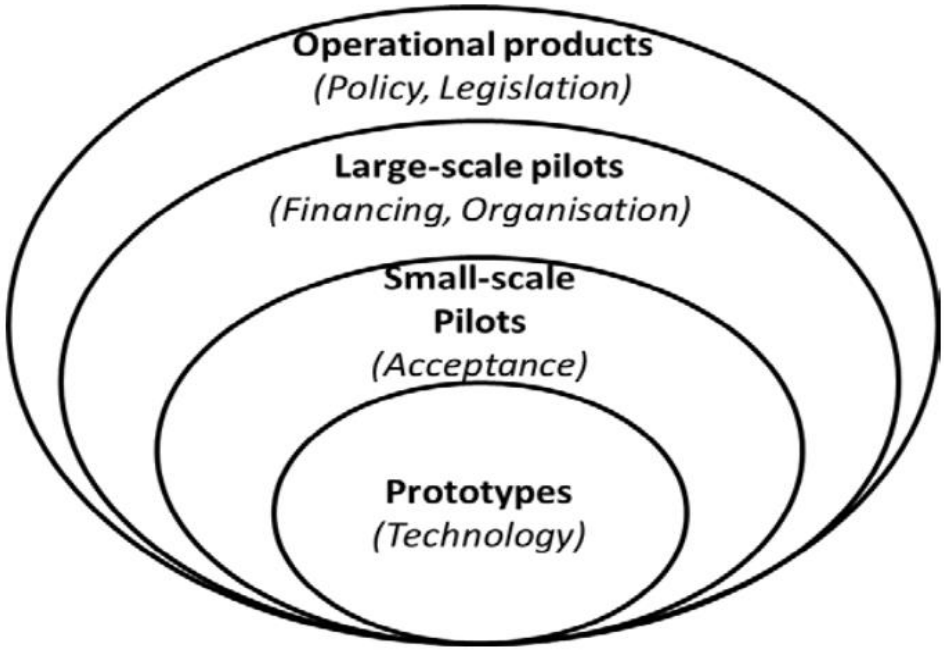


Figure 2: Layered Implementation Model. Source: Savidas (2009)

Several kinds of literature on the state of telemedicine in South Africa has established that various telemedicine projects being step up in South Africa have failed remarkably (Savidas, 2009). According to Broens et al. (2007), most of the projects did not survive past the

prototype phase because of majority of the factors identified in the model. This includes technology, acceptance, finance and organization, policy and legislation.

2.8.4 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is one of the popular models that is often used to explain and predict the reasons for an individual's acceptance or rejection of certain technology that is introduced (Davis 1989; Davis et al. 1989). According to Davis et al. (1989), two major factors which are; perceived usefulness and perceived ease-of-use, determined acceptance, and usage of any technology. Adams et al. (1992) later posited that the perceived uses of technology which is focused on the extent to which the newly introduced technology enhance their job performance. Adams et al. (1992) noted that the second belief which influences the user is the perceived ease of use; this is a very crucial matter that affects how people accept and maximize the use of any technology. Hendrickson et al. (1993) posited that every user is looking for technology that will reduce their effort and that would make them carry out their task with ease. Also, the need for reduced effort, it suggests that the technology has to be user-friendly. However, contrary to the opinion of Adam et al. (1992), Hu et al. (1999) later argued that the perceived ease of use is less likely to be a determinant of attitude and usage intention if other external factors are allowed.

The model is based on certain assumptions which are that the intention to use the telemedicine system is often influenced by the individual's attitude towards using the system (Ahlan and Ahmad, 2014). Perceived usefulness affects behavioral intention directly because users may intend to use a system just by thinking it may help them do their job better (Ahlan and Ahmad, 2014). Iran (2000) earlier argued that perceived usefulness and perceived ease of use are affected by other external variables and determines users' attitude, perceived ease of use may have an impact on perceived usefulness supported by a suggestion that the easier it is to use the more useful it can be.

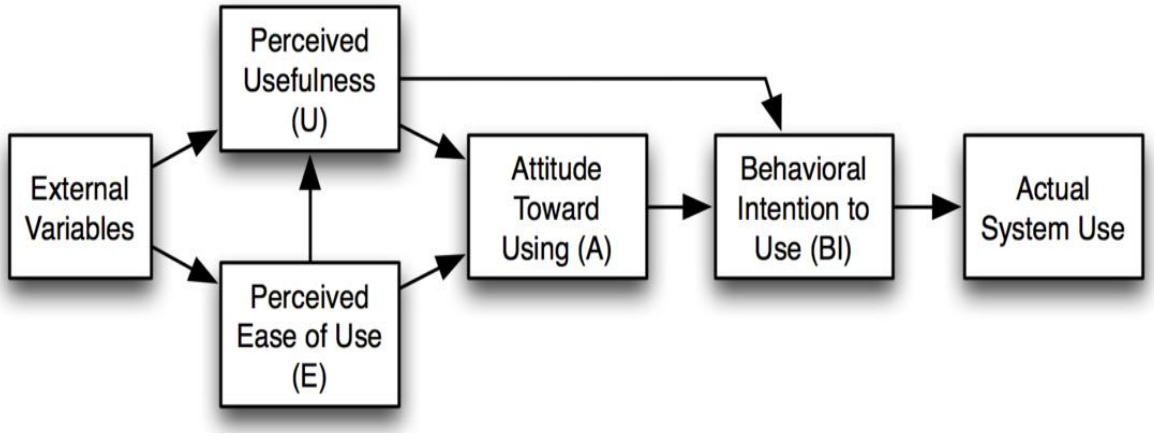


Figure 3: Technology Acceptance Model (TAM) Source: Davis 1989

For this research, the Technology Acceptance Model (TAM) will be adopted and applied to the user of telemedicine in South Africa. This implied that the despite the fact that the theory has limited explanatory and predictive power which are the basic fundamental characteristics of any theory. This model seems to be more capable of explaining the situation of medical practitioners about their pay, attitudes and other challenges attributed to the utilization of the telemedicine than the maturity model. This is because it hinges more on how the external variables influence the perception of health practitioners and in turn affects their attitudes and their behavioural intention which eventually affects the way they use the system.

CHAPTER THREE - RESEARCH METHODOLOGY

3.1 Introduction

In this chapter detail of the methodology and the procedures that would be adopted for this research is given.

3.2 Research Design

The research adopted a correlation survey research design. This is because the research is designed to examine the relationships between the variables in the study. To achieve this, the research would adopt purposive data collection. Eight hospitals are selected based on proximity and existence of telemedicine facility. The respondents responded in their individual capacity (i.e. not as a staff of their respective hospitals). Furthermore, the research administers a structured questionnaire which was adapted from Olok et al. (2015). It is a self-administered instrument which is administered to the 124 healthcare professionals.

3.3 Population of the Study

The population of this study includes all the registered health practitioners and medical doctors in eight hospitals in Johannesburg South Africa which is182. The population is made up of all the 127 health practitioners in urban areas in four selected private hospitals while 53 practitioners were selected from four hospitals in public hospitals in the periurban area in Johannesburg South Africa. The percentages for the representation of the two categories are 70.5% and 29.5% respectively. This is also the percentage that was used to locate the sample when identified.

3.4 Sample and Sampling Technique

This research samples a total of one hundred and twenty-four (124) medical practitioners. Using the above percentage as identified in the previous section, 70.5% for the urban hospitals and 29.5% for the hospitals in the periurban areas and public hospitals. The sample selected in the urban hospitals is eighty-four (84) while the numbers of practitioners to be selected from the outskirt hospital are thirty- five (35). Therefore, one hundred and twenty-four (124) health practitioners are selected from eight different hospitals in the Johannesburg South Africa four of these hospitals are located in the urban area, while four are located in the rural area. The sample size was determined using Raosoft sample size calculator, with a margin of error of 5% and 95% confidence level. The researcher administered the structured questionnaires on all the 124 respondents who are health practitioners from the eight purposively selected hospitals in Johannesburg South Africa. The eight hospitals are sampled because of their prominence, proximity, accessibility and because they have used telemedicine facilities. The simple random sampling method is used to select the health practitioners in each of the hospitals. This sampling method is suitable for this research because it will ensure that all the health practitioners in each hospital have equal chances of participating in this research. The table below shows the population and sample size used in this research.

Table 1: Population and Sample Size for the selected hospitals in Johannesburg South Africa

Urban Areas in South Africa	**Population**	**Sample Size**
Netcare	30	21
Brenthurst Clinic	36	23
Duff Scott Hospital	34	22
Clinix Selby Park Hospital	27	18
Total	**127**	**84**
Rural Area in South Africa		
Helen Joseph hospital	13	8
Edenvale Hospital	10	7
Chris Hani Baragwanath	16	11
Hospital Hill	14	9
Total	**53**	**35**

3.5 Instrument of Data Collection

The research adopted a structured questionnaire designed by Olata et. Al, (2015). This research titled the questionnaire; Questionnaire on Potentials and Barriers of Telemedicine (QPBT). The instrument contains three sections. The first section of the questionnaire elicited information about the background of the medical practitioner, while the second section elicited information on the medical practitioner's level of Information and Communication Technoilogy(ICT) skills while the third section elicited information on the perception of the health practitioners about telemedicine. The questions in the first section included participants' gender, age, and rank in the hospitals, etc. The questions in the second section on respondents' level of Information and Commnication Technology (ICT) use was measured on a 5-point Likert type scale that ranged from "1 = very low" to "5 = very high". Also, in the second section, the question on the level of Information and Commnication Technology (ICT) skills was measured on a 5-point Likert type scale that ranged from "1 = very poor" to "5 = very good". The perceived attitude of the respondents was rated on a 5-point Likert scale that ranged from "1 = strongly disagree" to "5 = strongly agree". The test for reliability of the instrument showed that the alpha value is greater than 0.7 indicating an acceptable range of the instrument.

3.6 Method of Data Analysis

The quantitative data is gathered, sorted, coded, analysed and presented in tables using descriptive statistics such as frequency count and percentages. The hypotheses will be tested using correlation. The analysis was done using the Statistical Package for Social Sciences (SPSS version 20). Also, qualitative data was collected and transcribed through converting recorded conversations into written form; the data is studied and linked with analytic notes.

3.7 Ethical consideration

Before embarking on the research, the researcher collected a letter of introduction from the Wits Business School department and submitted it to each of the participating hospitals to notify the hospital management about the researcher's intentions to carry out this research. The letter also solicited for the cooperation of the health practitioners. Once the letter was presented and the approval by the hospital management was obtained, the researcher proceeded on the research. The researcher with the aid of the research assistant administered the questionnaire and assured the respondents of their anonymity and their right to opt out of the research if they felt it necessary, as it has been indicated on the questionnaire. To ensure confidentiality of the respondents, the researcher did not take down the names of the respondents or any other details that can be traced to them in the course of the research.

CHAPTER FOUR - DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter contains the data presentation and analysis which makes the chapter one of the most important chapters in a research work. The result presented and discussed are intended to provide answers to the research questions raised in the first chapter of this research. They are reported in parts as detailed by the research methodology, while the full questionnaire can be found in the appendix. A total of one hundred and twenty-four (124) questionnaires were administered, thirty (30) were not filled appropriately and as such were considered inappropriate for this research. Hence, a total of ninety-four (94) questionnaires were deemed appropriate for this research.

All the tables presented in each of the sections were supported with a brief interpretation of them to save the reader from misconceptions. Also, each of the tables was accompanied with a bar chat which gave summarized information presented in the table.

4.2 Demographic Data of Health Practitioner

This section presents information on the personality of the respondents who were health practitioners. The section contains tables and charts showing the gender, age, qualification, Gross Annual Income and years of service (used as a proxy for experience).

Table 4.1 Distribution of respondent based on Gender

Response	Frequency	Percentage %
Female	33	35.11
Male	61	64.89
Total	**94**	**100.00**

Source: Field Survey, 2018

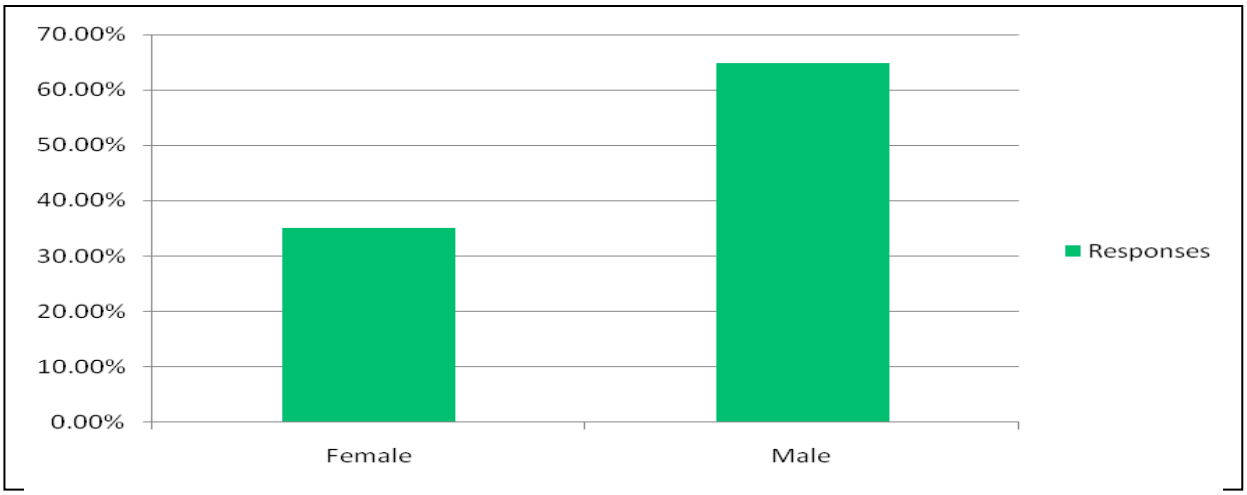


Figure 4.1: Distribution of respondent based on Gender

The table shows the respondents' gender. The description of respondent's gender shows that 33(35.11%) of the respondents were females while 61(64.89%) were males. This only implies that there were more male health practitioners than female within the study area. While this could be indicative of the medical profession in South Africa (with regards to the gender representation of medical doctors in the country), like the rest of the demographic representations used in subsequent sections, the results are however not intended to be used as a generalization.

Table 4.2 Distribution of respondent based on Age

Response	Frequency	Percentage %
18 to 24	0	0.00
25 to 34	9	9.57
35 to 44	55	58.51
45 to 54	18	19.15
55 to 64	8	8.51
65 to 74	4	4.26
75 or older	0	0.00
Total	**94**	**100.00**

Source: Field Survey, 2018

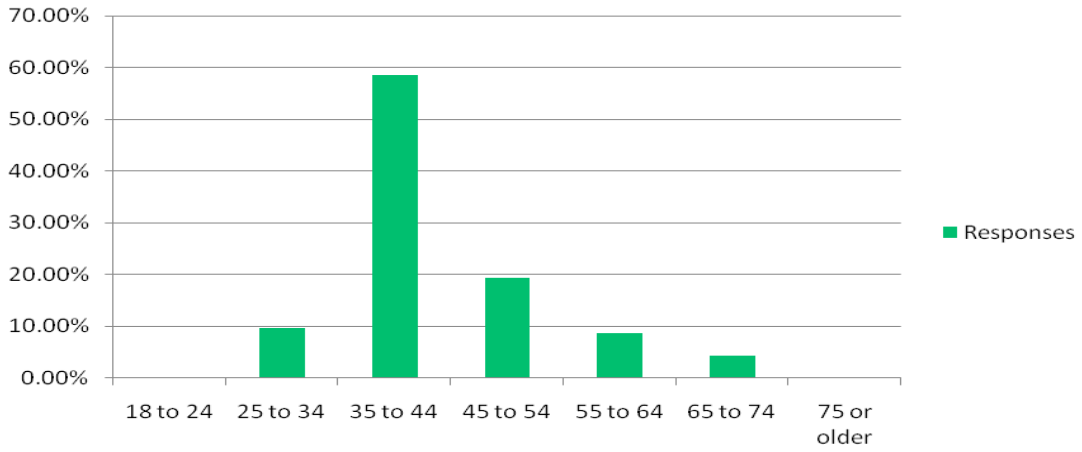


Figure 4.2: Distribution of respondent based on Age

The table shows the respondents' Age. The description of respondent's age shows that 9(9.57%) of the respondents were between the age of 25 to 34 years, 55 (58.51%) of the respondents were between the age of 35 to 44 years, 18 (19.15%) of the respondents were between the age of 45 to 54 years, 8 (8.51%) of the respondents were between the age of 55 to 64 years while 4(4.26%) of the respondents were between the age of 65 to 74 years. This shows the level of age maturity of the respondents.

Table 4.3 Distribution of respondent based on Health Practitioner's Qualification

Response	Frequency	Percentage %
Bachelor's Degree	5	5.75
Internship	0	0.00
Community Service	2	2.30
Medical Officer	3	3.45
Consultant	70	80.46
Head of Department	7	8.05
Total	**87**	**100.00**

Source: Field Survey, 2018

To give credibility to the findings, it is seen that 4-in-5 of the respondents are consultants. This shows that besides age and years of service, the respondents are expected to be generally knowledgeable people and their responses should be credible and valid.

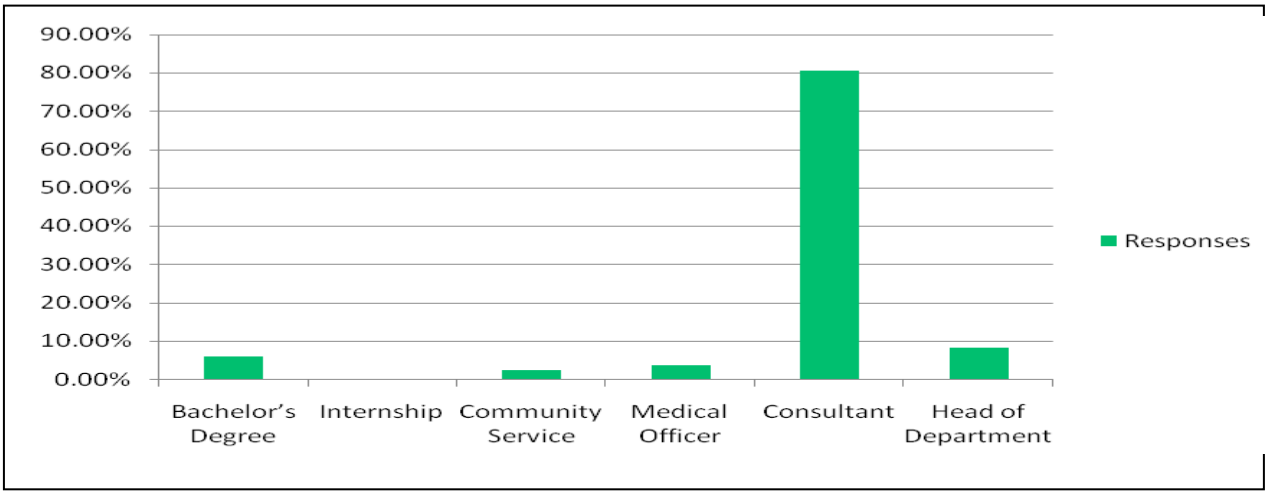


Figure 4.3: Distribution of respondent based on Health Practitioner's Qualification

The table shows the respondents' Health Practitioner's Qualification. Only 87 respondents responded on this item. The description of respondent's qualification shows that 5(5.75%) of the respondents had bachelor's degree, 2(2.30%) of the respondents were qualified community service personnel, 3(3.45%) of the respondents were qualified medical officer, 70(80.46%) of the respondents were consultants, while 7 (8.05%) of the respondents were heads of department. This table also shows that medical practitioners are decently remunerated in South Africa.

Table 4.4 Distribution of respondent based on Gross Annual Income

Response	Frequency	Percentage %
R200,000 - R400,000	3	3.19
R400,000 - R600,000	0	0.00
R600,000 - R800,000	8	8.51
R800,000 - R1,000,000	11	11.70
Above R1,000,000	58	61.70
Undisclosed	14	14.89
Total	**94**	**100.00**

Source: Field Survey, 2018

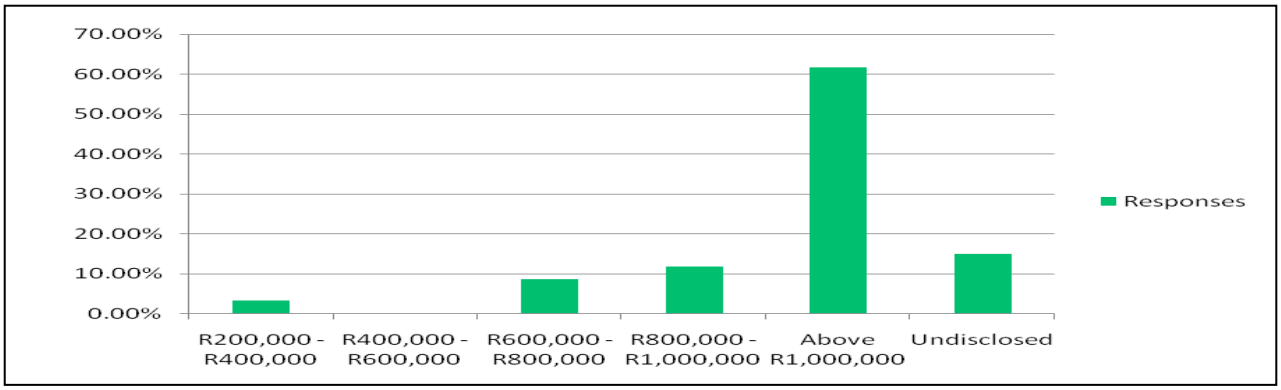


Figure 4.4: Distribution of respondent based on Gross Annual Income

Table 4.4 showed the respondents' Gross Annual Income. The description of respondent's gross annual income shows that 3(3.19%) of the respondents earn a gross annual income of R200,000 - R400,000, 8(8.51%) of the respondents earn a gross annual income of R600,000 – R800,000, 11(11.70%) of the respondents earn a gross annual income of R800,000 – R1,000,000, 58 (61.70%) of the respondents earn a gross annual income of above R1,000,000, while 14(14.89%) of the respondents did not disclose their gross annual income. This shows that most of the health practitioners who were consultants in South Africa earn above R1,000,000.

Table 4.5 Distribution of respondent based on Years of Service (Length of Experience)

Response	Frequency	Percentage %
<5 Years	3	3.19
5-10 years	24	25.53
10-15 years	30	31.91
Over 15 years	37	39.36
Total	**94**	**100.00**

Source: Field Survey, 2018

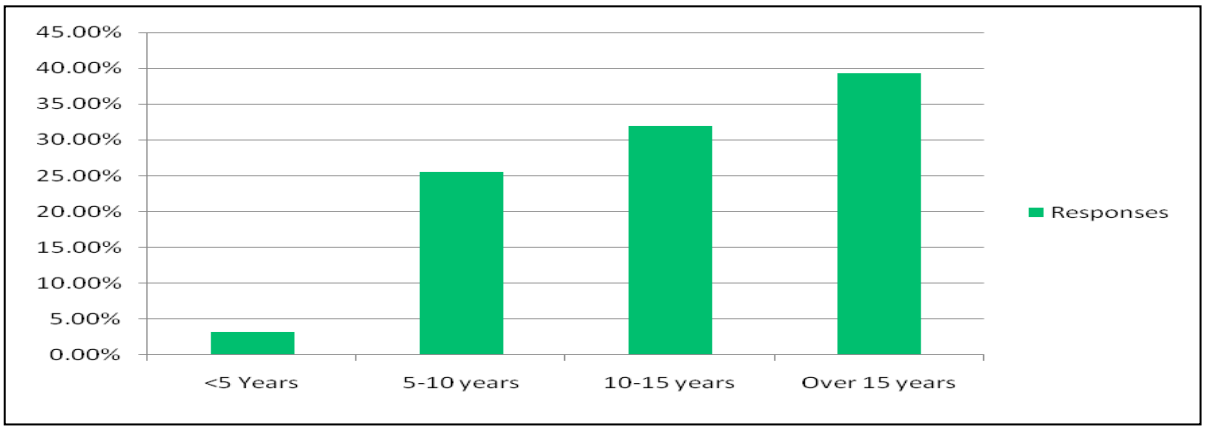


Figure 4.5: Distribution of respondent based on Years of Service (Length of Experience)

The table shows the respondents' Years of Service (Length of Experience). The description of respondent's years of service (length of experience) shows that 3(3.19%) of the respondents have less than 5 years of service, 24 (25.53%) of the respondents have between 5 to 10 years of experience, 30 (31.91%) of the respondents have between 10 to 15 years of experience, 37 (39.36%) of the respondents have more than 15 years of experience. This implies that most of the medical practitioners in South Africa who were major consultants have more than 15years in service.

4.3 The nature of telemedicine in countries around the world.

This section examines the nature and characteristics of telemedicine all over the world. It considers the ICT usage and features that serves as the foundations for telemedicine.

Table 4.6 Distribution of respondent based on the rate of ICT usage

Response	Frequency	Percentage %
Very low	2	2.13
Low	27	28.72
Undecided	18	19.15
High	38	40.43
Very high	9	9.57
Total	**94**	**100.00**

Source: Field Survey, 2018

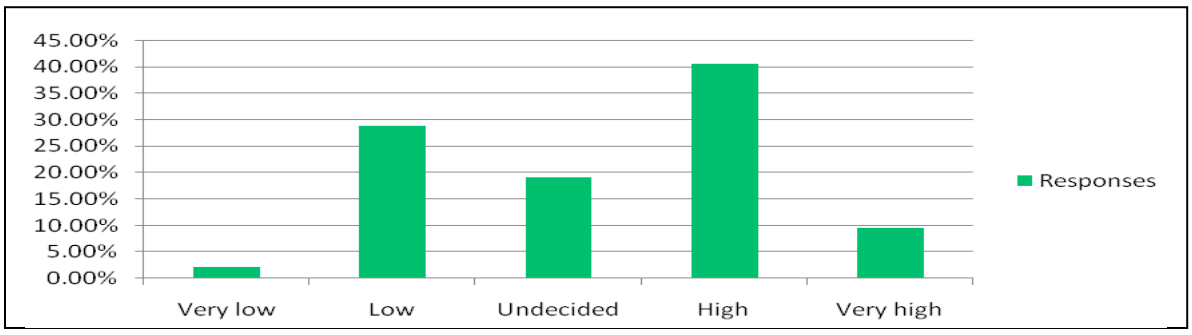


Figure 4.6: Distribution of respondent based on rate of ICT usage

The table shows the respondents' rate of ICT usage. The description of respondent's rate of ICT usage shows that 2(2.13%) of the respondents indicated that their ICT usage is very low, 27(28.72%) of the respondents 'indicated that their ICT usage is low, 18(19.15%) of the respondents' indicated that they are undecided on the rate of their ICT usage, 38(40.43%) of the respondents 'indicated that their Information and Communication Technology usage is high, while 9(9.57%) of the respondents 'indicated that their Information and Communication Technology usage is very high. This implies that Information and Communication Technology is highly utilized by the medical practitioners in South Africa. The reason why Information and Communication Technology is being utilized by medical practitioners in South Africa was explained by Brown (2000) in Section 2.2. According to Brown (2000) telemedicine has improved communication and the quality of telemedicine. Furthermore, it is being utilized because it has enabled telemedicine to provide clinical support, overcome various geographical barriers, most especially the locations that are far apart and rural- urban areas.

Table 4.7 Distribution of respondent based on the rate of ICT Skills

Response	Frequency	Percentage %
Very poor	1	1.06
Poor	22	23.40
Undecided	21	22.34
Good	41	43.62
Very good	9	9.57
Total	**94**	**100.00**

Source: Field Survey, 2018

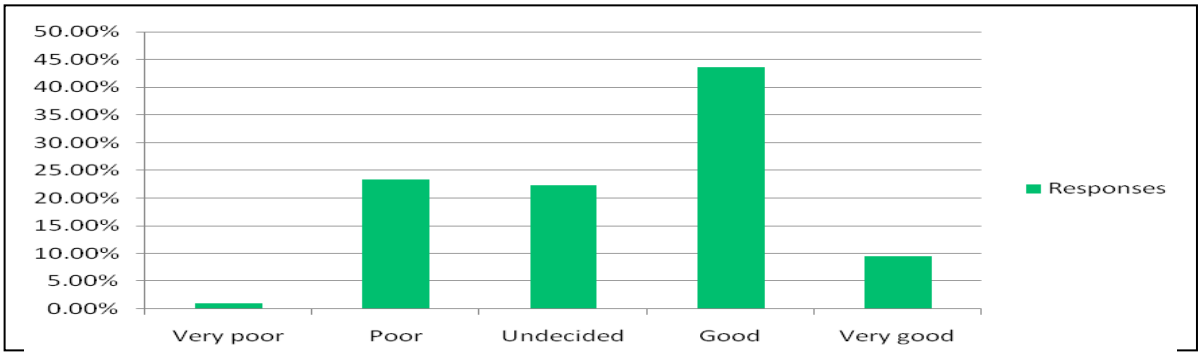


Figure 4.7: Distribution of respondent based on the rate of ICT Skills

The table shows the respondents' rate of Information and Communication Technology Skills. The description of respondent's rate of Information and Communication Technology Skills shows that 1(1.06%) of the respondents indicated that their skills in Information and Communication Technology is very poor, 22(23.40%) of the respondents indicated that their skills in Information and Communication Technology is poor, 21(22.34%) of the respondents indicated that their skills in Information and Communication Technology is undecided, 41(43.62%) of the respondents indicated that their skills in Information and Communication Technology is good, while 9(9.57%) of the respondents indicated that their skills in Information and Communication Technology is very good. This implies that the medical practitioners in South Africa are currently good at Information and Communication Technology. This explains why they have been resistant to telemedicine till recently. According to The WHO (2004) report presented in Section 2.7, lack of basic computer literacy has been singled out as potential reasons why medical practitioners resist change.

4.4 Holistic assessment of the nature and state of telemedicine in Johannesburg, South Africa

Items presented in this section are aimed at assessing the nature and state of telemedicine in Johannesburg, South Africa.

Table 4.8 Distribution of respondent based on access to telemedicine technology

Response	Frequency	Percentage %
Yes	44	46.81
No	50	53.19
Total	**94**	**100.00**

Source: Field Survey, 2018

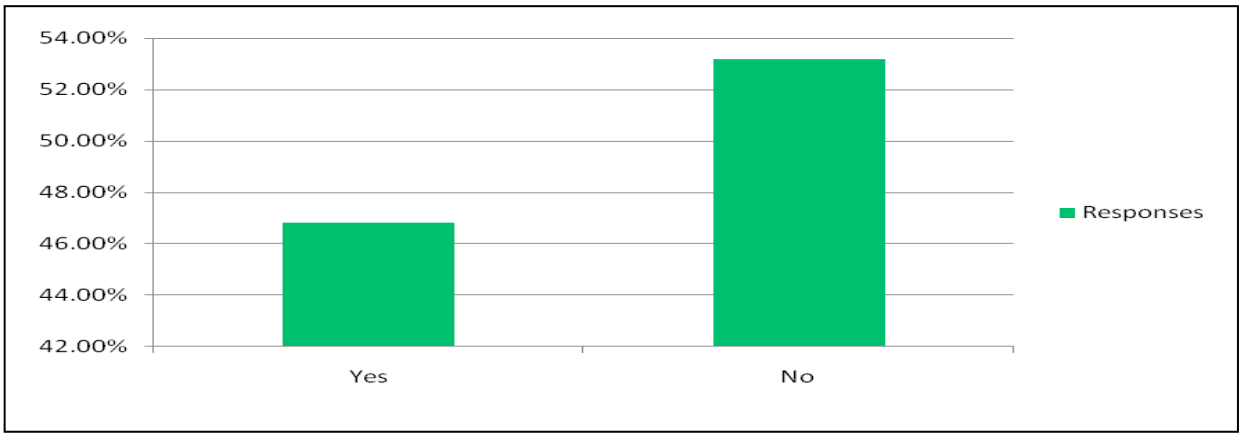


Figure 4.8: Distribution of respondent based on access to telemedicine technology

The table shows respondents' access to telemedicine technology. The description of respondent's access to telemedicine technology shows that 44(47.81%) of the respondents indicated that they have access to telemedicine technology while 50(53.19%) of the respondents indicated that they do not have access to telemedicine technology. This implies that despite the fact that the health practitioners were skilled in Information and Communication Technology, they do not have access to the telemedicine technology in South Africa. This collaborated the findings of the General Household Survey (2016) which suggested that less than 38.3% of household in rural areas in South Africa have access to mobile internet which is grossly inadequate considering the large population. And since internet is the major driver of telemedicine, it implies that access to telemedicine in South Africa is not encouraging as presented in Section 2.5.

Table 4.9 Distribution of respondent based on the type of telemedicine technology used in respondent's hospital

Response	Frequency	Percentage %
Concierge services such as e-visits, e.g. Skype or other multimedia platforms	15	16.67
Remote patient monitoring e.g. home hemodialysis	8	8.89
Consumer grade remote monitoring from off-shelf devices/wearables e.g., Blood pressure monitor, Holter	29	32.22

ECG, Sleep Study Device		
Telephonic consultation	69	76.67
Other (please specify)	11	12.22
Total	**90**	**100.00**

Source: Field Survey, 2018

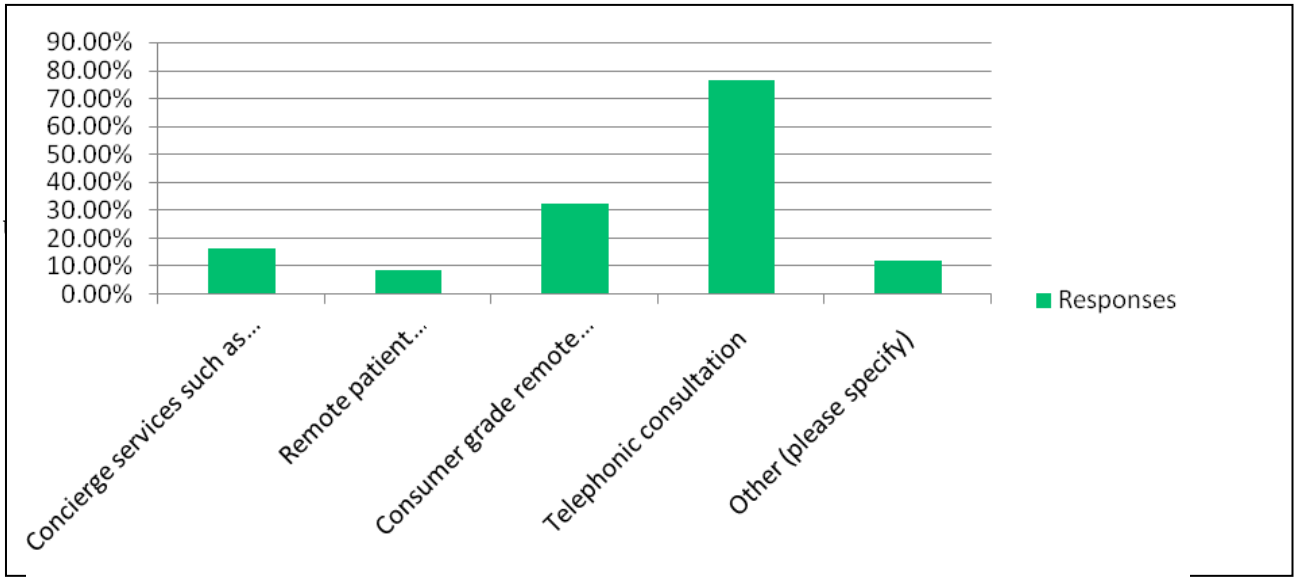


Figure 4.9: Distribution of respondent based on the type of telemedicine technology used in respondents' hospital

The table shows the type of telemedicine technology used in the respondent's hospital. 90 respondents responded to this item. The description of the type of telemedicine technology used in the respondents' hospital shows that 15 (16.67%) of the respondents indicated that they use concierge services such as e-visits, e.g. Skype or other multimedia platforms, 8 (8.89%) of the respondents indicated that they use remote patient monitoring e.g. home hemodialysis, 29 (32.22%) of the respondents indicated that they use consumer grade remote monitoring from off-shelf devices/wearables, e.g., Blood pressure monitor, Holter ECG, Sleep Study Device, 69

(76.67%) of the respondents indicated that they use telephonic consultation, while 11 (12.22%) of the respondents indicated that they use other types. This implies that most of the hospitals in South Africa use telephonic consultation type of telemedicine technology. This finding corroborates the position of Brown (2006) in section 2.2 that two or more health professionals can discuss consultancy services through mobile devices that support both asynchronous and synchronous communication. Similarly, it supported the position of Lugn (2006) that 70% of the hospital patients in Eastern Cape Town South Africa which is a rural area, can have access to health professionals in urban areas in Cape Town and Johannesburg or even in other nations through telephones technologies.

4.5 Perceptions of healthcare professionals about the benefits and challenges of telemedicine usage in Johannesburg, South Africa

Table 4.10 Distribution of respondent based on the telemedicine technologies relative advantage

Response	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Telemedicine technologies enables me to accomplish medical tasks more efficiently	1	1.09	4	4.35	30	32.61	46	50.00	11	11.96	92
Telemedicine technologies improves the quality of medical work I do	2	2.15	8	8.60	30	32.26	45	48.39	8	8.60	93
Telemedicine technologies allow me to perform my medical work easily	1	1.08	9	9.68	28	30.11	50	53.76	5	5.38	93
Telemedicine technologies improve my job performance	1	1.10	6	6.59	32	35.16	45	49.45	7	7.69	91
Telemedicine technologies gives me greater control over my work	1	1.08	9	9.68	33	35.48	43	46.24	7	7.53	93
Telemedicine technologies increases my work productivity	1	1.08	9	9.68	30	32.26	44	47.31	9	9.68	93

Source: Field Survey, 2018

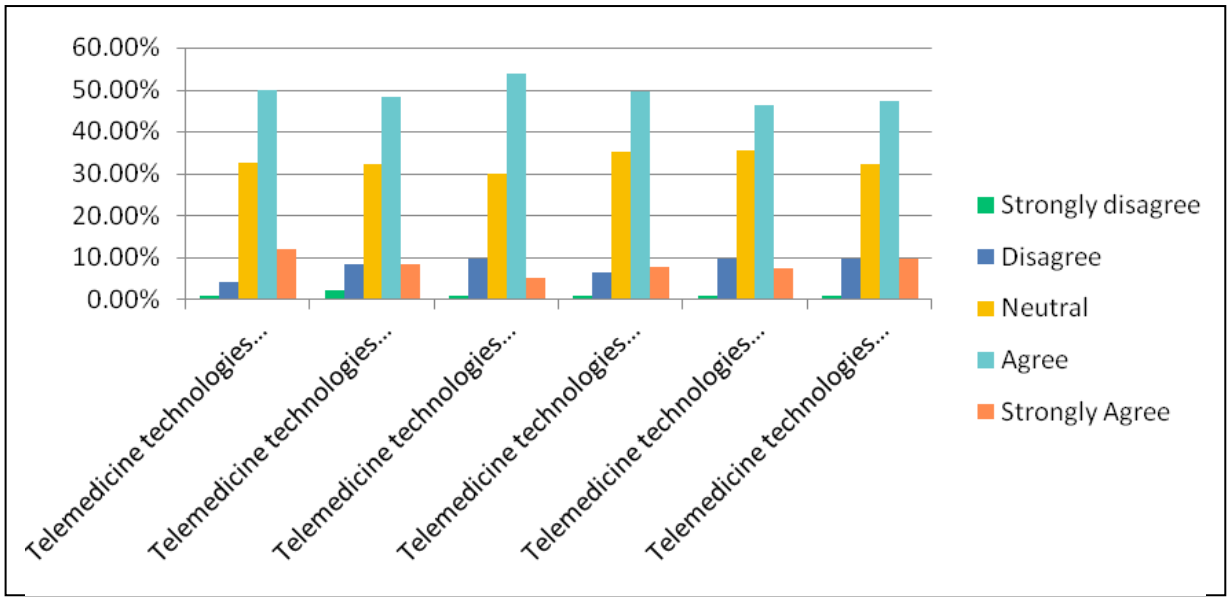


Figure 4.10: Distribution of respondent based on the telemedicine technologies relative advantage

Table 4.10 and Figure 4.10 shows telemedicine technologies relative advantages. The number of respondents that responded on the items ranged between 91to 93. The description of respondents based on telemedicine technologies relative advantages shows that 46(50.00%) of the respondents agree that telemedicine technologies enables them to accomplish medical tasks more efficiently, 45(48.39%) of the respondents agree that telemedicine technologies improves the quality of medical work that they do, also, 50(53.76%) of the respondents agree that telemedicine technologies allow them to perform their medical work easily, 45(49.45%) of the respondents also agree that telemedicine technologies improve their job performance, 43(46.24%) of the respondents strongly agree that telemedicine technologies gave them greater control over their work, while 44(47.31%) of the respondents indicated that telemedicine technologies increases their work productivity. This implies that the most prominent telemedicine technologies relative advantage to medical practitioners in South Africa is that telemedicine technologies allow them to perform their medical work easily. This was supported by the Technology Acceptance Model (TAM) where Adams et al. (1992) in section 2.8 noted that the second belief which influences the user is the perceived ease of use, which is very crucial matter that affects how people accept and maximize the use of any technology. This serves as one of the bases of why the telemedicine is being accepted in South African in recent time.

Table 4.11 Distribution of respondent based on the compatibility of telemedicine technologies

Response	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	Weighted Average
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Telemedicine technologies are compatible with all aspects of my work	6	6.38	34	36.17	32	34.04	21	22.34	1	1.06	94	2.76
Telemedicine is completely compatible with my current situation	6	6.38	22	23.40	29	30.85	34	36.17	3	3.19	94	3.06
I think the telemedicine technology It fits well with the way I like to work	2	2.13	8	8.51	33	35.11	50	53.19	1	1.06	94	3.43
Using telemedicine technology fits well into my work style	1	1.06	13	13.83	34	36.17	45	47.87	1	1.06	94	3.34

Source: Field Survey, 2018

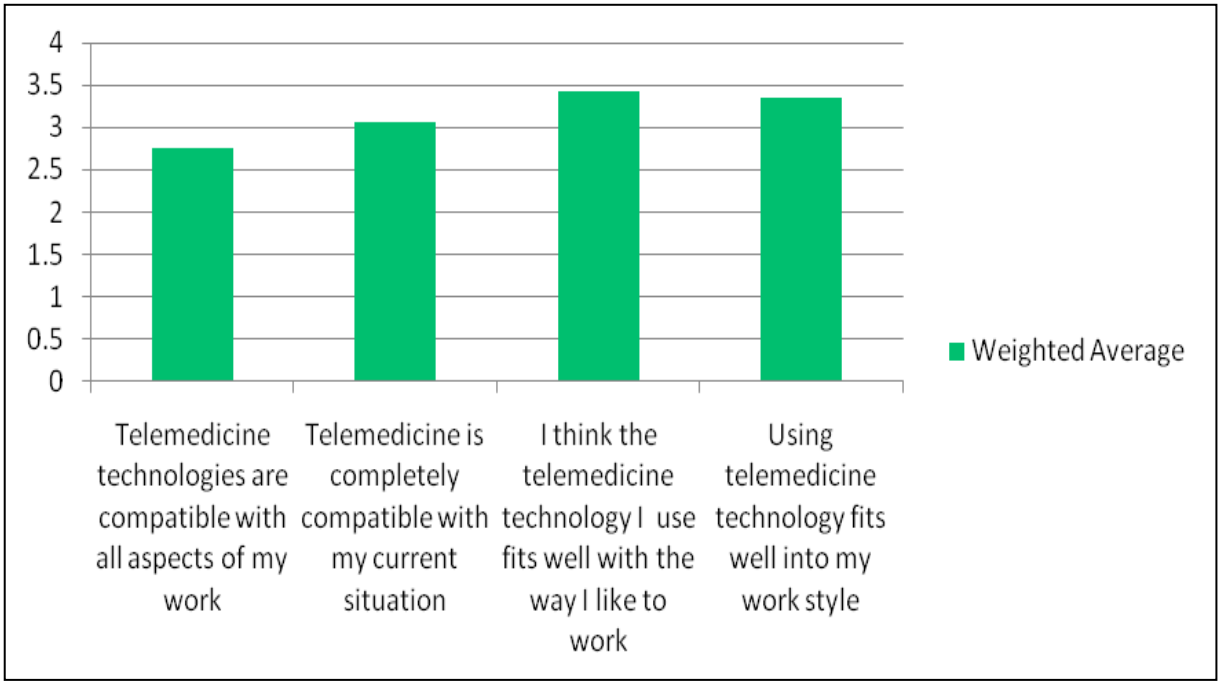


Figure 4.11: Distribution of respondent based on the compatibility of telemedicine technologies

The table shows the compatibility of telemedicine technologies. The description of respondents based on the compatibility of telemedicine technologies shows that 34 (36.17%) of the respondents disagree that telemedicine technologies are compatible with all aspects of their work, 34 (36.17%) of the respondents agree that telemedicine is completely compatible with their current situation, 50 (53.19%) of the respondents agree that they thought that the telemedicine technology they use fits well with the way they like to work, while 45 (47.87%) of the respondents agree that using telemedicine technology fits well into their work style.

The weighted average of each of the statement indicated that; telemedicine technologies are compatible with all aspects of my work, has an average weight of 2.76, telemedicine is completely compatible with my current situation, has an average weight of 3.06, also, I think the telemedicine technology I use fits well with the way I like to work, weight an average of 3.43 while using telemedicine technology fits well into my work style, weight an average of 3.34.

Based on the compatibility of telemedicine technologies with the work of the medical practitioners, majority of medical practitioners representing 53.19% with an average weight of 3.43, thought that

the telemedicine technology medical practitioners use fits well with the way they like to work. This implies that medical practitioners in South Africa think the telemedicine technology they use fits well with the way they like to work, thus, they think that the telemedicine technology is compatible with their work. This is supported by the findings of Ahlan and Ahmad, (2014) in section 2.8 that the perceived usefulness affects behavioral intention directly because users may intend to use a system just by thinking it may help them do their job better.

Table 4.12 Distribution of respondent based on the complexity of telemedicine technologies

Response	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	Weighted Average
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
I believe that using telemedicine technology is cumbersome	3	3.45%	40	45.98%	27	31.03%	17	19.54%	0	0.00%	87	2.67
Using telemedicine technology require a lot of mental effort	3	3.30%	49	53.85%	27	29.67%	11	12.09%	1	1.10%	91	2.54
Using telemedicine technology is often frustrating	0	0.00%	29	32.58%	31	34.83%	29	32.58%	0	0.00%	89	3
I believe that it is easy to make telemedicine technology user friendly	1	1.10%	5	5.49%	25	27.47%	53	58.24%	7	7.69%	91	3.66
Learning to operate telemedicine technology is easier for me	0	0.00%	6	6.82%	43	48.86%	36	40.91%	3	3.41%	88	3.41
Telemedicine technology has reduced my remuneration	1	1.10%	44	48.35%	40	43.96%	4	4.40%	2	2.20%	91	2.58

Source: Field Survey, 2018

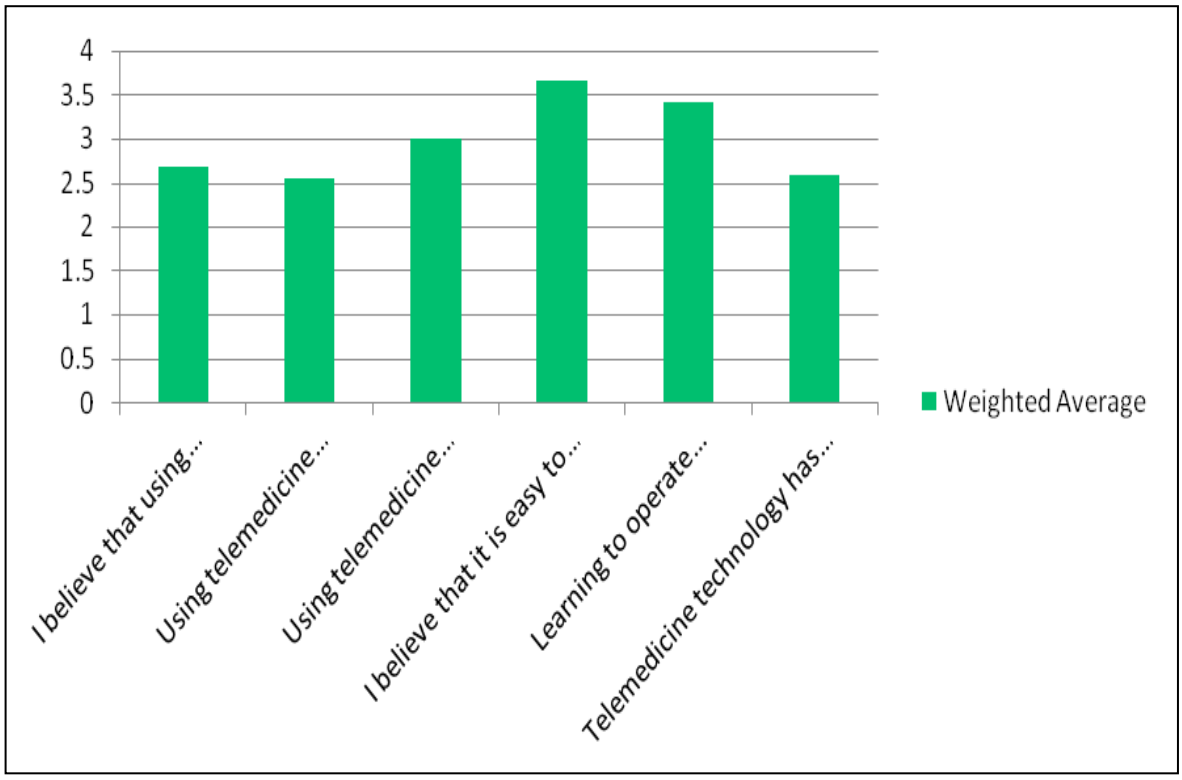


Figure 4.12: Distribution of respondent based on the complexity of telemedicine technologies

The table shows the complexity of telemedicine technologies. The number of respondents ranged between 87 and 91. The description of respondents based on the complexity of telemedicine technologies shows that 40(45.98%) of the respondents disagree that they believed that using telemedicine technology is cumbersome, 49 (53.85%) of the respondents disagree that using telemedicine technology require a lot of mental effort, 31(34.83%) of the respondents were neutral about whether using telemedicine technology is often frustrating, 53 (58.24%) of the respondents agree that they believe that it is easy to make telemedicine technology user friendly, 43 (48.86%) of the respondents were neutral about whether learning to operate telemedicine technology is easier for them, while, 44 (48.35%) of the respondents disagree that telemedicine technology has reduced their remuneration.

The weighted average of each of the statement indicated that; I believe that using telemedicine technology is cumbersome has, an average weight of 2.67, using telemedicine technology require a

lot of mental effort, has an average weight of 2.54, Using telemedicine technology is often frustrating, has an average weight of 3, I believe that it is easy to make telemedicine technology user friendly, has an average weight of 3.66, Learning to operate telemedicine technology is easier for me, has an average weight of 3.41 while Telemedicine technology has reduced my remuneration, had an average weight of 2.58.

Based on the complexity of telemedicine technologies with the work of the medical practitioners, majority of medical practitioners representing 58.24% with an average weight of 3.66, believe that it is easy to make telemedicine technology user friendly. This implies that medical practitioners in South Africa still believe that it is easy to make telemedicine technology user friendly. Their belief was premised on the fact since telemedicine has been widely applied by health practitioners to tackle a wide range of health challenges all over the world, the inability of some medical experts to use some equipment and software in telemedicine with reasonable ease and efficiency can be tackled (Bhattacherjee, 2001).

Table 4.13 Distribution of respondent based on the trialability of telemedicine technologies

Response	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	Weighted Average
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
I've had a great deal of opportunity to try telemedicine technology applications	10	11.11%	54	60.00%	15	16.67%	11	12.22%	0	0.00%	90	2.3
I know where I can go to satisfactorily try out telemedicine technology	11	12.50%	45	51.14%	16	18.18%	16	18.18%	0	0.00%	88	2.42
I always try out telemedicine technology applications before using it	6	6.74%	15	16.85%	34	38.20%	31	34.83%	3	3.37%	89	3.11
I use telemedicine technology on a trial basis, to foresee what it could do	4	4.40%	23	25.27%	30	32.97%	34	37.36%	0	0.00%	91	3.03
I do not have to take much effort in trying out telemedicine technology	3	3.30%	23	25.27%	42	46.15%	23	25.27%	0	0.00%	91	2.93

Source: Field Survey, 2018

The table shows the trialability of telemedicine technologies. The number of respondents ranged between 88 and 91. The description of respondents based on the trialability of telemedicine technologies shows that 54(60.00%) of the respondents disagree that they have had a great deal of opportunity to try telemedicine technology applications, 45 (51.12%) of the respondents also disagree that they knew where they can go to satisfactorily try out telemedicine technology, 34(38.2%) of the respondents were neutral on whether they always try out telemedicine technology applications before using it, also, 34(37.36%) of the respondents agree that they use telemedicine technology on a trial basis, to foresee what it could do, while 42(46.15%) of the respondents were also neutral on whether they do not have to take much effort in trying out telemedicine technology. The weighted average of each of the statement indicated that; 'I have had a great deal of opportunity to try telemedicine technology applications' has an average weight of 2.3, 'I know where I can go to satisfactorily try out telemedicine technology' has an average weight of 2.42, 'I always try out telemedicine technology applications before using it' has an average weight of 3.11, 'I use telemedicine technology on a trial basis, to foresee what it could do has an average weight of 3.03' while 'I do not have to take much effort in trying out telemedicine technology had an average weight of 2.93'. Based on the trialability of telemedicine technologies, majority of medical practitioners representing 38.20% with an average weight of 3.11, are still neutral on whether they always try out telemedicine technology applications before using it but from all indication, as it is presented in the table their level of concurrence with the statement shows that vast majority of the respondents still always try out telemedicine technology applications before using it. This implies that medical practitioners in South Africa always try out telemedicine technology applications before using them. This is corroborated by Burke &Litwin (1992) approach; A Causal Model of Organisational Performance and Change, where it was mentioned that there must be clear understanding of the type of change that is wished before it can be adopted.

Table 4.14 Distribution of respondent based on the observability of telemedicine technologies

Response	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	Weighted Average
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
In the hospital, I see telemedicine technology being used for many tasks	11	11.83%	34	36.56%	16	17.20%	30	32.26%	2	2.15%	93	2.76
Telemedicine technology is very visible in the hospital I work at	19	20.21%	44	46.81%	16	17.02%	13	13.83%	2	2.13%	94	2.31
It is easy to observe people using telemedicine technology in the hospital	17	18.28%	37	39.78%	23	24.73%	16	17.20%	0	0.00%	93	2.41

Source: Field Survey, 2018

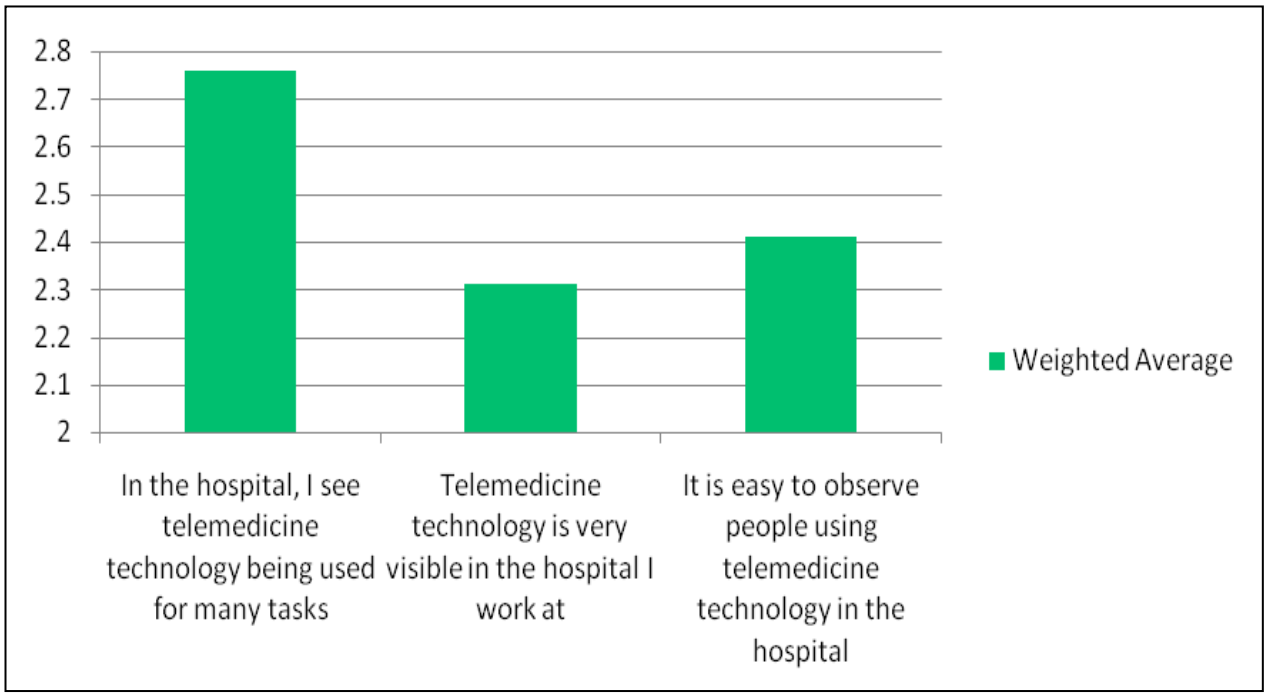


Figure 4.14 Distribution of respondent based on the observability of telemedicine technologies

The table shows the observability of telemedicine technologies. The number of respondents ranged between 88 and 91. The description of respondents based on the observability of telemedicine technologies shows that 34(36.56%) of the respondents disagree that In the hospital, they see telemedicine technology being used for many tasks, 44(46(81%) of the respondents also disagree that telemedicine technology is very visible in the hospital where they work, while another 37(39.78%) of the respondents also disagree that it is easy to observe people using telemedicine technology in the hospital.

The weighted average of each of the statement indicated that; In the hospital, I see telemedicine technology being used for many tasks has an average weight of 2.76, Telemedicine technology is very visible in the hospital I work at has an average weight of 2.31 while It is easy to observe people using telemedicine technology in the hospital has an average weight of 2.41.

Based on the observability of telemedicine technologies, majority of medical practitioners representing 36.56% with an average weight of 2.76, disagreed that in the hospital, they see telemedicine technology being used for many tasks. This implies that medical practitioners in South

African hospitals do not see telemedicine technology being used for many tasks. This is supported by Wootton (2008) who posited that in many developing counties, telemedicine is often used for diagnosis rather than clinical management which has tacked several health challenges in those nations.

4.6 Statistical Inferences

In this section, the hypothesis for the study is tested and inferences are drawn from the findings.

Hypothesis One

H_O The perceived usefulness of telemedicine has no significant effect on the behavioral intention of health professionals

H_i The perceived usefulness of telemedicine has significant effect on the behavioral intention of health professionals

Table 4.15 Cross tabulation table showing the relationship between Telemedicine technologies allow me to perform my medical work easily and I always try out telemedicine technology applications before using it

		I always try out telemedicine technology applications before using it					
		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Total**
Telemedicine technologies allow me to perform my medical work easily	**Strongly Disagree**	1	0	0	0	0	1
	Disagree	5	4	0	0	0	9
	Neutral	0	11	17	0	0	28
	Agree	0	0	17	31	0	48
	Strongly Agree	0	0	0	0	3	3
Total		6	15	34	31	3	89

Table 4.15 shows that the respondents agreed that medical practitioners always try out telemedicine technology application before using it because telemedicine technologies allow them to perform medical work easily. However, it was deemed needed to correlate the results of the perceived

usefulness of telemedicine with the behavioral intentions of the respondents. This will show if there is any relationship between how the respondent's prior intentions will affect or otherwise their response to the usefulness of telemedicine. In other words, if a practitioner already has a prejudice against telemedicine, they might be more inclined to have the opinion that telemedicine is not useful.

Table 4.16 Correlation table showing the relationship between perceived usefulness of telemedicine and the behavioral intention of health professionals

		Perceived usefulness of telemedicine	Behavioral intention of health professionals
Perceived usefulness of telemedicine	Pearson Correlation	1	.864**
	Sig. (2-tailed)		.000
	N	89	89
Behavioral intention of health professionals	Pearson Correlation	.864**	1
	Sig. (2-tailed)	.000	
	N	89	94

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

Table 4.16 shows the statistical correlation between perceived usefulness of telemedicine and behavioral intention of health professionals. The table shows that there is a strong-positive relationship between perceived usefulness of telemedicine and behavioral intention of health professionals with Pearson correlation of $r = .864^{**}$ and the significance value is less than .001 (as indicated by the double asterisk after the coefficient). Since the P value (significance value) which is 0.000 is less than 0.05 level of significance used in social statistics it means that their relationship is significant. This therefore means that H_o which states, that 'the perceived usefulness of telemedicine has no significant effect on the behavioral intention of health professionals' is hence rejected while the H_1 which states that the 'perceived usefulness of telemedicine has significant effect on the behavioral intention of health professionals' is accepted. This means that the perceived usefulness of telemedicine has significant effect on the behavioral intention of health professionals.

This further implies that as the perceived usefulness of telemedicine increases, there would also be a significant improvement in the behavioral intention of health professionals. This finding corroborates the Technology Acceptance Model (TAM) in which Adams et al. (1992) noted that the perceived usefulness; which is focused on the extent to which the newly introduced technology enhances their job performance determined acceptance which constitutes the behavioral intention of the health professional. Also, this finding supports the findings of Ahlan and Ahmad (2014) the perceived usefulness affects behavioral intention directly because users may intend to use a system just by thinking it may help them do their job better.

Hypothesis two

H_O External variables have no significant effect on perceived ease of telemedicine by health professionals

H_i External variables has significant effect on perceived ease of telemedicine by health professionals

Table 4.17 Cross tabulation table showing the relationship between Years of Service (Length of Experience) and I believe that using telemedicine technology is cumbersome

		I believe that using telemedicine technology is cumbersome				
		Strongly Disagree	Disagree	Neutral	Agree	Total
Years of Service	<5 Years	3	0	0	0	3
(Length of	5-10 years	0	24	0	0	24
Experience)	10-15 years	0	16	14	0	30
	Over 15 years	0	0	13	17	30
Total		3	40	27	17	87

The table shows that the medical practitioners that have worked for between 5-10 years believe that using telemedicine is not cumbersome

Table 4.18 Correlation table showing the relationship between external variables and perceived ease of telemedicine by health professionals

		External variables	Perceived ease of telemedicine by health professionals
External variables	Pearson Correlation	1	.847**

	Sig. (2-tailed)		.000
	N	87	87
Perceived ease of telemedicine by health professionals	Pearson Correlation	.847**	1
	Sig. (2-tailed)	.000	
	N	87	94

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

Table 4.18 shows the statistical correlation between external variables and perceived ease of telemedicine by health professionals. The table shows that there is a strong-positive relationship between external variables and perceived ease of telemedicine by health professionals with Pearson correlation of $r = .847^{**}$and the significance value is less than .05 (as indicated by the double asterisk after the coefficient). Since the P value (significance value) which is 0.000 is less than 0.05 level of significance used in social statistics it means that their relationship is significant. This therefore means that H_o which states, external variables have no significant effect on perceived ease of telemedicine by health professionals will be rejected while the H_1 which states that the external variables has significant effect on perceived ease of telemedicine by health professionals will be accepted. This implies that external variables have significant effect on perceived ease of telemedicine by health professionals.

This further means that as the external variables of telemedicine improves or increases, there would be a significant improvement increase on the perceived ease of telemedicine by health professionals. This finding was supported by finding of Iran (2000) that perceived ease of use are affected other external variables.

Hypothesis three

H_O Internal variables has no significant effect on perceived ease of telemedicine by health professionals

H_i Internal variables has significant effect on perceived ease of telemedicine by health professionals

Table 4.19 Cross tabulation table showing the relationship between what is your age and I believe that using telemedicine technology is cumbersome

		I believe that using telemedicine technology is cumbersome				Total
		Strongly Disagree	Disagree	Neutral	Agree	
What is your age?	25 to 34	3	6	0	0	9
	35 to 44	0	34	21	0	55
	45 to 54	0	0	6	12	18
	55 to 64	0	0	0	5	5
Total		3	40	27	17	87

The table shows that health professionals between the ages of 35 and 44 believe that using telemedicine technology is not cumbersome. Furthermore, Table 4.20 correlates that with the respondent's age. The results are shown on Table 4.20

Table 4.20 Correlation table showing the relationship between internal variables and perceived ease of telemedicine by health professionals

		Internal variables	**Perceived ease of telemedicine by health professionals**
Internal variables	Pearson Correlation	1	.800**
	Sig. (2-tailed)		.000
	N	94	87
Perceived ease of telemedicine by health professionals	Pearson Correlation	.800**	1
	Sig. (2-tailed)	.000	
	N	87	87

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

Table 4.20 shows the statistical correlation between independent variable (age) and perceived ease of telemedicine by health professionals. The table shows that there is a strong-positive relationship between age and perceived ease of telemedicine by health professionals with Pearson correlation of $r = .800^{**}$ and the significance value is less than .05 (as indicated by the double asterisk after the coefficient). Since the P value (significance value) which is 0.000 is less than 0.05 level of significance used in social statistics it means that their relationship is significant. This therefore

means that H_o which states, internal variables have no significant effect on perceived ease of telemedicine by health professionals will be rejected while the H_1 which states that the internal variables has significant effect on perceived ease of telemedicine by health professionals will be accepted. This implies that internal variables have significant effect on perceived ease of use of telemedicine by health professionals.

This further means that as the internal variables of telemedicine improves or increases, there would be a significant improvement and increase on the perceived ease of use of telemedicine by health professionals. As at now, no research available has been available. The researcher has presented information in this study on this issue which is one of this research's major contribution to the body of knowledge.

4.7 Chapter Summary

This chapter contains the data presentation and analysis which makes the chapter one of the most important chapters in a research work. The results of the 94 received questionnaires was presented and conclusions have been discussed. Demographic data on the valid questionnaires was presented. On the inferential side, it was reported that the most frequently used aspect of telemedicine was telephonic consultations while remote patient monitoring was the least popular. Most of the respondents said they are aware of telemedicine and they see it being adopted, but they don't particularly consider themselves as using it. In relation to the first hypothesis, it was resolved that medical practitioners are happy to try out telemedicine technology applications before using it formally as they agree that it allows them perform medical work more easily. The findings from the research data corroborates the Technology Acceptance Model TAM in which Adams et al. (1992) noted that the perceived usefulness; which is focused on the extent to which the newly introduced technology enhances their job performance determined acceptance which constitutes the behavioral intention of the health professional.

CHAPTER FIVE - SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter covers the summary of findings, conclusion, and recommendations on the research topic, perspectives of adoption of telemedicine in South Africa and examines the potentials and barriers to the uptake of telemedicine in South Africa. It relates directly to chapter 1 because, it revisits the aim, objectives, research questions and hypothesis of the research and it verifies that the plan of the research has been achieved. Having presented the overarching aim in the chapter, a review of extant literature in chapter 2, research design and methodology in chapter 3 and chapter 4 analyzing the results, this chapter wraps the research up in a succinct manner. It is done thematically to demonstrate how the aim of the research has been achieved.

5.2 Summary and key findings of the research

At this stage of the research, it is expedient to take an overview of the content of the five chapters one after the other. The first chapter gives an introduction to telemedicine, the second chapter contains the review of relevant literature, and theoretical framework, chapter three of the research presented the research methodology, while chapter four of the research contained the data analysis and the interpretation. The data were analyzed using frequency count, simple percentage, bar chart, cross tabulation, and correlation. The key findings of the research include:

The perceived usefulness of telemedicine has a significant effect on the behavioral intention of health professionals, which means that the way the health practitioners perceive telemedicine technology (to make their work easy, to be compatible with their work) would make them think of adopting it.

External variables have a significant effect on perceived ease of telemedicine by health professionals. This implies that demography such as years of service, employee's income and the availability of such facility goes a long way to affect how the health practitioner perceives its easy usage.

Internal variables have a significant effect on perceived ease of telemedicine use by health professionals. This implies that the age and gender, as well as the practitioners' Information and Commnication Technology (ICT) skills, go a long way to affect how they perceive ease of use of telemedicine tools.

5.3 Conclusion

Since the research has been able to establish that the perceived usefulness of telemedicine significantly improves the behavioral intention of health professionals, which various literature has supported and that both external and internal variables are capable of causing a significant increase on the perceived ease of telemedicine use by health professionals, the research therefore concludes that there is every possibility for telemedicine to be maximized in South Africa.

The possibility is hinged on the fact that even the medical practitioners have seen the benefit of telemedicine to their tasks and how much easier it is for them to execute their tasks. With this in mind, the three main theories in this research posited that they would want to accept it. Even though their access and abilities to manipulate some of these devices may constitute barriers to its full implementation and usage, yet, the medical practitioners are optimistic that a more user-friendly technology can be provided which would resolve the challenges of the uptake of telemedicine in South Africa.

Hence there is a need to put in place every necessary measure; policies, facilities, and skilled personnel to ensure that adoption and effective utilization of telemedicine technology is a permanent one.

5.4 Recommendations

It has emerged from this study that telemedicine applications may be diminishing due to a dearth of verifiable proof supporting their relative value compared to alternative services or for lack of evaluation research identifying the obstacles standing in the way of useful and sustainable programs. It can be argued that one of the main challenges facing telemedicine in South Africa (as with most developing nations) is the lack of usage (Field, 1996) lack of a change management plan and limited buy-in from practitioners (2013). This lack of usage could be because practitioners see no evidence that telemedicine is beneficial. Therefore, in line with the objective of this research and its findings, the research, therefore, makes the following recommendations:

1. For telemedicine to be fully achieved and implemented in South Africa, the medical practitioners need to play down the traditional and other healthcare practice that can hinder the effectiveness of telemedicine. Chief among these hindrances is remuneration. There is a need for collaboration with medical aid schemes/insurance for efficient reimbursement models. This would serve to incentivize the medical practitioners as well. This is one of the biggest barriers seen to reduce uptake of any telemedicine technology i.e. ‘the doctors are not adequately remunerated’. From the evidence, it seems there should be equivalent remuneration for remote assistance via telemedicine. Even if patients are not seen face-to-face, the advantages of using telemedicine in prevention, treatment or rehabilitation of patients are numerous in the long run.
2. Since telephonic consultation is the main telemedicine technology in South Africa, it is essential for the hospital's management to make adequate provision for all the facilities needed to make their work easy and enable them to embrace the technology. Additionally, it becomes imperative for hospital management to guarantee that they have an adequate understanding of the type of telemedicine technologies they would be adopting. They need to understand the peculiarities of their clients and patients and know what functions the technology needs to have; this is because accessible and easy to manipulate telemedicine technology can improve the level of acceptance.

3. The Government of South Africa should ensure that they review their policies as suggested in the change management approach and allow for more effective policies that support the effective adoption of these telemedicine facilities within hospitals.
4. This research is of the opinion that a broad-based role of telemedicine, as a method of health care delivery, surely would improve doctor-patient relationship, improve healthcare outcomes, increase access to care and members of a patient's healthcare team, and reduce medical bills when used as a component of a patient's longitudinal care. To achieve this, it is proposed that the most efficient use of telemedicine would be between a patient and physician with an established, ongoing relationship. This implies that there might be a need for at least one face to face consultation, subsequent treatments might be 'telemedical.'
5. This research is also of the thought that since telemedicine is still at its infancy in South Africa, it can be an alternative for patients who lack regular access to relevant medical expertise in their geographic area; especially rural dwellers. To enhance this, rural/community outreach programs should be incorporated into telemedicine. If doctors meet with their patients in rural areas, they can enlighten them of the planned and proposed usage of telemedicine. This will also alleviate any fears of confidentiality and secrecy fears that they (the rural dwellers) might have.
6. As indicated by Daniel and Sulmasy (2015), this research believes that episodic, direct-to-patient telemedicine services should be used only as an intermittent alternative to a patient's primary care, necessary to meet the patient's immediate acute care needs.
7. Finally, collaboration, participation, and capacity building are essential to the success and sustainability of telemedicine implementation in South Africa . High utilization should be an objective of any telemedicine program implementation. Without utilization, the program will decline.

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APPENDIX I - QUESTIONNAIRE ON POTENTIALS AND BARRIERS OF TELEMEDICINE (QPBT)

Dear Sir/Madam,

I am a student of Wits Business School, conducting a research on the topic "The perspectives of adoption of telemedicine in South Africa". You are kindly requested to sincerely respond to the items in the questionnaire. Be rest assured that all information provided will be used strictly for academic purposes and anonymity is guaranteed.

Thank you for your cooperation

Section A: Demographic of Health practitioner

Note: Please tick (√) as appropriate option

S/N	Questions	Response
1.	Hospital Name	
2.	Rank	(a) Internship doctor (b) Medical officer (a) Specialist(registrar) (b) Senior consultant (c) Others (specify)
3.	Sex	(a) Male (b) Female
4.	Age	(a) 20-29 years (b) 30-39 years (c)40-49 years (d) 50–59 years (e) 60and above
5.	Marital Status	(a) Single (b) Married (c) Devoured (d) Widow(er)
6.	Health practitioner's qualification	(a) Bachelor's Degree (b) MCAT (c) Medical School

		(d) Residency (e) Doctor of Medicine (f) Others specify_____
7.	Annual Income	(a) R0 – R100,000 (b) R100,001 - R200,000 (c) R200,001 – R300,000 (d) R300,001 – R400,000 (e) R400,001 – R500,000 (f) R500,001 and above
8.	Years of service	(a) ≤ 5years (b) 6 -10 years (c) 11-15 years (d) 16-20 years (e) 21years and above

Section B:

9.Practitioner's level of ICT use (a)very low (b) Low (c) undecided (e) high (f) very high

10. Any other comment_____

11. Practitioner's level of ICT skills (a)very poor (b) poor (c) undecided (e) good (f) very good

12. Any other comment_____

13. I have access to telemedicine technologies (a) yes (b) no (c) I don't Know

14. Any other comment_____

15. The Telemedicine technology used in the hospital (a**)** Digital camera (b) Computer (PCs) and tablets (c) Body scanner (d) Fax machine

16. Others specify: _____

Section C:

Note: Please tick (√) as appropriate option

SD=Strongly disagree, D =Disagree, N=Neutral, A = Agree and SA = Strongly Agree

S/N	**Telemedicine technologies Relative advantage**	**SA**	**A**	**U**	**D**	**SD**
17.	Telemedicine technologies enables me accomplish medical task more quickly					
18.	Telemedicine technologies improves the quality of medical work I do					

19.	Telemedicinetechnologies make me do my medical work easily					
20.	Telemedicinetechnologies make me improve my job performance					
21.	Telemedicinetechnologies gives me greater control over my work					
22.	Telemedicine technologies increases my work productivity					
	Compatibility					
23.	Telemedicine technologies are compatible with all aspects of my work					
24.	Telemedicine is completely compatible with my current situation					
25.	I think the telemedicine technology i use fits well with the way I like to work					
26.	Using telemedicine technology fits well into my work style					
	Complexity					
27.	I believe that using telemedicine technology is cumbersome					
28.	Using telemedicine technology require a lot of mental effort					
29.	Using telemedicine technology is often frustrating					
30.	I believe that it is easy to make telemedicine technology to do what I want it to do					
31.	Learning to operate telemedicine technology is easier for me					
32.	Telemedicine technology has reduced my remuneration					

	Trialability					
33.	I've had a great deal of opportunity to try telemedicine technology applications					
34.	I know where I can go to satisfactorily try out telemedicine technology					
35.	I always try out telemedicine technology applications before using it					
36.	I use telemedicine technology on a trial basis enough to see what it could do					
37.	I do not have to take very much effort to try out telemedicine technology					
	Observability					
40.	In the hospital, I see telemedicine technology being used for many tasks					
41.	telemedicine technology is very visible in the hospital where I work					
42.	It is easy to observe people using telemedicine technology in the hospital					

APPENDIX II - SPSS RESULT

```
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Crosstabs

Notes

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	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Telemedicine technologies allow me to perform my medical work easily * I always try out telemedicine technology applications before using it	89	94.7%	5	5.3%	94	100.0%

Telemedicine technologies allow me to perform my medical work easily * I always try out telemedicine technology applications before using it Crosstabulation

Count

		I always try out telemedicine technology applications before using it					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Telemedicine technologies allow me to perform my medical work easily	Strongly Disagree	1	0	0	0	0	1
	Disagree	5	4	0	0	0	9
	Neutral	0	11	17	0	0	28
	Agree	0	0	17	31	0	48
	Strongly Agree	0	0	0	0	3	3
Total		6	15	34	31	3	89

```
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```

Correlations

Notes

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Correlations

		I always try out telemedicine technology applications before using it	Telemedicine technologies allow me to perform my medical work easily
I always try out telemedicine technology applications before using it	Pearson Correlation	1	.864**
	Sig. (2-tailed)		.000
	N	89	89
Telemedicine technologies allow me to perform my medical work easily	Pearson Correlation	.864**	1
	Sig. (2-tailed)	.000	
	N	89	94

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

```
/TABLES=VAR00005 VAR00006 BY VAR00007
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/COUNT ROUND CELL.

Crosstabs

Notes

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	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
What is your age? * I believe that using telemedicine technology is cumbersome	87	92.6%	7	7.4%	94	100.0%
Years of Service (Length of Experience) * I believe that using telemedicine technology is cumbersome	87	92.6%	7	7.4%	94	100.0%

What is your age? * I believe that using telemedicine technology is cumbersome Crosstabulation

Count

		I believe that using telemedicine technology is cumbersome				
		Strongly Disagree	Disagree	Neutral	Agree	Total
What is your age?	25 to 34	3	6	0	0	9
	35 to 44	0	34	21	0	55
	45 to 54	0	0	6	12	18
	55 to 64	0	0	0	5	5
Total		3	40	27	17	87

Years of Service (Length of Experience) * I believe that using telemedicine technology is cumbersome Crosstabulation

Count

		I believe that using telemedicine technology is cumbersome				
		Strongly Disagree	Disagree	Neutral	Agree	Total
Years of Service (Length of Experience)	<5 Years	3	0	0	0	3
	5-10 years	0	24	0	0	24
	10-15 years	0	16	14	0	30
	Over 15 years	0	0	13	17	30
Total		3	40	27	17	87

```
CORRELATIONS
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  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

Notes

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	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=VAR00005 VAR00007 /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
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	Elapsed Time	00:00:00.06

Correlations

		What is your age?	I believe that using telemedicine technology is cumbersome
What is your age?	Pearson Correlation	1	.800**
	Sig. (2-tailed)		.000
	N	94	87
I believe that using telemedicine technology is cumbersome	Pearson Correlation	.800**	1
	Sig. (2-tailed)	.000	
	N	87	87

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

```
CORRELATIONS
  /VARIABLES=VAR00007 VAR00006
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=VAR00007 VAR00006 /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.07

Correlations

		I believe that using telemedicine technology is cumbersome	Years of Service (Length of Experience)
I believe that using telemedicine technology is cumbersome	Pearson Correlation	1	.847**
	Sig. (2-tailed)		.000
	N	87	87
Years of Service (Length of Experience)	Pearson Correlation	.847**	1
	Sig. (2-tailed)	.000	
	N	87	94

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